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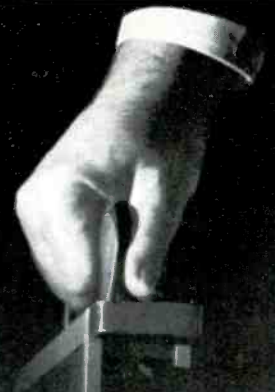
MARCH 1966/75 cents

Broadcast Engineering

*the technical journal
of the broadcast-
communications industry*



**INTRODUCING THE RIKER
"NEWLINE" VIDEO TEST SET
1st OF A SERIES OF NEW PRODUCTS**



UBIQUITOUS

. . . Ubiquitous because the light, compact, rugged "NEWLINE" test set is always ready to go anywhere (everywhere) and has every feature needed for high quality video testing.



THE "NEWLINE" VIDEO TEST SET FEATURES:

MULTIBURST • SIN² WINDOW (T AND 2T) • STAIRSTEP UNMODULATED OR MODULATED, INTERNALLY OR EXTERNALLY • FRONT PANEL COMP/NON COMP SWITCH • INTERNALLY OR EXTERNALLY DRIVEN • RACK MOUNTING OR INSTANTLY PORTABLE • HIGHEST QUALITY SILICON TRANSISTOR CIRCUITS

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- MODEL 6618 ENCODED COLOR BAR AND MANY MORE . . .

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can afford
RIKER quality**

MODEL 6601 — **\$1990**
VIDEO TEST SET —

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N.A.B SHOW**

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RIKER INDUSTRIES, INC.



Norden Lane, Huntington Station, New York Phone 516 HA 1-3444 Atlanta Los Angeles, Detroit, Washington, D.C.

Circle Item 1 on Tech Data Card

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FROM...



Sams Technical Institute, Inc.

... the dynamic training subsidiary of Howard W. Sams & Co., Inc., operates full-time training in electronics and other technologies with a continuous enrollment of more than 1100 resident students. NOW from the service-minded Howard W. Sams organization, known throughout the electronics industry for its authoritative service data and technical publications, comes the kind of home study program many technicians have been seeking.

TECHNICIANS... prepare for advancement AS AN FCC LICENSE HOLDER!



STI Self-Study Course

not only prepares you for your 2nd Class License, the first step toward your 1st Class "ticket," but also gives you the practical skills and know-how you must have for advancement to higher paying jobs in radiocommunications.

NOT A REVISED COURSE BUT ALL NEW FOR THE NEW FCC REQUIREMENTS

The Federal Communications Commission has recently revised and updated its standards and examination requirements for 1st and 2nd Class Radiotelephone Licenses. These new requirements demand an understanding of semiconductors and their circuit applications. Unlike "revised" courses, the STI home-study course was "built" for the new regulations. It is specially designed to enable technicians and others with basic electronics training, not only to pass the new FCC 2nd Class exam, but also to develop the solid background needed for advancement to a 1st Class License.

A TECHNICIAN'S ANSWER TO:

- increased earnings in two-way radio servicing
- updating your knowledge of transistors and other recent developments
- Improving your career position
- getting an FCC 2nd Class License

As the field of electronics changes, those who succeed must change with it.

**ACT
NOW!**

Start
preparing today
for
higher pay!

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Indianapolis, Ind.

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postage will be paid by:

Sams Technical Institute, Inc.

1720 EAST 38TH STREET
INDIANAPOLIS, INDIANA 46218

ATTN: HOME STUDY

Three Courses in One!

The Course combines material usually obtained only from three separate courses:

* FCC License Course

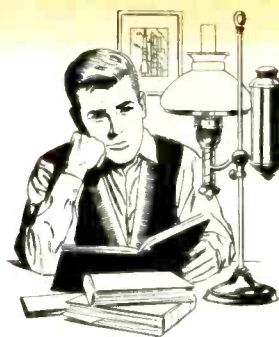
Presents material for Elements I, II, and III of the latest FCC license requirements in proper sequence—and far more thoroughly than is required for passing the 2nd Class FCC exam.

* Practical Servicing Course

Gives the practical know-how you need to adjust, troubleshoot and repair transistorized radio equipment.

* Covers Transistors

Gives far superior coverage of transistor principles and transistor circuit applications than found in most textbooks. In fact, this Course is an ideal way for a technician to up-date his transistor knowledge.



A Course with Proved Student Interest

Written by experts in the field, this new STI Course makes use of the latest and best teaching methods, and has been thoroughly student-tested in order to produce the finest Course available.

Every industry resource has been used to make this the most factual, timely and complete training of its kind. Learning is easy and enjoyable. The material is so interesting you will find yourself reading ahead with ever-increasing interest and enthusiasm.



Sams Technical Institute, Inc.
INDIANAPOLIS

- Please send complete information on the STI Home Study Course—
FCC License Course Radiotelephone 2nd Class.
- I am a technician Have had previous basic electronics training



Mr. William Renner, *Director*

SAMS TECHNICAL INSTITUTE, INC.

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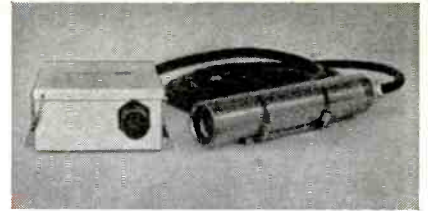
CITY _____ STATE _____ ZIP _____

TEAR HERE

ACT NOW!

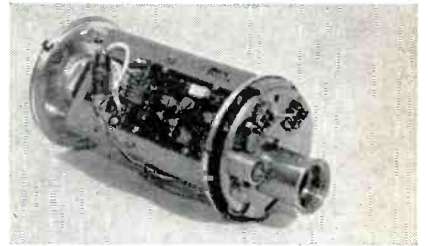
Start
preparing today
for
higher pay!

Solve any CCTV problem with one of these seven basic systems from Cohu.



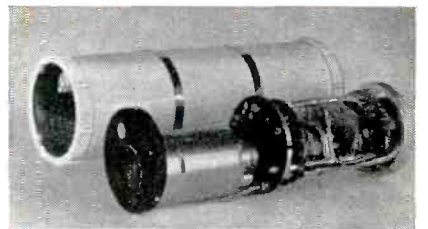
Radiation-tolerant

Get top quality TV pictures from radiation environments up to a cumulative dosage of 10^8 roentgens and/or 10^{12} neutrons/cm² with 3-inch diameter 2500 Series cameras. Readily de-contaminated.



Airborne

3" or 6" diameter cameras weigh as little as 5 lbs. Unaffected by extremes of temperature, humidity, dynamic pressure, altitude, noise, vibration, shock or acceleration, within broad limits.



Environment-resistant

3000 Series cameras provide continuous-duty operation in up to 100% humidity, at temperatures from $-20^{\circ}\text{C}.$ to $+60^{\circ}\text{C}.$, ocean depths to 250 feet and altitudes out to deep space. Meet military explosion-proof specifications. Operate on 10 or 20 megacycle bandwidths.

Which one solves yours?

For details on the industry's most complete CCTV line—including monitors, accessories and video switching systems—contact Cohu or your nearest Cohu representative.



High-fidelity color

1000 Series system includes the first CCTV camera with built-in references for correct registration and color balance. Compact, rugged, low-cost and easy-to-operate.



Miniaturized

Series 2000 cameras feature 3" outside diameter cylindrical housings that will accommodate remote-controlled 4:1 zoom lens. Many lens options available, including 10:1 zoom. Operate on 10 or 20 megacycle bandwidths.



High-resolution self-contained

Modular-designed 3100 Series offers choice of plug-in sync generators for EIA 525 or 729, 873 or 945-line scan rates. Automatically compensates for light level variations to 10,000:1.



Industrial self-contained

Complete with all camera control circuits, Model 20/20 cameras need only video cabling and any standard TV monitor to make a complete CCTV system. Highly versatile.

Visit our booth 311 at NAB, March 27-30
BOX 623 • SAN DIEGO, CALIFORNIA 92112 • PHONE: 714-277-6700

Circle Item 2 on Tech Data Card

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the technical journal of the broadcast-communications industry

Broadcast Engineering

Volume 8, No. 3

March, 1966

CONTENTS

Features

- | | | |
|--|---|----|
| The Gas-Powered FM Station | <i>Robert A. Jones and Anthony Santucci</i> | 14 |
| This FM Station generates its own power for a good reason—it saves money. | | |
| Broadcasting Football in Color | <i>George C. Sitts</i> | 16 |
| The inside story of how a network solves the problems in a live color remote. | | |
| Radio-Station Floor Plans | | 21 |
| Here are some ideas for laying out an efficient station floor plan. | | |
| Tower Marking and Lighting | <i>Thomas R. Haskett and Elton B. Chick</i> | 26 |
| Every broadcaster is concerned with this part of station construction and operation. | | |
| A Direct-Reading Transmission Set | <i>Charles D. Sears</i> | 31 |
| This piece of station-built test gear does part of the work for you in running the audio proof of performance. | | |
| Cartridge Care for Broadcast Turntables | <i>Robert B. Jackson</i> | 43 |
| Caring for this system element helps the station maintain a quality sound. | | |
| Investment Tax Credit on Equipment | <i>Ralph H. Butz</i> | 50 |
| Economic considerations often enter into engineering decisions; here is one to keep in mind. | | |

1966 NAB Convention Supplement

32 pages of news and information about the Convention and Engineering Conference. (supplement contents on page 52.)

51

Departments

- | | | | |
|-----------------------------|----|-----------------------------|-----|
| Letters | 13 | New Products | 114 |
| Washington Bulletin | 93 | Engineers' Tech Data | 123 |
| News of the Industry | 96 | Advertisers' Index | 125 |
| | | Classified Ads | 126 |

The word that best summarizes the current trend in television is "color." Scenes similar to this one in the studios of WSB-TV, Atlanta, will become even more common in the months to come. (Cover photograph courtesy of RCA.)



**This is the new FM Volumax.
It prevents FM overmodulation without distortion.
It eliminates SCA crosstalk.
It solves your pre-emphasis problem.**

It is yours absolutely free.
(for 30 days)



Overmodulation. An FM station engineer's headache. Use a clipper and you get distortion. Use a common limiter and you get pumping. You could reduce modulation levels. But that's not the answer.

So CBS Laboratories developed something new. A solid state FM limiting device that replaces common limiters and clippers. And it is unconditionally guaranteed to pre-

vent FM overmodulation and SCA crosstalk *without distortion*.

Hard to believe it does everything we say? Just send this page and your station letterhead. We'll send you the FM Volumax free. (For MPX stations we'll send the stereo model.)

Use it 30 days. After that, send it back if you can part with it. We'll even pay the freight. Or keep it for

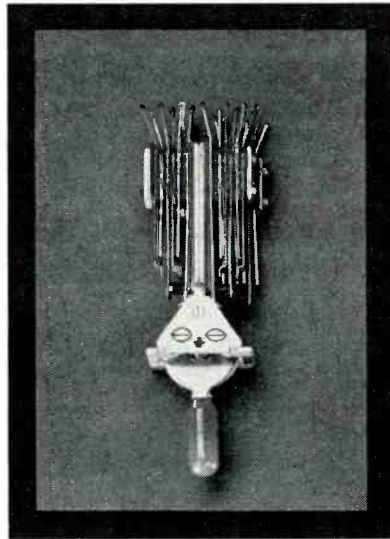
only \$695. Double that if you want the stereo model.

AM broadcasters were quick to respond to our free 30-day Audimax and Volumax offer. Now with the new FM Volumax we can make you the same offer. Be the first on *your band*.



CBS LABORATORIES
Stamford, Connecticut. A Division of
Columbia Broadcasting System, Inc.

Circle Item 3 on Tech Data Card



The pop-click-hum bug is dead.

Collins' new Speech Console hasn't a mechanical contact in the program circuits.

Photoconductive cells instead of relays and switches.

No contacts to wear and get dirty. Nothing at all to keep clean. Result: your most troublesome maintenance problem is ended. Also: no pops, clicks and hums from mechanical switches. Your audio is the cleanest, clearest audio on the air.

A lot less wire (and a lot less hum).

Audio doesn't have to travel to front panel and back. This means you have a lot less wire to pick up noise. (There is no noise, either, from attenuators. They are sealed in protective capsules.)

Module design ends time-wasting troubleshooting.

Simply take out one card and plug in another. Replace attenuator, input switches, and amplifier output switches with one quick shuffle of cards.

The Collins solid state 212S-1 is for stereo and dual channel operation for FM, AM and TV stations. The companion 212M-1 Console has fewer modules for mono program and monitor outputs.

For details, call your Collins representative. Or write: Broadcast Communication Division, Collins Radio Company, Dallas, Texas 75207.

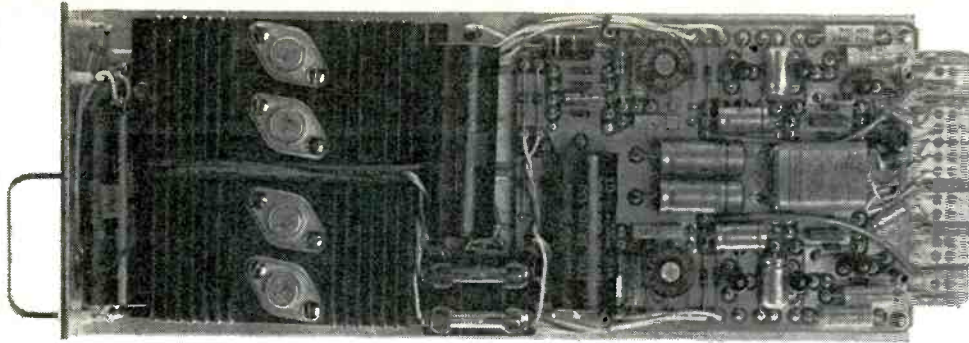


**This is the
Collins 212S-1
that killed the
pop-click-hum bug.**

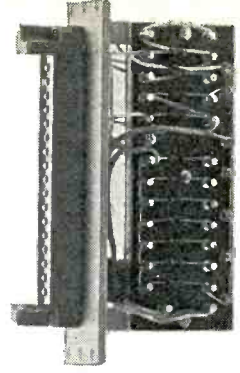


COMMUNICATION / COMPUTATION / CONTROL • COLLINS RADIO COMPANY / WORLD HEADQUARTERS / DALLAS, TEXAS

Visit Collins' Exhibit at the NAB Convention, Booth 209, to see the finest in Custom Audio, Speech Consoles, AM and FM transmitters
Circle Item 4 on Tech Data Card



AA-601 Plug-in Audio Distribution Amplifier Module (with cover removed) — self contained, solid state design. Each module provides up to 6 outputs (60 in a 5¼" frame) at +24 dbm, 600 ohms balanced.



Connector Assembly mounted on rear of rack frame determines input/output configuration and provides all connection terminals needed.

The Audio Equivalent Of A Video Distribution Amplifier—Avoids Cross-Talk — Provides High Quality Performance and On-Air Reliability

AUDIO DA

- HIGH ISOLATION BETWEEN OUTPUTS AVOIDS CROSSTALK — 60 db or better across entire audio band width, balanced or unbalanced.
- ADVANCED, HIGH-RELIABILITY. SOLID-STATE CIRCUITRY — minimizes possibility of failures that interrupt or degrade audio.
- RESPONSE ± 0.25 db 30-15,000 CYCLES — less than 0.5% harmonic distortion.
- INPUT MATCHING OR BRIDGING, BALANCED OR UNBALANCED, 600 or 150 OHMS.
- WIDE VARIETY OF OUTPUT NUMBER/IMPEDANCE/LEVEL CONFIGURATIONS AVAILABLE.

See this, and many other new exciting Ward products at the NAB Convention

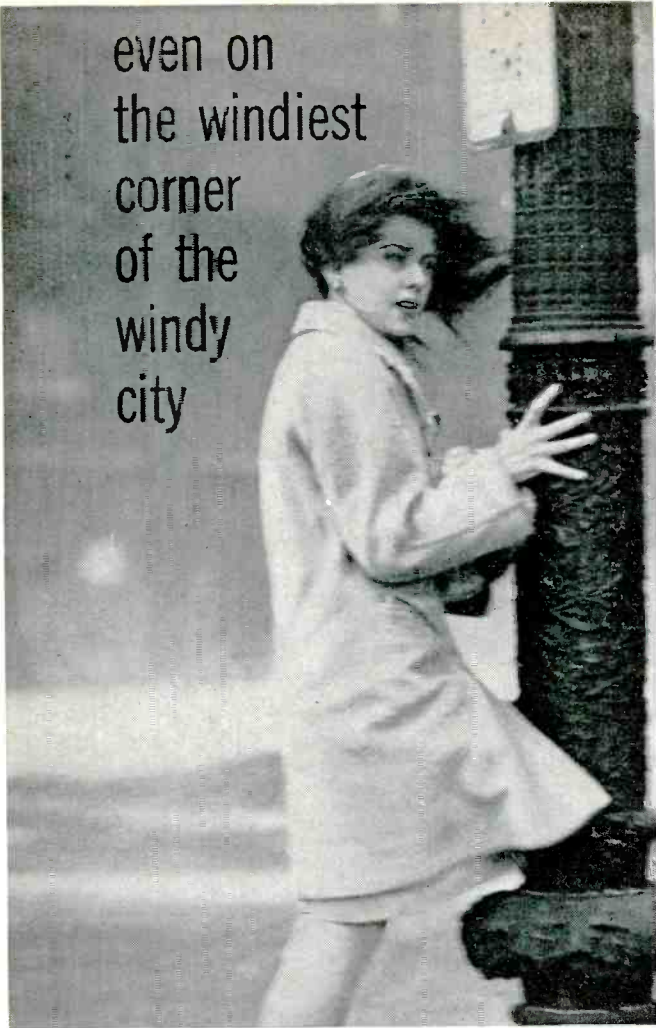


WARD ELECTRONIC INDUSTRIES

1414 EAST ST. GEORGE AVE., LINDEN, N. J. 07036 • (201) 925-4690

Circle Item 5 on Tech Data Card

even on
the windiest
corner
of the
windy
city



...this
microphone
needs no
external
windscreen

Shure's remarkable new SM50 omnidirectional dynamic microphone is SELF-WINDSCREENED! It is strikingly immune to wind noises and explosive breath sounds—making it ideal as a dependable “workhorse” microphone for remote interviews, news, sports pick-ups and a variety of field and studio applications. The five-element built-in windscreen makes it virtually pop-proof in close talking situations. And unlike other “built-in” windscreens, this one is “unitized” and self-contained with no bits or pieces to re-assemble after cleaning. In fact, you can actually rinse dirt, saliva, lipstick and other screen-clogging foreign matter out of the windscreen assembly under running water as often as needed—or replace the “unitized” assembly if necessary in a matter of seconds.

Additionally, the SM50 is the cleanest sounding professional microphone at anywhere near its price class. It delivers highly intelligible, natural and pleasing speech and vocal music that is especially full-bodied and rich in the critical mid-range.

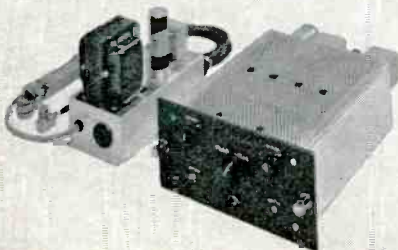
It is extremely rugged and will require little or no down time as the years go by. Too, when comparing it to other moderately priced omnidirectionals, it is lighter in weight, supremely well-balanced for “handability,” has a detachable cable, and a rubber mounted cartridge for minimizing handling noises. The SM50 is worthy of your most serious consideration.

For additional information, write directly to Mr. Robert Carr, Manager of Professional Products Division, Shure Brothers, Inc., 222 Hartrey Avenue, Evanston, Illinois.

SHURE SM50

OMNIDIRECTIONAL DYNAMIC MICROPHONE

SHURE STATION-TESTED AUDIO CIRCUITRY EQUIPMENT



SE-1 Stereo Transcription Pre-amplifier

Provides precise RIAA equalization from magnetic phono reproducers at line levels. Separate high and low frequency response trimmers. Lowest distortion, noise level, susceptibility to stray RF fields.

M66 Broadcast Stereo Equalizer

Passive equalizer compensates recorded frequency to three playback characteristics: RIAA, flat, roll-off. Provides precise equalization from magnetic pickup at microphone input level.



Shure stereo equalizer and preamplifiers are praised as MAJOR contributions to upgrading station quality by broadcasters.

Circle Item 6 on Tech Data Card

BROADCAST ENGINEERING



Belden wired broadcasting console

logs over 11,000 trouble-free hours

At radio station KDWB, St. Paul, Minnesota, where the disc jockeys are their own engineer and production man, a compact, highly reliable, and flexible broadcasting console was required. For flexibility, a custom console was designed to the critical specifications of the station's chief engineer.

To assure highest operating reliability and facilitate the console's compactness, Belden Beldfoil* shielded broadcast audio cable was used throughout the unit. Beldfoil is "the total shield." For extremely sensitive circuit applica-

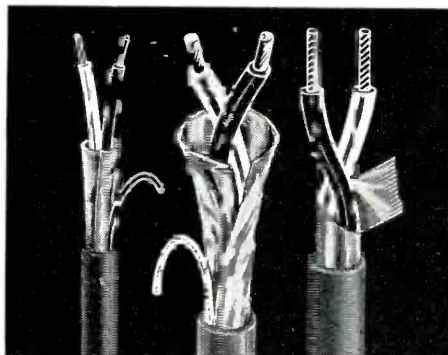
tions, it is superior to all other types of shielding for guarding against crosstalk and spurious signal impulses. Beldfoil also reduces cable diameters up to 66% . . . increases electrical integrity . . . and provides faster and easier shield termination.

Belden manufactures the most complete line of wire and cable for all radio and TV broadcasting, recording studio, remote control circuit, and similar applications. Ask your Belden sales representative for complete information or write for Catalog 865.

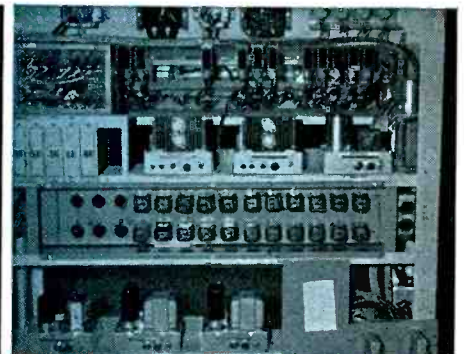
*Belden Trademark—Reg. U.S. Pat. Off.



In the studio, the disc jockey is in complete control. Looking over the installation are (left to right) Dick Halvorsen, Chief Engineer, KDWB; Sam Bridges of Electronic Design Company, console designers and builders; and Steve Gabor, Belden territory salesman. The disc jockey is Don DuChene.



Better Built—Better Buy—



The compact KDWB console is a solid state unit having complete broadcasting features and standby power. It provides mixing facilities for fourteen inputs including five cartridge tape machines, three turntables, microphone, news effects, tape machine, auxiliary, news room, and disc jockey studio.

BELDEN MANUFACTURING COMPANY

power supply cords • cord sets and portable cordage • magnet wire • lead wire • automotive wire and cable • aircraft wires • welding cable

P.O. Box 5070-A • Chicago, Illinois 60680

Circle Item 7 on Tech Data Card

8-8-5

March, 1966

TAKE A CLOSER LOOK

at the **RUGGED NEW**

J A M P R O

**UHF
ZIG ZAG**

**TELEVISION
ANTENNA**

IT'S DESIGNED FOR FLEXIBILITY

The ZigZag offers more pattern and gain flexibility than any other UHF antenna. Extremely high power gains are available with contoured vertical patterns.

Models with omni-directional and cardioid patterns are available providing power gains from 10 to 53 and power capabilities of up to 50 KW!

This low cost antenna contains a self supporting internal tower, and is capable of withstanding the most severe weather conditions. The heavy duty construction features hot dipped galvanized steel, stainless steel hardware and the time proven balun feed system.

FOR DETAILS WRITE:

J A M P R O

ANTENNA COMPANY
6939 POWER INN ROAD
SACRAMENTO, CALIFORNIA

VISIT NAB BOOTH 305
Conrad Hilton Hotel, Chicago

Circle Item 8 on Tech Data Card

BROADCAST ENGINEERING



The spirit of 76 (tv)

We'd like to urge you to buy our 76TV microwave relay system next time you are in the market for monochrome or color video transmission equipment. Not for the obvious reasons, though, like its outstanding performance, low price, and easy maintenance.

No, we think you ought to buy our 76TV because of its demonstrated heroism and valor. And long-suffering patience in the face of overwhelming odds.

How do you think it feels when, year after year, hundreds of tons of explosives are fired off inside you? When, in a typical week—besides three glorious concerts and five exciting football games—about 30 murders, 24 auto accidents, twelve divorces and four or five extortion schemes are perpetrated

through your unflinching innards? When headaches, backaches, congested nasal passages all get their appropriate fast relief through you?

To do this day-in and day-out takes solid-state guts. Such devotion ought to be rewarded. Buy a 76TV microwave relay system from Lenkurt Electric Co., Inc., San Carlos, California, now! That's the spirit.

LENKURT ELECTRIC
SUBSIDIARY OF
GENERAL TELEPHONE & ELECTRONICS **GTE**

Circle Item 9 on Tech Data Card

General Electric announces a compact audio-console for all TV, AM, FM and recording applications



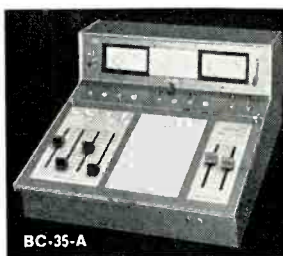
BC-35-B

The new BC-35 is the most compact audio console on the market. 19" wide, 21" deep, and 10½" high—a real solid design. The console base cabinet is optional.

Dual level input channels operate as low level (mike) inputs or medium level inputs (a tape, transcription, line or phone). A Hi-Lo Switch on the circuit board is your selector.

The new console sports such unique features as DC controlled audio switching, new and improved silicon transistorized circuitry, and built-in "cue" facilities.

It's used in single or dual program channels, and comes in 2 models—the "A" Model with 4 mixers and the "B" Model with 8 mixers. Otherwise they're identical.



BC-35-A

These key features make the new BC-35 the only audio console on the market that does what you want it to. Result? You get top performance, optimum operation, and minimum maintenance—all in one unit.

Write today for information on the new BC-35 A/B. It's for all AM, FM, TV and recording applications. General Electric Company, Visual Communications Products #7-315, Electronics Park, Syracuse, N.Y. 13201.

GE-28

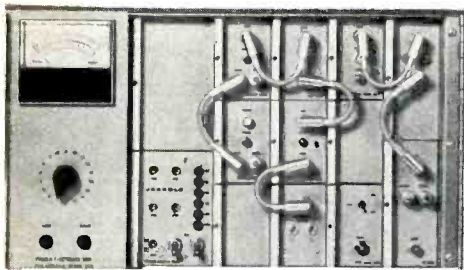
Visual Communications Products

GENERAL  ELECTRIC

Circle Item 10 on Tech Data Card

BROADCAST ENGINEERING

not just color... COLOR



with new Jerrold 440 solid-state microwave

For your STL and other microwave applications, color transmission demands excellent differential phase and gain characteristics. New Jerrold 440 Solid-State Microwave, with differential phase of ± 0.25 degree and differential gain of ± 0.25 db, is the equipment to specify.

Compact, ultra-stable, with solid-state design and high-output klystron—the 440 Series by Jerrold is without a doubt the finest microwave gear available from any manufacturer at any price. We'll prove it—write today for complete technical data.

Features of Jerrold 440 (6-8 GHz)

1-watt (min.) transmitter output • Vapor-stabilized transmitter klystron • Frequency stability $\pm 0.005\%$ • Solid-state receiver and local oscillator • 12 MHz baseband, flat within ± 0.25 db • Individually self-contained power supplies • Modular construction throughout • Compact—only 10½ in. high.



Communications Systems Division
401 Walnut Street, Phila., Pa. 19106
Circle Item 12 on Tech Data Card

March, 1966

LETTERS to the editor

DEAR EDITOR:

I am a contract technician serving the local Armed Forces Radio and Television broadcasting facility. In the May 1965 issue of BROADCAST ENGINEERING was a description of a new product which might be the answer to a problem we have in this station. If I were at home I could easily look up the address of the company and write directly to them, but here I don't have the information handy, so I am asking you to forward my request.

Far removed from the main stream of civilization, we can't always get simple parts as easily as we can in the States. If something breaks and you can't get the parts to repair it, you still have to "do something." If what you do is an obvious "jury-rig," somebody will see in it a "ground safety hazard." Even a cube tap in a convenience outlet is strictly prohibited everywhere on the base; if an extra outlet is needed, a work order must be submitted through channels, and we must wait until the work is done. (Occasionally, we can find a way to interpret a regulation so that we can do the work ourselves, as in the case of convenience outlets in the bases of the uninstalled equipment racks; these were part of an electronic assembly and not wiring as such.) We try to buy accessories which will give as much backup for the dollar with as little obvious "jury-rigging" as possible.

JAMES A. DAVIS
A.P.O., New York

This is part of a very interesting letter Jim wrote us relating some of the problems encountered by a civilian contract technician on a military base in Greenland. Maintenance problems are bad enough when there is ready—or even limited—access to repair parts or replacement equipment; it takes real ingenuity to keep a station going when you're severely limited in what you can do.

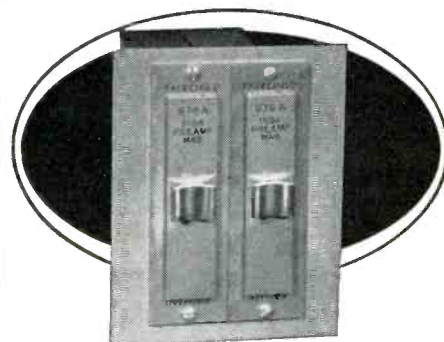
Your request has been forwarded to the proper people, Jim. We hope they'll be able to help you.—Ed.



FAIRCHILD Model 750—the only quality 3-speed, 16" turntable with -65 db rumble, .03% wow and flutter, 3 speeds easily selected, whisper soft operation, cue pad provided, and minimal moving parts for long trouble-free performance.



FAIRCHILD Model 755—a quality 2-speed belt drive turntable which incorporates extremely low rumble and imperceptible wow and flutter, fast cueing, attractive packaging and easy installation. Far superior to any other turntable at this or even higher price.



FAIRCHILD EQUALIZED NAB PLAYBACK PRE-AMP, Model 676A—a low noise silicon transistor preamp for proper NAB playback of records. Minimum controls assure consistency of station quality. Available mono—676A; stereo—676A-2 (pictured).

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Circle Item 11 on Tech Data Card

THE GAS-POWERED FM STATION

by **Robert A. Jones**, *Midwestern Regional Editor*,
and **Anthony Santucci**—This station uses commercial
power as a stand-by.

WTAS is an usual broadcast station—it operates with public utility electric lines for stand-by power. The reason is a simple one: economics.

Economic Considerations

WTAS is the FM sister station of WCGO (AM), Chicago Heights, Illinois. Because of the minimum mileage separation required by the FM allocation standards, it was not possible to construct the FM facility at the WCGO site. This, of course, required that a new transmitter building be constructed for the FM station. Under consideration during the planning for this new building was the utilization of gas for heating and air conditioning. The people at the gas company suggested using gas not only for that purpose but also for electric-power generation; some thought had already been given

to installing a stand-by generator. (Normally stand-by power would not be needed in this part of Illinois, but the rural FM site was thought to be more subject to power failures than the WCGO site in Chicago Heights.)

At first the idea of using gas to power the entire station seemed humorous, but further investigation began to show that the idea was feasible. Table 1 shows a summary of the three basic plans prepared by the gas company and the WCGO/WTAS technical staff.

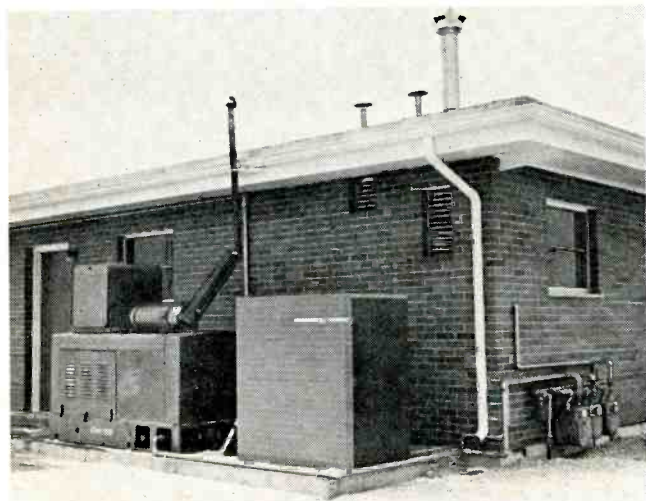
Plan A is based on using gas for heating, air-conditioning, and power-generating equipment. Under this plan the station would own the gas generator. Also it was assumed that some electric power would be purchased for stand-by and other minimum requirements.

Plan B is based on using gas for

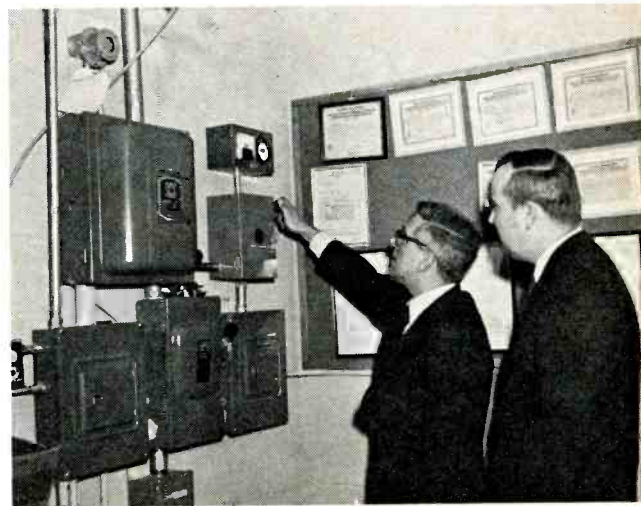
heating and air-conditioning, with this equipment being owned by the station. Under this plan, the gas-powered generator would be leased by the station. Some electric power would still be purchased for stand-by and minimum requirements and for running lights, etc., at night when the transmitter is shut down.

Plan C is based on a "total-electric" station—one using electric power not only for broadcasting but for heating and air-conditioning. All equipment would be owned by WCGO/WTAS. Under this plan, there would be no stand-by electric power.

The figures listed in the table are yearly costs and are based on the normal power requirements of a station employing a five-kilowatt transmitter and located in this northern Illinois climate. There is the



Gas-powered generator is at left on slab behind building.



Transfer switches, meter panel for gas-fired generator.

normal amount of studio and auxiliary equipment, lights, etc. The costs for heating the station are based on a three-ton unit. Such a unit would consume, with full-load operation, about 110,000 BTU/hour; the heating season was assumed to be six months. For cooling, a three-ton unit was also taken as the basic model. If a station installed larger or smaller units than these, the costs would be proportionally greater or less than those given.

The figures shown are based on the rate for the higher use of gas. If the station did not use gas for both heating and air-conditioning, but only for generating electric power, the rate would be higher.

The lower estimated cost of gas-generated electric power, plus the availability of stand-by electric power, was a big incentive to go "all-gas." The estimated savings by using gas instead of an all-electric system would be about \$150 per year if the station purchased the gas power generator. The savings would be about \$60 per year if the generator were leased. It was concluded that the use of gas and a station-owned generator would be the most economical plan.

The System

The power system installed at WTAS has a 25-kw generator operating at 37.5 KVA and 0.8 power factor. The generator is driven by a six-cylinder engine that can be operated on either natural gas, as at WTAS, or bottle gas. With some minor changes in the carburetion system, it can even be operated on gasoline.

As the photographs show, this generator is not a small thing. It must be installed on a thick concrete pad and should be outside since there are exhaust fumes and some noise while it is in operation. The unit weighs about 1540 lbs, stands 42" high, and is about 6' long. A weather-proof housing is supplied, and there is a remote start and stop circuit in addition to the local starting panel and meter functions.

Fig. 1 shows the electrical distribution system devised by the WCGO/WTAS staff. Electrical output from the generator feeds into both the main transfer switch and the auxiliary power-transfer switch.

Table 1. Summary of Annual Power Cost

	Plan A	Plan B	Plan C
1. Electric Power for Night Use	\$ 73.00	\$ 73.00	\$ —
2. Space Heating	147.50	147.50	398.75
3. Air-Conditioning	64.00	64.00	106.00
4. Electric Power	1012.24	1012.24	2220.00
5. Stand-By Electric Service (Demand)	360.00	360.00	none
6. Owning Cost of Gas-Powered Generator (based on \$4,300 at 6% depreciation over 15 years)	440.00	0	0
7. Leasing Cost of Gas Generator	0	525.00	0
8. Maintenance Cost of Gas Generator	480.00	480.00	0
9. Total Costs	\$2576.74	\$2661.74	\$2724.75

Power from the electric-company mains also feeds into each box. These boxes have only transfer switches, not fuses or breakers. The switches allow the engineering staff to select the gas-powered output or the regular mains to feed the transmitter. Also, either source of power is available for supply to the auxiliary equipment. If desired, the transmitter can be operated by the gas-powered generator, while the other equipment operates from the mains. The opposite arrangement is also possible.

Shown in Fig. 1 is the meter panel for monitoring voltage and frequency of the generator output. These meters can be read when either the main or auxiliary power-transfer switch is engaged.

System Problems

There were some difficulties in putting the generator into service. It was sometimes hard to start and keep running because the battery was run down. This was found to be caused by an undersized fan belt. A heavy-duty belt solved the problem.

Another unique problem was caused by the tower lights. The fluctuating power demand due to the flashing top beacon affected the speed of the generator. The problem was solved by moving the beacon to another circuit leg and more carefully balancing the electrical load.

The frequency of the gas-powered generator is not as steady or accurate as that of the regular mains. This, of course, has an undesirable

• Please turn to page 84

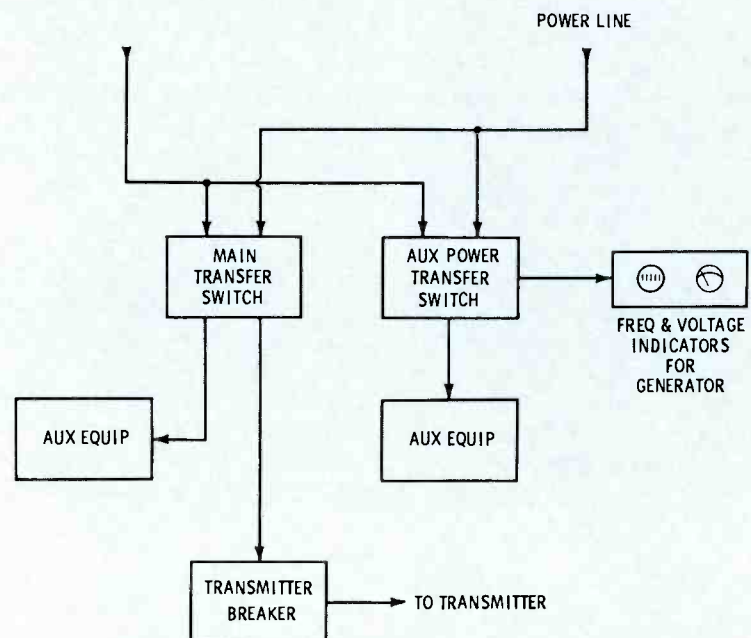


Fig. 1. Diagram shows arrangement for transferring from generator to power line.

BROADCASTING FOOTBALL IN COLOR

by **George C. Sitts**, Eastern
Regional Editor — This is how a network
outdoor color pickup is made.

Mention of network television engineering brings to mind an image of large equipment pools, remote vans, and crews specializing in particular pieces of gear. But how does a network go about maintaining its engineering standards when color equipment is so scarce that the network cannot purchase enough to meet all its remote-pickup needs?

NBC is scheduled for as many as eight color-TV football pickups on one weekend. Finding and preparing equipment for the Denver Broncos-New York Jets game at Shea Stadium, New York on Sunday, October 31, was typical of the current procedures for game pickups.

Walking into Shea Stadium on Thursday morning, before the game, we found a simple studio and control room in the basement on the east side of the stadium and four WOR-TV color cameras scattered through the fourth-level press box on the west side of the field. That was it. Because NBC had obligations for several color pickups that weekend, it had arranged to rent most of the equipment for this game. The four cameras already at the stadium were those WOR-TV had used to pick up New York Mets baseball. Sports Network Incorporated (SNI) was to furnish two more color cameras, plus two video tape recorders with color capability. NBC also brought in two black-and-white cameras of its own.

Initial Setup

Setup began at 8:00 AM, Thursday, when three video men, three cameramen, two maintenance men, and two audio men arrived and met personnel assigned by SNI, WOR-TV, and the local phone company to

supervise their own equipment. First operation was placing the two SNI cameras and setting up the WOR-TV cameras as follows:

On the fourth level, west side—one at the north-end 20-yard line, two at the 50-yard line, and one at the south-end 20-yard line.

On the fourth level—one behind the south-end goal post. At field level, west side—one mounted on a forklift truck with enough cable to reach either end of the field.

The WOR-TV cameras were already cabled to camera controls in the east-side basement control room. However, it was necessary to connect the SNI cameras to the SNI camera-control van outside the west side of the stadium and to connect the video signal from the control units to the switcher in the east-side control room, over a thousand cable feet from the vans.

While NBC electricians were cabling video and cameras to the SNI camera van, the stadium electricians were busy hooking up power to the van, and telephone men were occupied with connecting intercom phones (or PL's) between the van, control room, announcers' press box, and field. Video and audio lines to the announcers' press box were available from previous WOR-TV pickups. The box, located on the 50-yard line, was immediately adjacent to the two midfield cameras.

Video men ran into the expected number of connector problems. A camera cable connector was bent, so a spare was substituted. Several audio and video connectors had to be changed, jumpered, or otherwise modified to match the foreign equipment. By quitting time Thursday,

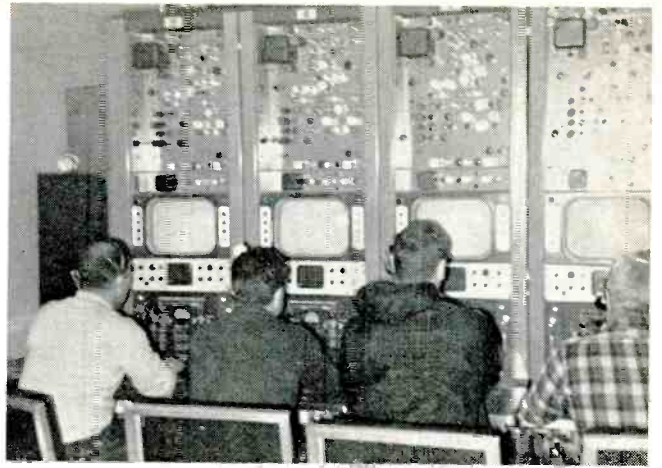
however, most cables were in place and in operating condition.

Friday morning the crews were again on the job by 8:00AM. Cameras were started and allowed to warm up and stabilize. A color-bar test signal was used to match (approximately) and adjust the six cameras. Each camera was uncapped and registered using a test pattern (TP). These two processes, the TP and color-bar check, brought out several minor problems: a viewfinder that was not bright enough, noise in one channel, an intermittent gain loss, some need for added cable compensation, and minor tube replacements. These problems were solved by mid-afternoon. Lenses were distributed and traded about until each cameraman could get all his shots.

While the cameramen were solving their problems, the SNI videotape truck arrived, was parked behind the SNI camera truck, and connected for power, video, sync, and audio. Each of the two videotape recorders in the van received its input video signal from a switching bus in the control room. The output video signal from each machine returned to the control room, appearing on a similar output switching bus. The machines were used for NBC's "instant replay" effect. During the game, before each play, the director selected the two cameras most likely to follow the play. He then keyed in the words "instant replay" from a black-and-white studio camera and switched each of the two cameras to a video-tape machine. A cue tone was inserted on the cue track at the start of each play by the VTR operator to allow a rapid recue. The machine recording the best view of the play was then used for "instant replay."



Mobile field-level camera in action during the game.



Four WOR-TV camera controls in basement control room.

The video replay determined by the director was switched on the line composite switcher. Video from the two cameras used to tape for replay also appeared on the regular switcher, allowing the director full camera selection at all times.

All of this fancy switching and keying required careful attention to pulse delays and phase relations between the control room and video-tape van. In the setup operation, video-tape operators first phased an incoming color-bar signal to record properly. They discovered a delay-line problem—the pulse-delay range of the machine was not broad enough, leaving them with too little breezeway. (Breezeway is a commonly accepted designation for the portion of the back porch between the horizontal-sync pulse and the burst. The section between the burst and the beginning of video is now referred to as the back porch.) The addition of several external delay lines satisfactorily cleared up that problem.

Several minor troubles arose that could best be described as traveling

troubles—connections and components worked loose during travel to the stadium. The VTR crew spent the remainder of Friday working out these bugs.

The audio men were probably the quietest of the three crews, although their signal routing was almost as complex as the video routing. Because audio lines had been placed on Thursday, the technicians spent Friday positioning and testing microphones, setting levels, placing intercoms, and improvising connections. Three microphones were placed in the announce box, with one as a spare. One small parabolic microphone was hung in the stadium to pick up crowd noise. Another larger parabolic microphone was wired for hand-carrying along the sideline to pick up cadence and player noise. Finally, one mike was connected at field level, and two were connected in the studio for interviews.

Intercoms were set to allow all necessary communication. The director could talk to cameramen via headset intercom and to VTR operators via a squawk box. He

could also speak by headset to the stage managers, both in the announce box and the studio. In addition, the director could contact the announcers by interrupting the program feed on their headsets.

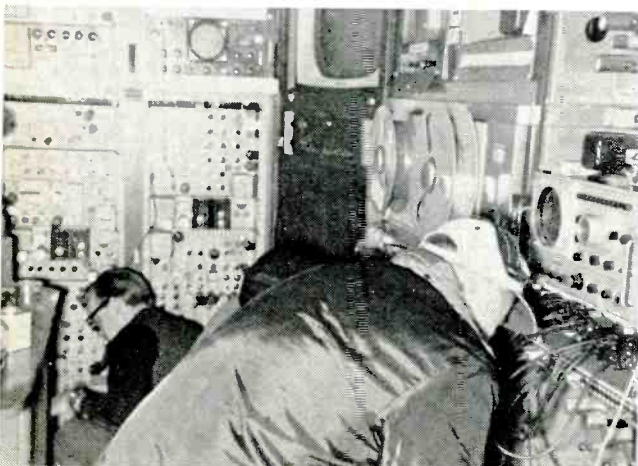
Other audio feeds included crowd noise to the VTR van and program audio to several monitor points, headsets, and NBC network control in Manhattan.

By Friday night, most audio, video, and tape problems were licked, and all major program equipment was in operating condition.

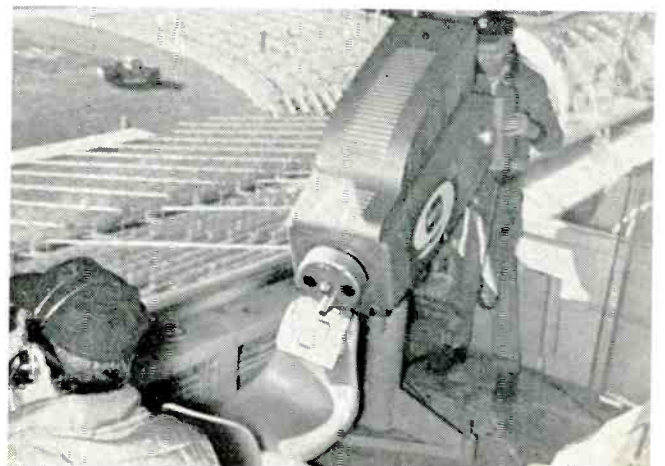
Final Setup

Saturday was the day for peaking and checking, and pressure appeared less than during the preceding two days. Some of the maintenance men pointed out that the setup had been exceptionally smooth, putting the crew about half a day ahead of schedule. They also explained that a major problem with a camera, VTR, or switching equipment could have eaten up that half day very quickly.

Video and VTR operators spent



VTR's inside van (used for instant replay) are adjusted.



Midfield cameras were registered and balanced Saturday.

the morning tightening up pulse timings, phasing cameras, and selecting the best heads for the video-tape recorders. Two large cloths, one black, one white, were placed on the field and used to adjust the black-and-white balance of the color cameras. A minor video-tape problem occurred when a head preamp conked out. Its failure was finally attributed to a connector strip that had worked loose. By noon, everything looked in good shape.

A college game between Syracuse and Pittsburgh was scheduled for Saturday afternoon and gave NBC crews an excellent opportunity to rehearse. Because there were no announcers, producer, or director (they were at an Atlanta game), the technical director (TD) rehearsed the cameramen and video-tape operators throughout the game. The NBC cameramen had not been familiar with the WOR-TV cameras before this time, and the tape operators were unfamiliar with the details of SNI's VTR's. During the afternoon, both groups worked out operating problems.

Sunday operation began before dawn when a skeleton crew arrived at 4:45 AM to warm up the equipment. The main force began arriving at 7:30 AM, and almost everyone was on the job by 8:30 AM. The studio stage manager set up his super (key) cards (which were black menu boards on easels), lighted his studio, and checked his shots. The field stage manager spent the morning hanging lights and NBC banners in the announce box and at field level, placing the announcers' monitors, covering WOR-TV and SNI designations on cameras, and check-

ing scripts and cue cards.

The side-line camera was mounted on the fork-lift and tested for loose cable connections and ignition interference by driving the lift up and down the field several times. All the cameras were on TP and pronounced operational before 10:00 AM, when the crews went to lunch.

Final TP occurred at 11:00 AM, when the sun was on the field; cameras were touched up for flesh tones and intercamera balance. At about this time, an announcer audio-taped a player interview in the locker room for insertion during the game. By 12:45, everyone was in position and ready. The game began at 1:00 PM.

The Game

Production during the football action was typical network high caliber. The director called the shots, while the TD switched them. Each camera chain had one cameraman and one camera control operator. The senior video operator continuously monitored phasing and balance between cameras and video tape, calling for corrections as needed. The two stage managers handed out cue cards and commanded setups for keyed inserts. The producer sat near the director, calling the commercial interruptions and deciding program content. The control room, as with any large production, was extremely busy, but operations ran smoothly.

After the Game

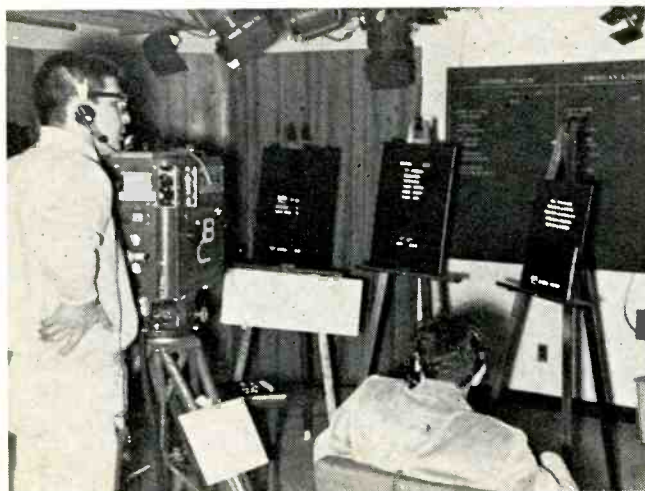
A short, "catch-your-breath" break followed the game; then came the preliminary tear-down. Monitors and mikes were removed to prevent theft or weather damage.

Monday, tear-down began in earnest, and all equipment was out by evening. The crews took their two days off Tuesday and Wednesday, then began again on Thursday in a different stadium in a different city with completely different equipment.

NBC, in order to accomplish this color football pickup, had to scramble for color equipment, adjust connectors and levels that did not match, build platforms, and rewire equipment on the spot. The appearance of these non-textbook problems might leave the casual observer with the idea that the entire remote operation was "improvise and make-do," but careful analysis would change that opinion. NBC accepted shortage of color equipment as simply another problem. The network knew well in advance what problems might occur in interconnecting foreign equipment with their own, and it planned for people to be on hand to solve the difficulties. For instance, a tape man from SNI was present who knew the van and handled VTR maintenance, despite the fact that NBC had a score of men available who knew that type machine. Although NBC had several experienced video men at the stadium, a video man from WOR-TV was also there who knew the idiosyncrasies of that station's cameras.

Conclusion

We went to Shea Stadium on October 31 to see how a network would improvise a color football pickup; we left knowing that a professional broadcasting outfit like NBC does not improvise, but rather accepts and analyzes possible problems and engineers them away. ▲

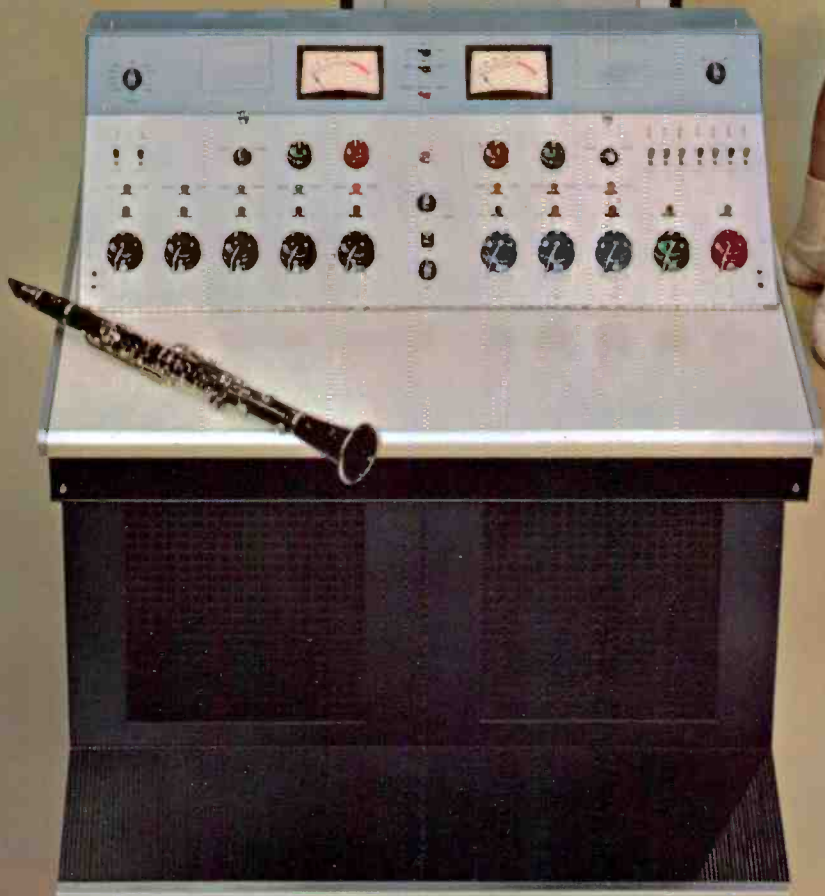


Monochrome camera in basement studio used for inserts.



Control room in action: TD, director, producer, audio men.

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Plan E should be built at a cost of \$16,000 to \$24,000, depending on local labor and material costs and the type of construction used: block, frame, or brick. It was planned for a small-market, small-staff station. The control room is adjacent to the transmitter room for maximum convenience in a combo-type operation. Though a separate newsroom and music library seem like luxuries, music and news are the source of the majority of programming in a local operation and therefore deserve their own space. By separating the library from the control room and studio area, auditioning of records and commercial production aids can be done without

interference to regular programming.

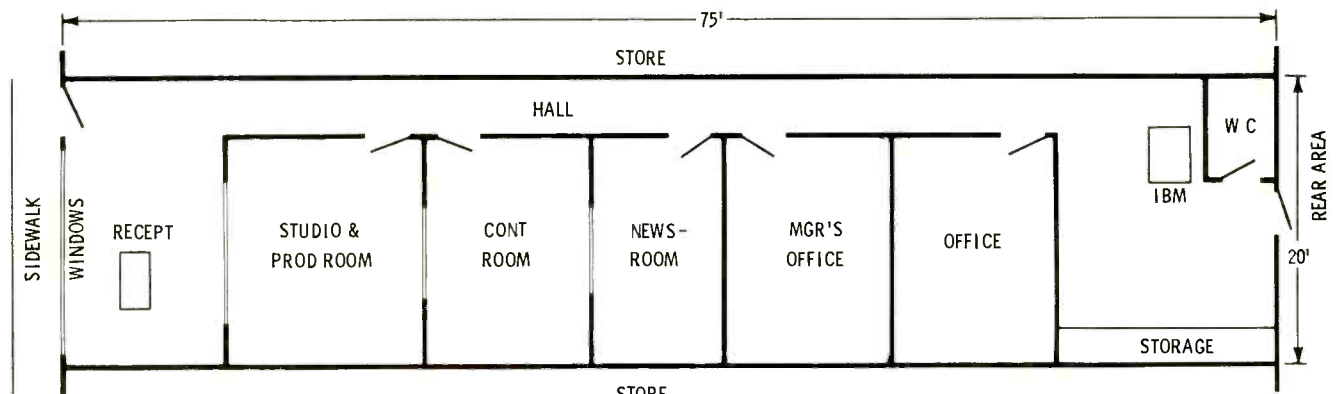
A separate recording/production/FM control room was included, with production recording as the main use in mind. However, with FM becoming more important and separate programming being emphasized, this feature could prove doubly valuable. Sound locks aren't essential, but they contribute to a better "sound" by eliminating extraneous noise. The added cost is very small, as is the space used.

The centrally located utilities room improves heating and air-conditioning efficiency by reducing the length of air ducts. It also makes more outside wall space available to rooms which should have windows.

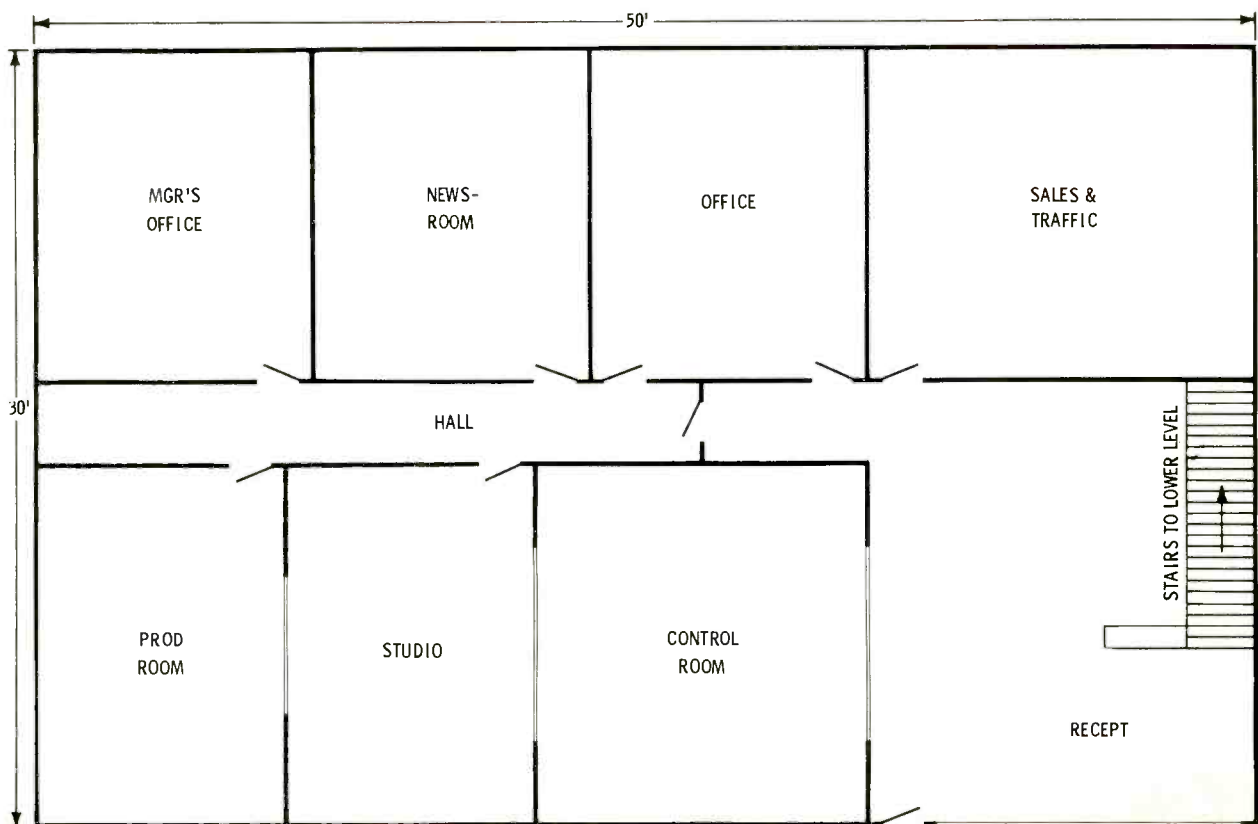
Several variations can be made to

the single-story plan. One moves the newsroom to the area shown for the workshop adjoining the control room. The manager's office is expanded in size to include the space devoted to the music library, and a larger music library can then be put in the former newsroom space. The bench shown in the workshop next to the transmitter room becomes a table, and a window providing a view into the control room makes it possible to originate newscasts directly from the newsroom.

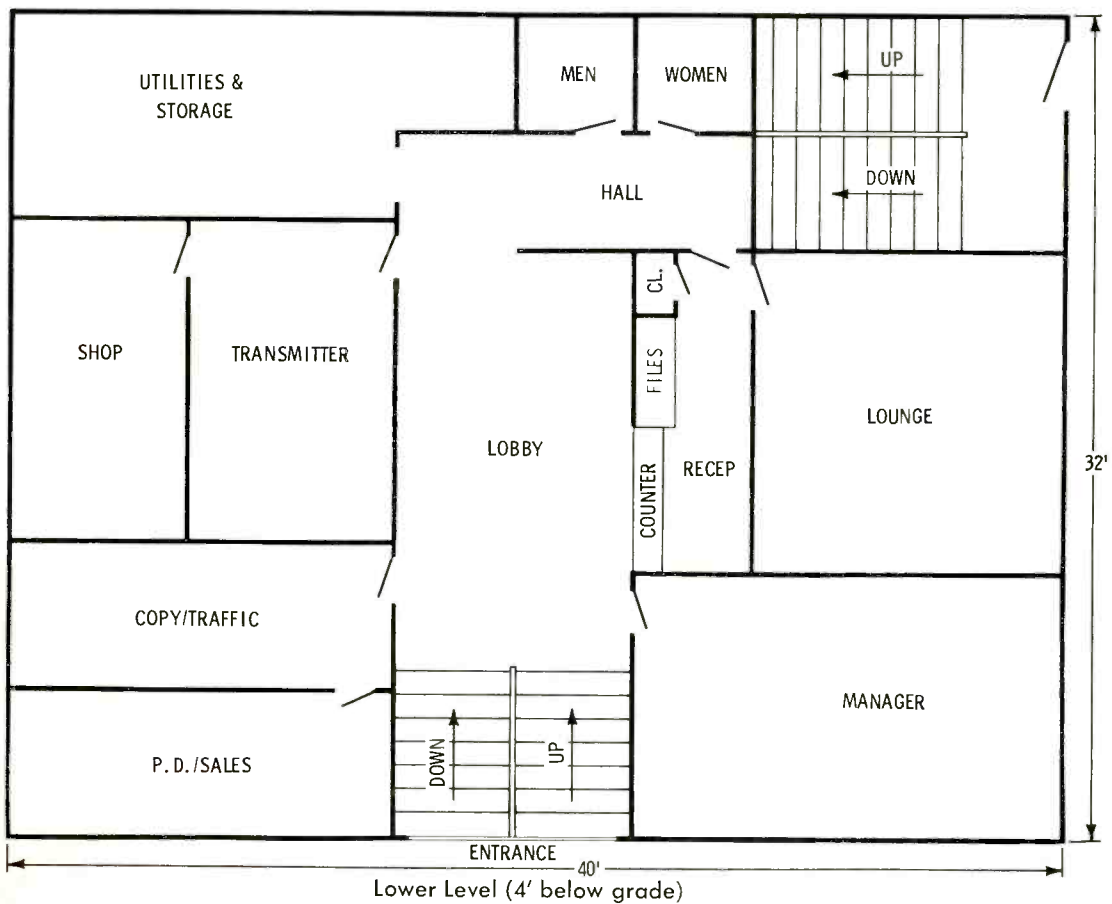
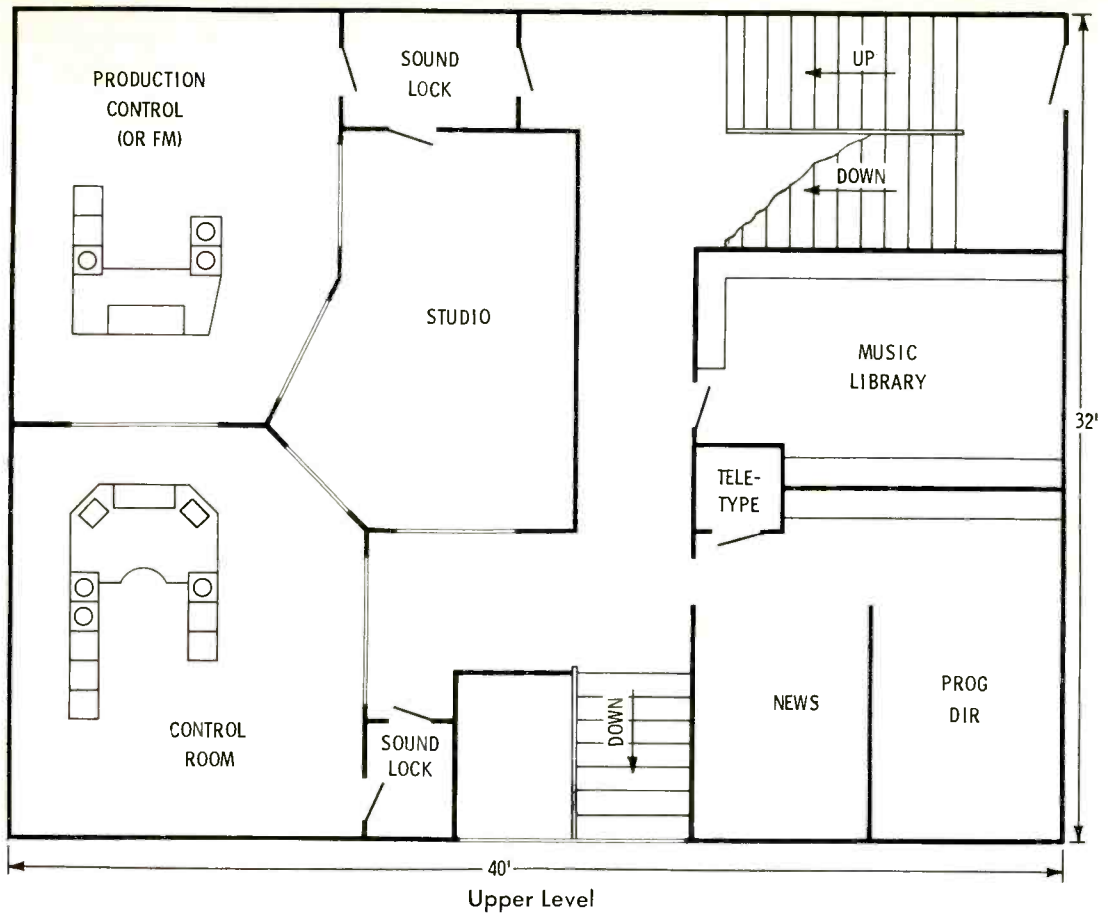
If desired, a basement can be added to this one-story plan; the stairway is put in the space shown for the mailing-duplicating-kitchen area. ▲



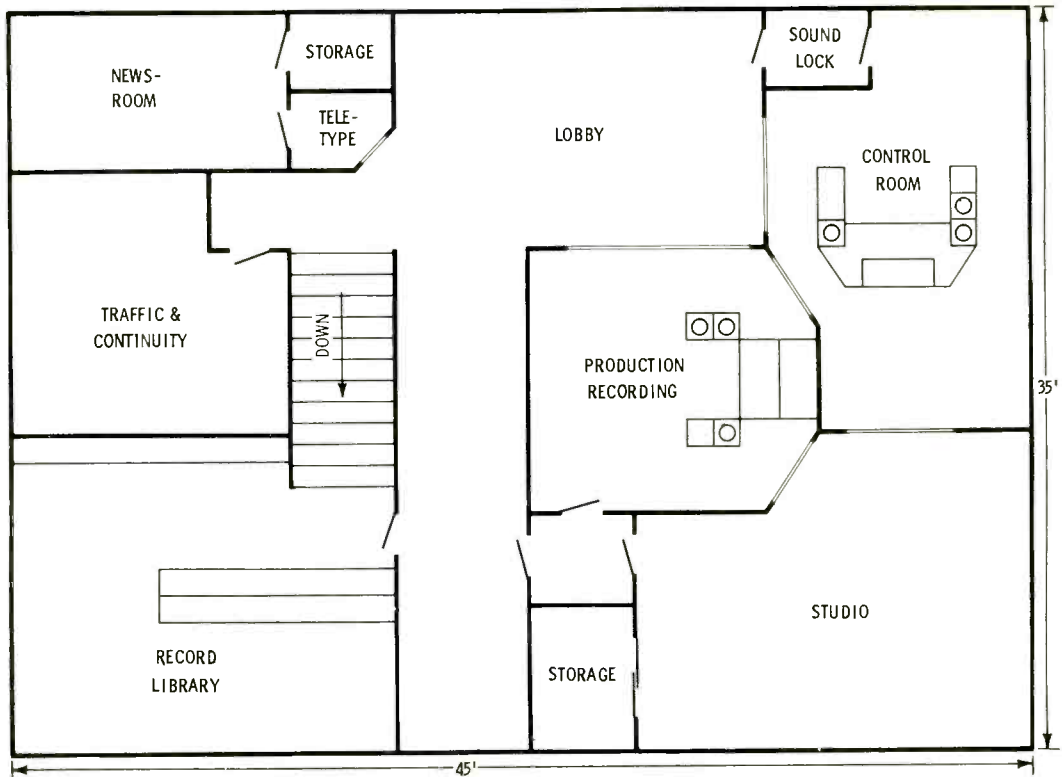
Plan A



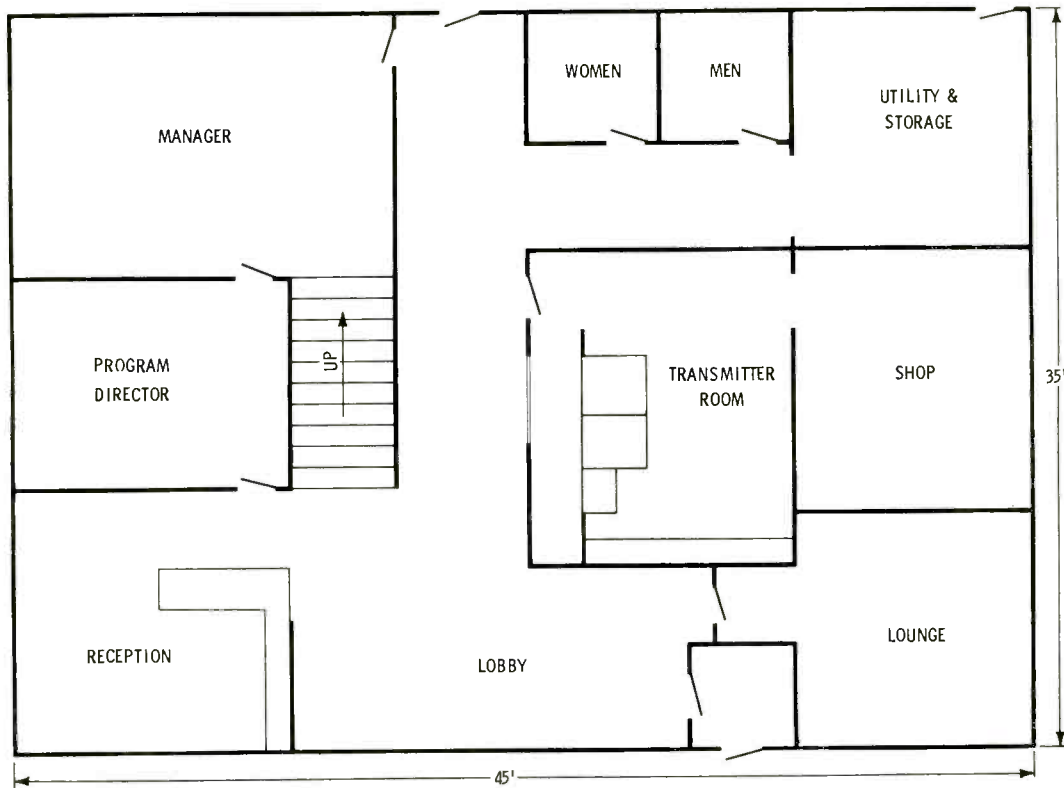
Plan B



Plan C

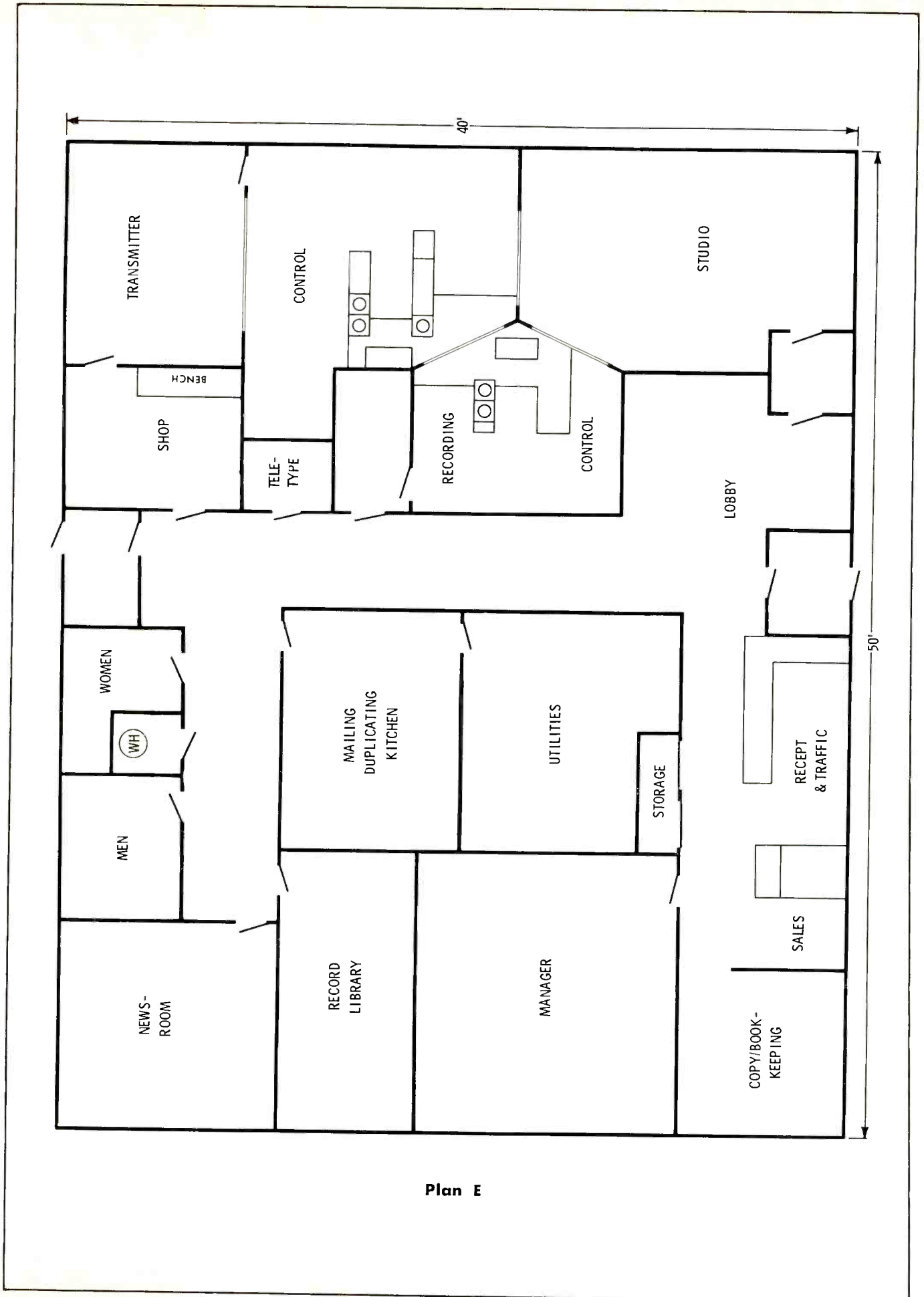


Upper Floor



Ground Floor

Plan D



Plan E

TOWER MARKING AND LIGHTING

by **Elton B. Chick**, Consulting Author, General Manager, WLOU, Louisville, Ky. and **Thomas R. Haskett**, Central Regional Editor—Part 1. The requirements for tower marking are not complex, but familiarity with them is important to the broadcaster.

Broadcast towers almost always present a hazard to air navigation. Tower members are quite thin when viewed from a distance, and were they neutral in color, they would be practically invisible to a pilot. It is obvious that such hazards to aircraft must be made plainly visible if accidents are to be avoided. The first reason for painting a tower, therefore, is to increase its visibility to aircraft pilots.

Not only does the painting and marking of a broadcast tower reduce its danger as a *hazard* to aircraft, the tower then becomes an *aid* to navigation—it becomes an obvious landmark. This is a second reason for painting towers.

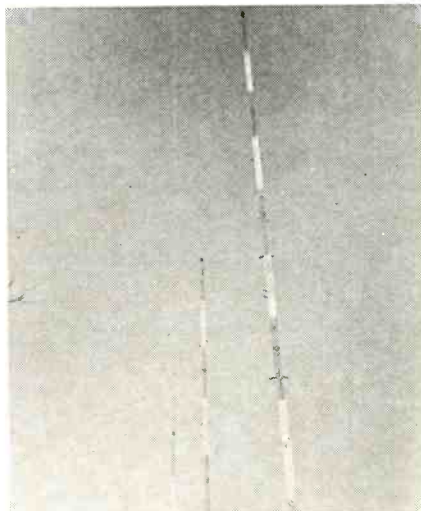
There is a third reason: Practically all towers are fabricated from steel, which must be protected from rust and corrosion. While it is possible to galvanize steel for protection, it costs little more to paint the tower, and the paint forms a protective coating which retards rust.

Obviously the painting of a tower serves to warn airmen of its presence only during daylight. Between sunset and sunrise, lights must be used to mark the obstruction. Therefore the tower continues to serve as a navigational reference at night.

Because the need for marking and lighting is acute, rules have been formulated to govern these practices. There are four sets of pertinent regulations: FAA Rules, FCC Rules, National Electrical Code, and local codes.

FAA Rules

The Administrator of the Federal



Aviation Agency has the statutory responsibility to promote safety in air commerce, and the FAA is vitally concerned with any object which may be a hazard to the safe operation of aircraft. FAA rules governing such hazards are published in a pamphlet entitled "Obstruction Marking and Lighting."

In general, FAA provides that broadcast towers must be painted in alternate bands of aviation-surface orange and white. The rules provide that:

The painted surfaces of the obstruction should be cleaned or repainted as often as necessary to maintain good visibility.

If the smooth surface of the paint on the ladders, decks, and walkways of certain types of steel towers and similar structures presents a potential danger to maintenance personnel, such surfaces need not be painted. However, the omission of paint should be restricted to actual surfaces the painting of which will present a hazard to maintenance personnel, and care should be taken that the overall marking effect of the painting is not reduced.

The bands should be perpendicular

to the major axis of the obstruction, with the band at each end colored aviation surface orange. The widths of the bands should be equal and the width of each band should be approximately one-seventh of the length of the major axis of the obstruction, provided that each band shall have a width of not more than 40 feet nor less than 1½ feet.

Note the meaning of the last paragraph: Towers less than 280' high are painted with seven bands, while above that height, the 40' rule limits the width of the bands and increases the number of bands.

Lighting is necessary to assure visibility of the obstruction from aircraft at any normal angle of approach. The top light, or lights, displayed on an obstruction should be installed so as to mark the points or edges of the obstruction highest in relation to an imaginary airport surface, or the points or edges of the obstruction highest in relation to the ground (or water, if so situated). Obstruction lights and hazard beacons must be operated at all times when the center of the sun's disk is 6° or more below the horizon and during periods of restricted visibility. They may also be operated at such other times as considered desirable.

Because it is impractical to measure the sun's angle of declination, accepted practice is to specify the northern sky-light intensity level as the governing factor for obstruction lighting:

The operation of obstruction lighting installed on obstructions of an overall height greater than 150 feet above ground, or water if so situated, should be controlled by a light-sensitive control device adjusted so that the lights will be turned on a north

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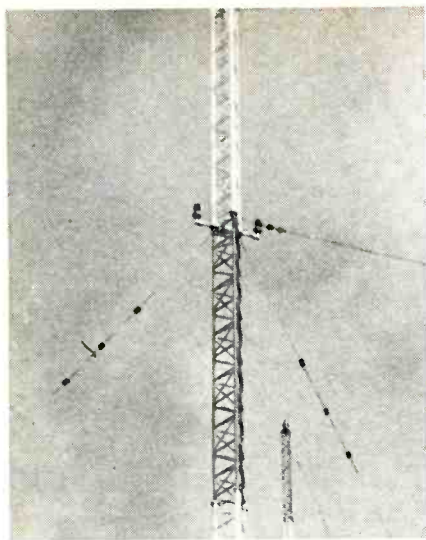


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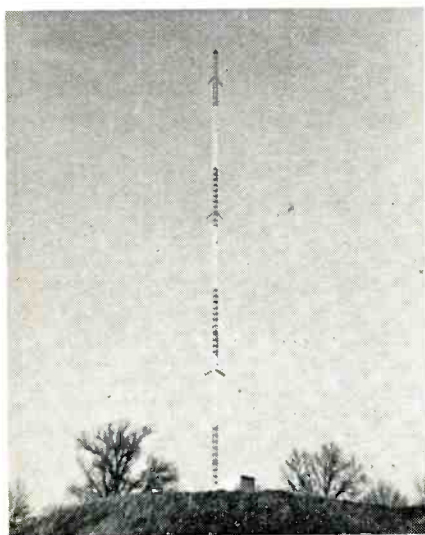
Note difference between the side lights (near tower) and top light (far tower).

sky light intensity level of about 35 foot-candles and turned off at a north sky light intensity level of about 58 foot-candles, or should be continuous.

Under normal conditions, where no special means of controlling obstruction lighting has been recommended, either a light-sensitive control device or an astronomic dial clock and time switch may be used to control the obstruction lighting in lieu of manual control.

To insure that the lighting system is functioning properly, a daily inspection is required:

Obstruction lighting should be visually observed at least once each 24 hours, or checked by observing an automatic and properly maintained indicator designed to register any failure of such light, to insure that all such lights are functioning properly as required. In the event the obstruction lighting is not readily accessible for the above observation of at least once each 24 hours, an automatic alarm system designed to detect any failure of such lights may be installed to replace the normally required visual in-



If a tower is short enough, lighting of the structure may not be required.

spection. The Federal Aviation Agency will not object to excluding the side or intermediate obstruction lights on an obstruction from the alarm circuit, provided the signaling device will indicate malfunctioning of all flashing and rotating beacons regardless of their position on the obstruction, and of all top lights; and that all obstruction lights mounted on the obstruction are visually inspected at least once every 2 weeks, with all lamps being replaced at regular intervals after being lighted the equivalent of not more than 75 percent of their normal life expectancy.

If the lighting system *should* fail during darkness, the FAA wants to know about it:

Any observed or otherwise known extinguishment or improper functioning of a rotating or flashing beacon which will last more than 30 minutes, and any observed or otherwise known extinguishment or improper functioning of a steady burning obstruction light, installed at the top or near top of any natural or manmade obstruction, which will last more than 30 minutes, should be immediately reported. Such reports should be made by telephone or telegraph to the nearest flight service station or office of Federal Aviation Agency and should set forth the condition of the light, or lights, the circumstance which caused the failure and the probable date that normal operation will be resumed. Further notification by telephone or telegraph should be given immediately upon resumption of normal operation by the light, or lights.

Note that the above notification rule applies *only* to top lighting. Side lights, or obstruction lights, are not affected:

Any extinguishment or improper functioning of a steady burning side or intermediate light, or lights, installed on a natural or manmade obstruction should be corrected as soon as possible, but notification of such extinguishment or improper functioning is not necessary.

The beacon light required atop a tower must flash on and off at a prescribed rate:

A rotating beacon should produce a flash not less than 12 times per minute nor more than 15 times per minute. A flashing beacon should be equipped with a flashing mechanism producing not more than 40 flashes per minute nor less than 12 flashes per minute with a period of darkness equal to approximately one-half the luminous period, except that the frequency of flashes of an obstruction beacon mounted on an obstruction located within 15,000 feet of the reference point of a landing area should not be less than 20 per minute.

Furthermore, the color and light intensity of both beacons and obstruction lights is prescribed:

The signal emitted by hazard beacons

and obstruction lights shall be aviation red in color.

The integral of the time-intensity curve of each flash emitted by a rotating hazard beacon, measured in the direction corresponding to the peak intensity and integrated over a period not exceeding 0.5 second, should be not less than 7,500 candle-seconds of aviation red light.

The intensity of fixed obstruction lights should not be less than 10 candles of aviation red light.

Probably few broadcast operators know about the next rule:

To provide satisfactory output by obstruction lights, the rated voltage of the lamp used should, in each case, correspond to or be within 3 percent higher than the average voltage across the lamp during the normal hours of operation.

It is unlikely that a broadcast tower would be located close to a railroad line. For those towers which are, in the event that obstruction lighting *could* interfere with rail traffic by being mistaken for railroad signal lights, shielding may be required to prevent the lights from being seen from low angles.

It is also permissible to use non-standard lights for obstruction lighting systems—gaseous tubes, or other than incandescent lamps—providing that “. . . such lighting installation offers equal or greater light intensity in all angles of azimuth and elevation than that specified for standard obstruction light assemblies, affords equal or greater dependability of operation, and possesses the color characteristics prescribed in the following specifications.”

The specifications for marking and lighting equipment pertinent to broadcasters are: Flashing code beacons must comply with FAA Specification 446, for Code Beacons, 300 mm. Double and single obstruction lights must comply with either (a) Military Specification MIL-L-7830, Light, Navigational Boundary and Obstruction Markers, or (b) FAA Specification L-810, Specification for Obstruction Light. Paints used for daylight marking must conform as follows: Federal Specification TT-C-595, Color Guide; Ready Mixed Paint, (1) Orange No. 12197 (Aviation Surface Orange), (2) White No. 17875 (Aviation White). Other paint specifications are: (a) Federal Specification TT-P-59, Aviation

● Please turn to page 90

COLOR IT FAITHFUL

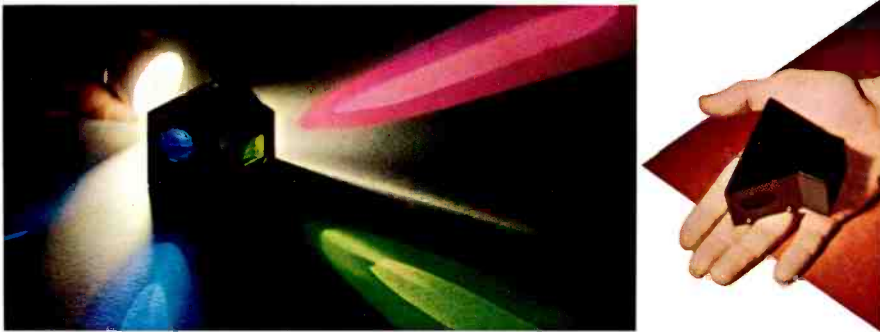


...with *Norelco*® PC-70 PLUMBICON Color Cameras

The Norelco PC-70 Plumbicon Color Camera permits hours of "hands-off" operation and exact color matching between cameras...even for close-up flesh tones and over wide variations of indoor and outdoor light levels, including highlights and shadows. No need for "color painting." This exceptional color stability and color balance are the achievements of precise grey-scale tracking, stable gamma circuits and automatic black level stabilization circuits, the Plumbicon's long linear transfer characteristic and absence of dark current. PC-70 Plumbicon features include... • Operational sim-

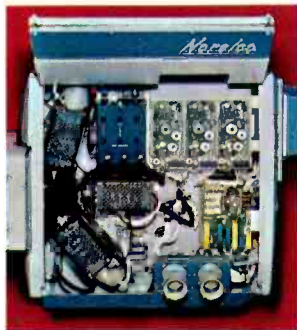
plicity—permits one man setup at the control console, typically in less than 15 minutes • Solid state design • Short warm-up time—15 minutes for on-air operation • Narrow profile, lightest weight camera—120 pounds with 42 pound zoom lens detached • Transistorized design coupled with Plumbicon characteristics eliminate need for heating or cooling devices in camera head • Stabilized deflection circuits • Built-in test circuits—including push-button check of power supplies, calibration and alignment signals, front panel test points • Power consumption for entire chain—only 350 watts.

COLOR SEPARATION SYSTEM



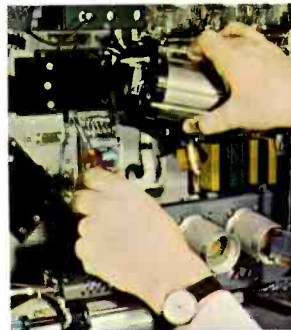
Remarkable, yet simple, the Norelco color separation system eliminates need for optical relays, dichroic mirrors and field lenses. This unique assembly, consisting of a sealed prism block only three inches long has many advantages which contribute to the superiority of

the PC-70... • Complete absence of ghost images or spurious reflections normally caused by dichroic mirrors • No astigmatic aberrations • Negligible color errors due to polarized light • Patented color separation prism block—sealed off from dust and moisture.



PC-70 CAMERA HEAD

If Plumbicon tube replacement is required, complete yoke assembly can be removed from the camera than reinstalled and optically aligned—all in less than 15 minutes.

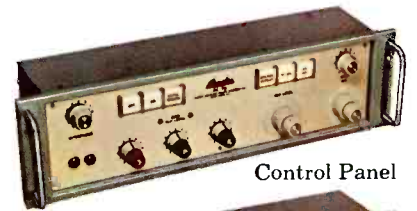


TWO ZOOM LENSES AVAILABLE

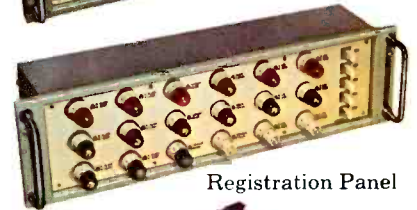
For normal use, Type 10x18J with a lens speed of f/2.2 and nearest object-focus distance of 3 feet, provides an equivalent focal length of 1.4 to 14 inches. Type 12x50 is designed for long focal length use. This lens, with a maximum aperture of f/4.5 and less than 1° smallest taking angle, provides continuous zoom over the equivalent focal length range of 4 to 48 inches.

• All three lens functions—zoom, focus and iris are servo operated • Four pre-set zoom positions are provided • The zoom control is continuous over the entire range with no reduction in lens speed... no switching is necessary • Range extenders are available • Each lens can be quickly removed from the camera, reducing both weight and physical dimensions, for maximum portability.

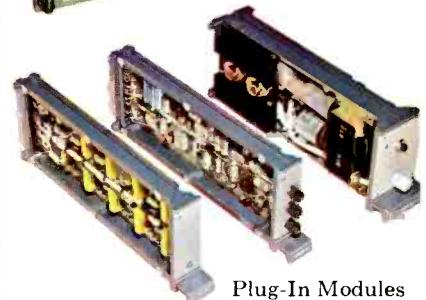
CAMERA CONTROL



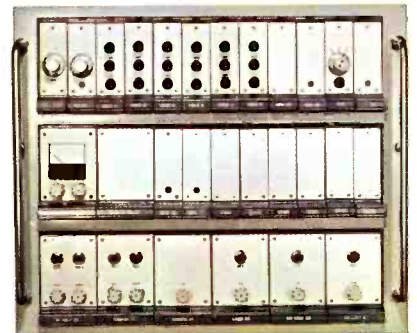
Control Panel



Registration Panel



Plug-In Modules



Camera Control Unit

The Norelco PC-70 achieves maximum installation flexibility with Registration Panel and Control Panel remotely operable from the Camera Control Unit.

The Camera Control Unit is constructed of rugged plug-in modules which utilize printed wiring and solid state components throughout. Mounts in standard 19 inch rack— including power supplies, is only 15 3/4 inches high.



NORTH AMERICAN PHILIPS COMPANY, INC.
900 South Columbus Avenue, Mount Vernon, New York 10550

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Represented nationally by Visual Electronics Corporation, 356 West 40th Street, New York, N. Y. 10018

A DIRECT-READING TRANSMISSION SET

by Charles D. Sears, Chief Engineer, WIAN, Indianapolis, Ind.—Operational convenience is a feature of this station-built instrument.

This direct-reading transmission set speeds not only the actual audio proof of performance but the preparation of the paperwork afterwards, because points for the four curves (three for FM) are read directly from the calibrated attenuators. It is thus unnecessary to calculate the inserted attenuation against a reference level, then invert to show output frequency response. Only one frequency run need be made because of the switch-selected reference level. This makes for much less work with the distortion meter, because the meter has to be tuned to each audio frequency only once.

The function of a transmission set is simple: measuring the output level of the audio generator and reducing this level a desired, controlled amount. This transmission set employs the constant-output-level method because it is easier and more accurate than the constant-input-level method. Further, the constant-input-level method cannot be used with FM because of pre-emphasis.

Because it is difficult to read accurately those indicated values falling between certain scale calibrations of the station modulation mon-

itor, the insertion-loss method is considered to be most accurate. The calibrated step attenuators of the transmission set are used to measure accurately the input level necessary for the desired modulation, as shown on the station modulation monitor. The changes in the calibrated step attenuators are used to plot the curves.

Operation

The operation of this transmission set can be understood by referring to Fig. 1. A 500-ohm unbalanced input is used because unbalanced pads are inexpensive and easy to build. Also, unbalanced calibrated attenuators are less expensive than the balanced type.

The VU meter is provided with four ranges, and it can be switched to read any external source without affecting the rest of the system.

The three level-preset pads are used to reduce the level of the audio generator to provide the approximate input level required for the unit under test. Since this unit is designed only to measure the amount the gain changes with frequency, and not the total gain of the unit

under test, these pads are made with 5% resistors. The exact loss is of little consequence, because the only requirement is that the level be approximately the same as the source normally used on a given input. Of course, the attenuation can be changed so that higher-level inputs can be tested. Approximately 1-db steps are available from 1-db loss to a total of 95-db loss. One loss pad is used before the calibrated attenuators, and the remaining pads after, to isolate fully the calibrated attenuators from any external effects.

An Altec No. 8413 unit is used for the 1db/step, 30-step calibrated attenuator, and an Altec No. 8407 is used for the 0.1db/step, 20-step calibrated attenuator. All attenuators are equipped with detents.

Fig. 2 shows the special scales made for the calibrated attenuators.

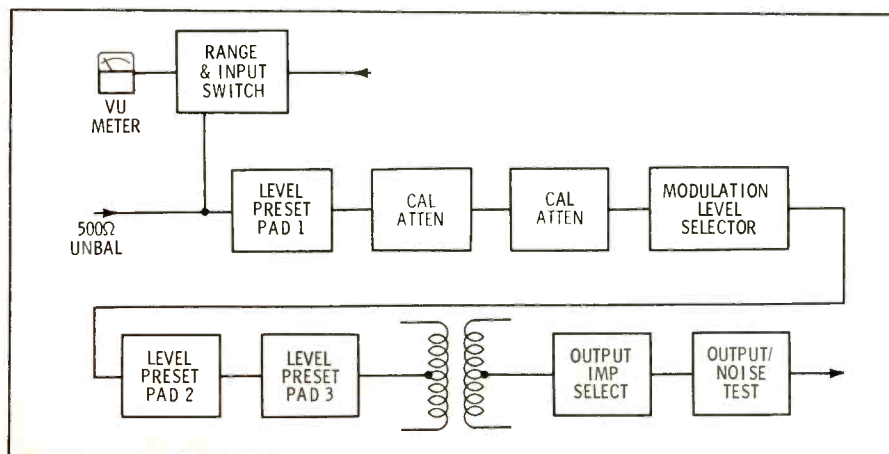


Fig. 1. Block diagram shows operation of the direct-reading transmission set.

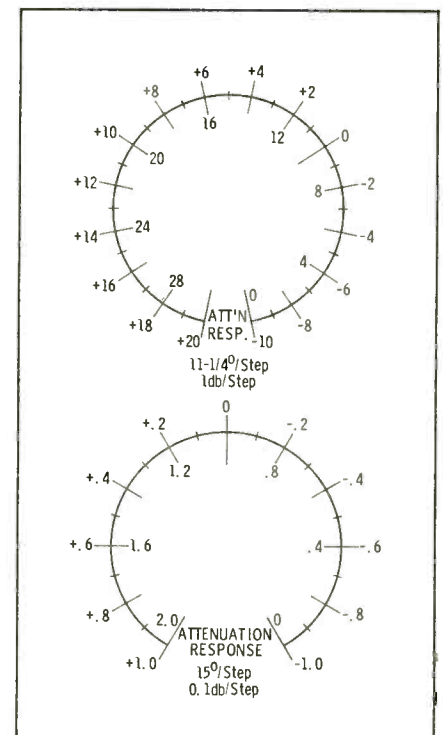


Fig. 2. Dials for the attenuators.

Note that they are calibrated in both the inserted attenuation and output response of the unit under test. When setting up the unit, set these attenuators to the response-scale "0" and the other pads for the desired input level for the unit under test. Once the other attenuators are set,

only the calibrated attenuators are changed to give the desired output level. Then the variation from the reference is read and logged directly from the special response scale, with no calculation necessary.

The modulation reference-level attenuators are switch-selected attenu-

ators that set the four (three for FM) reference levels. All attenuation can be removed from this section if desired.

Following all attenuators is a UTC HA-108X transformer used for isolation and impedance matching. The primary is permanently strapped for 500 ohms unbalanced. The secondary is balanced (center tap floating), and the impedance is switch-selected to match the desired input impedance of the circuit under test. This transformer has 5 output impedances: 50, 125, 200, 333, and 500 ohms.

The final switch in the circuit is used for noise test. The output line is lifted from the output transformer and shorted, terminated with one of three resistors, or left open, as may be desired.

The output connectors are binding posts which will accept banana plugs, and an Amphenol three-pin socket. Cables can be made up that will plug into the equipment most frequently tested. In the absence of proper connectors, a cable with clips on the end can be used.

Construction

The circuit diagram is shown in Fig. 3. The VU-meter switch is a

TABLE 1. SWITCH POSITIONS

Position	VU Meter Range and Input Selector		Level Preset Pad 1	Modulation Reference Level Selector	
				Basic Atten	
1	External	1 mw	0 db Atten	Out	—
2	External	+4 VU	10 db Atten	100% Mod	2 db
3	External	+14 VU	20 db Atten	85% Mod	3.5 db
4	External	+24 VU	30 db Atten	50% Mod	8 db
5	O F F		40 db Atten	25% Mod	14 db
6	Input	+24 VU	50 db Atten	Out	—
7	Input	+14 VU			
8	Input	+4 VU			
9	Input	1 mw			

	Level Preset Pad 2	Level Preset Pad 3	Output Impedance	Output/Noise Test
1	0 db Atten	0 db Atten	500 ohms	Audio
2	5 db Atten	1 db Atten	333 ohms	Short
3	25 db Atten	2 db Atten	200 ohms	51-ohm resistor
4	30 db Atten	3 db Atten	125 ohms	240-ohm resistor
5	35 db Atten	4 db Atten	50 ohms	510-ohm resistor
6	40 db Atten	5 db Atten		Open circuit

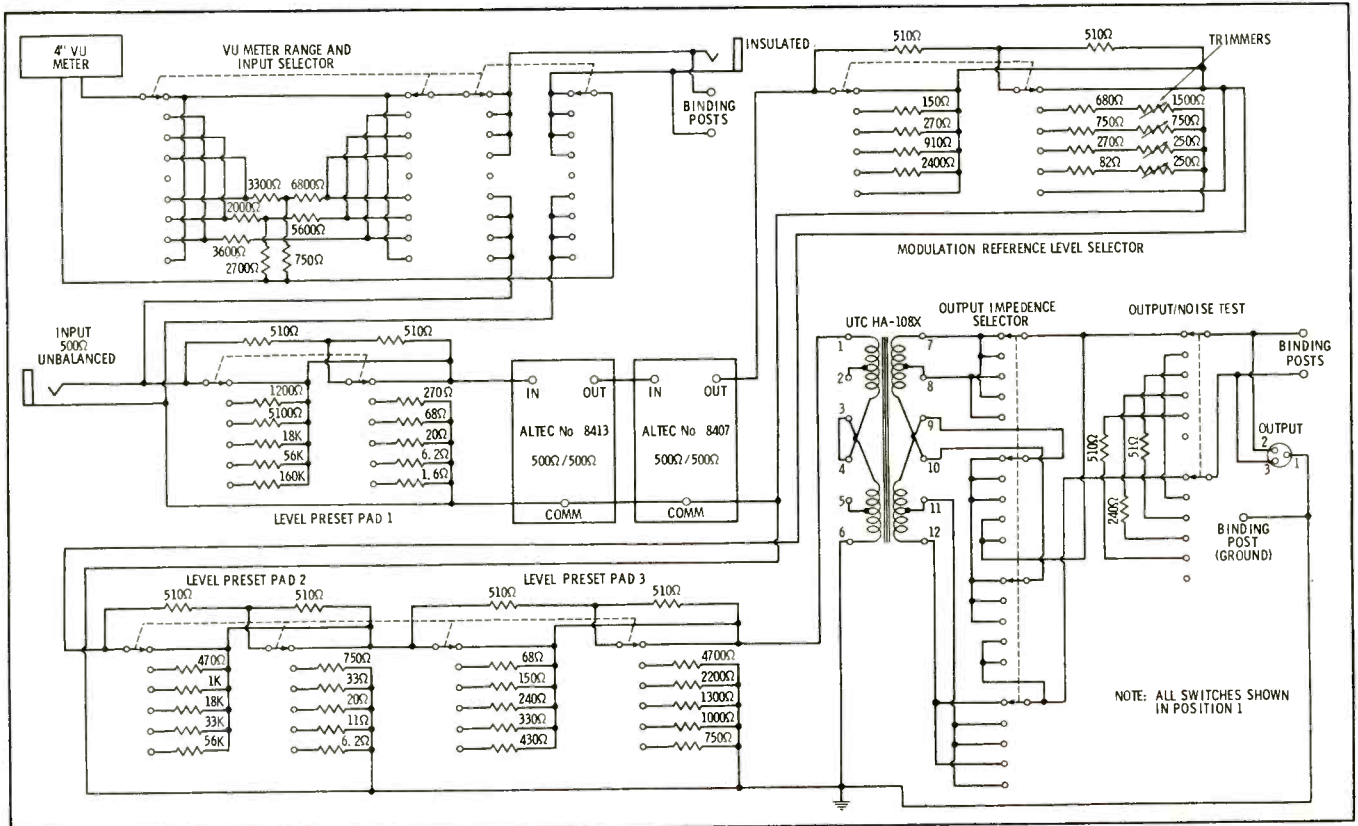
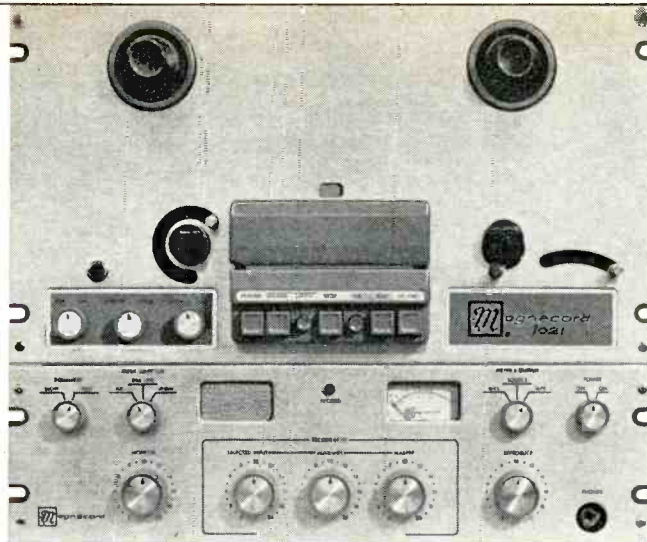
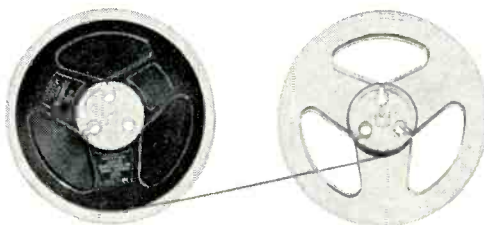


Fig. 3. Complete schematic diagram of the direct-reading transmission set shows all switches and attenuators.



THIS MAGNECORDER MODEL 1021 IS NOT BROADCAST READY




(You have to put a tape on it)

Just add a reel of tape and you are ready for production with the most versatile and complete monaural recorder/reproducer in the field.

Truly a broadcast ready instrument, the Magnecord 1021 requires no accessories. Broadcast standard input and output connectors, standard impedances, an inbuilt cueing speaker with separate level control, a mixing auxiliary input and an amplifier which will drive an external speaker are already incorporated into the design.

Ease of operation is built right in, too. You can one-hand cue if you like, and the cue button lifts tape to the heads, releases the brakes and applies low, even torque to the reels. A single pole, single throw switch controls remote start-stop in a preset mode. The Model 1021 features a fine hysteresis synchronous capstan drive and is engineered for safe, gentle tape handling and braking, even with the thinnest tapes.

Looking for a completely broadcast ready tape instrument? All you need is the Magnecord Model 1021 and a reel of tape. See your authorized Magnecord dealer today, or write for free brochure.

 **Magnecord** Sales Div. | Subsidiary of the TELEX Corporation
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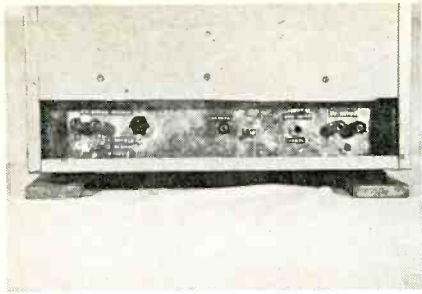


Fig. 4. Rear view shows input, output connections, meter-light switch.

CRL miniature four-pole, nonshorting rotary switch. It has 11 positions with the stop set at the ninth position. Two poles select the meter range, while the other two poles select either the audio generator or the external input. The resistors are 5%, 1/2-watt units, having stock values nearest the desired values.

The level preset pads use Mallory 3126J shorting switches. These are bridged-T pads. Fewer resistors and switch sections (poles) are required for this type of pad. All three pads have the same construction; however, since the attenuation is different for each pad, the resistor values are different. Again the resistors are

5%, 1/2-watt units, having stock values nearest the computed values.

The modulation reference-level switch is very similar to the level-preset pads. There are 2 positions that do not provide any attenuation; because the switch has six positions and only five are needed, the last position was made into a "no-attenuation" position (like the first position). The arrangement is a bridged-T attenuator with the shunt leg adjustable within a limited range. Table 1 shows the basic attenuation for each of the four positions, with the trimmer in the approximate center of its range. Each trimmer has a range of approximately +0.5db.

The switches for the level-preset pads, the modulation reference level, the output impedance selector, and the output noise test should all be shorting types. Otherwise, instead of a smooth change from one position to the other, a large increase in the level will result which could knock an AM transmitter off the air.

Everything except the output transformer and the connectors is mount-

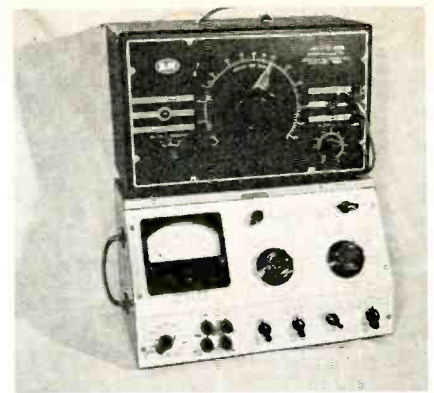


Fig. 5. Front view of transmission set with signal generator in place.

ed on the front panel. The labeling of the panel was done by lettering a large sheet of paper and covering it with 3/32" sheet plastic. Inside the cabinet are two flashlight cells to light the lamps in the VU meter. These were included since the VU meter used was illuminated and required only the addition of the batteries. A switch is included on the rear of the unit to turn the lamps on. The meter was equipped with No. 47 lamps which were replaced with No. 49 lamps.

The input and output connectors

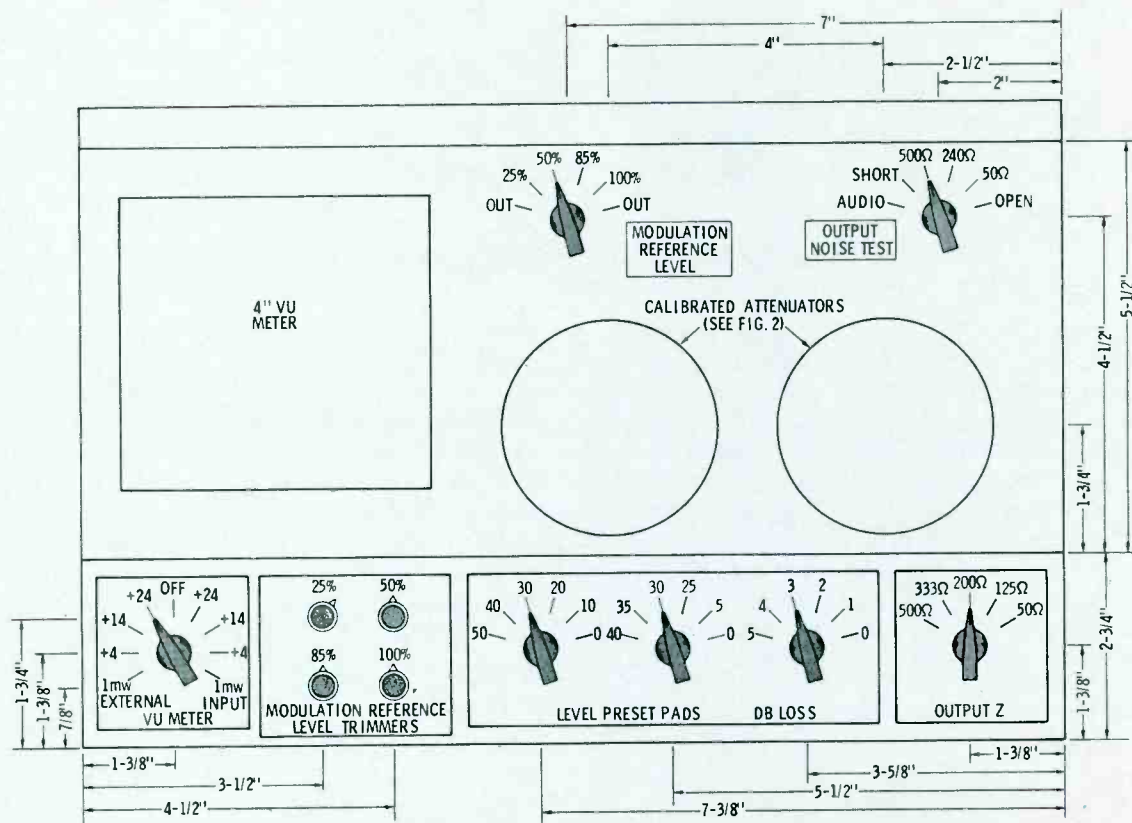
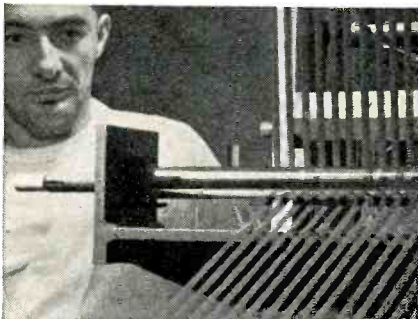


Fig. 6. Layout for the front panel; the controls and meter are located as shown by the dimensions along the edges.

Some plain talk from Kodak about tape:

Sobering thoughts about slitting... and making the best basically better

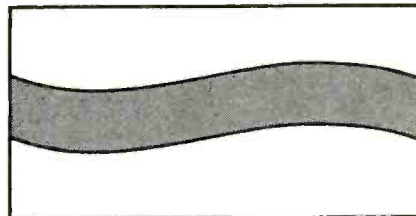
A wise man once said, "Baloney's basic worth is unaffected by the manner in which you slice it." Maybe so for baloney...but certainly not for sound recording tape. Slicing, or to be technically correct, slitting quarter-inch ribbons of tape from the 42-inch-wide master web in manufacture takes a pretty sharp eye. This slitting operation is important to your pleas-



ure since the closer the tape comes to being dimensionally perfect, the better is the azimuth relationship between the recorded signal and the reproduce head. Like it in plainer English? Then consider some examples of poor slitting...and what they sound like.

"Drunken" slitting and others. Variations from the ideal occur if tape is too wide, too narrow, or if its width varies. If the tape is too wide, it may actually override the guides on your tape deck. If the tape is too narrow, it may see-saw as it passes by the head. Either way, you're in trouble. Variations also occur if the edges are not straight. One such variation goes by

the name of "drunken" slitting. Sound bad? You bet. The edges snake even though the width is constant (see drawing). As a result, on playback the output varies as the tape weaves past the reproduce head...causes a warbling of the signal. This is a type of distortion the human ear is most sensitive to. You wouldn't like it.



Drunken slitting, a dramatization

Quality-control makes the difference. Standard industry specification calls for a tolerance on width of $\pm .002$ inches. To start, we hold ours to $\pm .001$ inches. And to make things more interesting we make our test over a twelve inch span to equal or exceed guide spacing on most tape recording equipment. Next, not relying on eyeball tests as others do, we test for drunken slitting or fluted edges by actually running the tape with a recorded short wavelength signal through a tape recorder. This "drunkometer" test helps us spot any tape that's had even one beer. The slightest whiff, and out it goes. Lastly, Kodak Sound Tapes have to go under the microscope where we watch for rough or dirty edges. When you buy Kodak Tapes, you know they're clean.

Best base better? Strength and toughness sound like they mean the same thing...but they don't quite when it comes to a tape base. Take a piece of spaghetti. It's stronger when it's dry...but tougher when it's wet—harder to break, that is, and not just because it's slippery. Designing a tape base, you're always up against the problem of making it strong so it doesn't stretch...and tough so it doesn't break. Today's DUROL base, the best there is, is now more resistant to shock abuse and carelessness. It's even tougher than before while it still retains the strength that made it famous.



Kodak tapes—on Durol and Polyester bases—are available at most electronic, camera, and department stores. To get the most out of your tape system, send for free, 24-page "Plain Talk" booklet which covers the major aspects of tape performance. Write: Department 8, Eastman Kodak Company, Rochester, N.Y. 14650.

EASTMAN KODAK COMPANY, Rochester, N.Y.

Circle Item 15 on Tech Data Card

are mounted on a recessed panel at the rear of the cabinet (Fig. 4). Rubber feet are installed on the bottom and on one end of the cabinet, and a handle is installed on the other end. The top is left clear so that the audio generator can be placed on top of the transmission set during operation (Fig. 5).

Using the Transmission Set

The layout of the front panel is shown in Fig. 6. First, connect the audio generator to the input of the transmission set, then the output of the transmission set to the microphone input of the audio console. Before turning on the audio generator, place the output/noise test switch on "short." Now turn on the audio generator. This protects the circuit under test from high audio levels while setting up. Next, set the modulation reference-level switch to 100%. Set the trimmers to the center of their ranges. Set the calibrated attenuators to "0" on their response scales. Place the meter range switch on +14 VU input. Set the combination of level preset pads 1 and 2 for about 65db, with approximately equal attenuation in each pad. Final adjustment of these pads will be made shortly. Set the output impedance to match the input impedance of the console. (If testing a high-level input, less attenuation is needed.)

Select the desired reference frequency on the audio generator, and set the output of the generator to give "0" on the VU meter. All controls on the equipment under test should be set for normal operation. Set the output/noise test switch to "audio." Next set the level preset pads so that the modulation meter reads within 1/2db of 100%. Then trim the level to exactly 100% with the 100% trimmer. Now set the modulation reference-level switch to 85% (AM transmitters only; omit this step for FM transmitters), and adjust the trimmer for exactly 85% modulation. Follow this procedure to check the 50% and 25% levels. If it is not possible to trim exactly to the desired level, change level preset pad 3 by 1db and try again. When any level preset pad is changed, all the reference-level trimmers must be readjusted. Once all

the reference levels are set, do NOT make any further adjustments of the level-preset pads or the trimmers.

Running the Proof

Start by measuring the distortion at the reference frequency. Begin with the 100% level; then change the sensitivity of the distortion meter, change the modulation reference level switch to 85%, and read distortion at that level. In measuring at the extreme frequencies on an AM transmitter, it is sometimes desirable to start at the 25% modulation level to avoid overloading the transmitter while tuning the distortion meter.

The audio generator is changed to the next higher desired frequency and the generator adjusted to "0" on the VU meter. The modulation reference-level switch is then changed to 100%, the calibrated attenuators are adjusted for 100% modulation on the modulation meter, and the reading from the response scale logged. Then the modulation reference-level switch is changed to 85% and the calibrated attenuators adjusted for 85% modulation as shown on the modulation meter. (This and further adjustments of the calibrated attenuators at each frequency will normally be either zero or at most 0.1 or 0.2db. A greater change indicates either trouble in the equipment under test or a change in the reference level.) The same is true for 50% and 25% modulation. Now return to 100% modulation to read and log the distortion for this level. Then drop the level to 85% and read and log the distortion. Use the same procedure for 50% and 25% modulation. The distortion can also be read while measuring the response.

Now change the audio generator to the next higher frequency and follow the same procedure for the rest of the desired audio frequencies.

Work Sheet

The work sheet shown in Fig. 7 (page 38) can be used to facilitate running the audio proof of performance. It is not filed with the proof, but is used to provide an orderly way of recording the readings. The information is then copied into the proper places on the finished report.

Also, this form shows all necessary measurements so that none is forgotten. It contains the audio frequencies used, as well as the tolerances allowed by the FCC for both AM and FM. All of the basic specs are included on the form for easy reference. The FM response limits are taken from the standard 75-microsecond pre-emphasis curve and lower limit so that while running the proof one can tell at a glance that all measurements are within limits.

The form has space to make a change in any measurement, if the initial measurement should be out of tolerance, or if it is desired to check a reading. This additional space can be used to shift the audio-response measurements, if necessary, when measuring the response of an FM transmitter. Also there is space for two additional audio frequencies if others are to be measured.

The transmitter meter readings are not necessary as part of the proof, but these readings show that the transmitter is operating within the required license values. They also make a good reference to ascertain whether the transmitter is operating the same as during the previous test; and they provide a good standard from which to work if trouble develops.

Cost

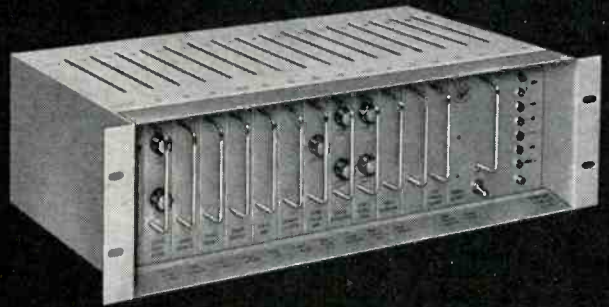
The VU meter must have good frequency response. The one used in this unit is a Weston meter removed from a console and sent through a repair and calibration cycle. A new meter of this type costs about \$75. The two Altec calibrated attenuators cost about \$75. The UTC HA-108X transformer costs about \$20; a smaller transformer could be used, such as the UTC A-21 for \$12, but with high output levels, low-frequency distortion can result because of the smaller size of such a transformer. A shielded transformer is a must. The cabinet and hardware cost about \$10; the switches, about \$15; and resistors, about \$15. The figures are approximate because the unit was built from parts on hand in addition to parts purchased specifically for the project.

The total cost of the unit is about \$200. ▲

THE BBRC MARK VIII AUTOMATIC GAIN CONTROL VIDEO AMPLIFIER



The Mark VIII is available in two models: one for use in studios where local drives can be supplied, and the other where its drive pulses can be derived from composite video signals originating outside the studio, or from VTR's. Both models have full color capabilities, designed to compensate for both video and set-up levels over a ± 6 db range. For price and delivery information contact Ball Brothers Research Corporation, Video Marketing, Boulder Industrial Park, Boulder, Colorado.



- Solid-state designed and built in the laboratories of Ball Brothers Research Corp.
- Provides continuous monitoring of video levels from a variety of signal origination equipment.
- Automatically adjusts video gain and setup.
- Ideally suited to follow film chains and live cameras, or network originations.
- Prevents video signal distortion when used ahead of transmission systems or video tape recorders.

BALL BROTHERS RESEARCH CORP • BOULDER, COLORADO 80301 • TEL: 303/442-2965 • TWX: 303/443-6290

Circle Item 16 on Tech Data Card



FREQUENCY RESPONSE HARMONIC DISTORTION

FM RESPONSE LIMITS	FREQUENCY		RESPONSE		AUDIO FREQUENCY	HARMONIC			DISTORTION		
	25%	50%	85% (AM ONLY)	100%		25%	50%	85% (AM ONLY)	100%		
NOT SPECIFIED					30*						
0- -4.0					50*#						
0- -3.0					100*#						
.1- -2.9					400*#						
.9- -2.1					1,000*#						
3.8- 0.8					2,500						
8.3- 5.3					5,000*#						
11.5- 8.5					7,500*						
13.8- 10.0					10,000#						
15.6- 11.2					12,500						
17.0- 12.0					15,000#						

*REQUIRED AM (30 CPS; RESP ONLY)
 # REQUIRED FM (10KC-15KC NOT REQUIRED FOR 25% & 50% DIST)
 AM RESP: ±2db OF 1KC; 100 TO 5K
 AM DIST: 5%-0 TO 84% MOD;
 7-1/2% - 85% TO 95% MOD.
 FM DIST: 3-1/2% - 50 TO 100 CPS; 2-1/2% - 100 TO 7.5KC; 3% - 7.5 TO 15KC
 USE 400-CPS TONE FOR NOISE REFERENCE AND CARRIER SHIFT.

AM TRANSMITTER NOISE. REQ: -45db	Ep _____ Ip _____ Ig _____ I mod _____ I ant _____ P out _____
FM TRANSMITTER NOISE. REQ: -60db	
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AM CARRIER SHIFT MAX SHIFT 5%	25%	
	50%	
	85%	
	100%	

HARMONIC RADIATION	
HARMONIC	LEVEL
1	
2	
3	
4	
5	
6	

REMARKS:

Fig. 7. This worksheet can be used for convenience in recording the data obtained while running the proof of performance. It also provides space for other readings.

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eggheads have
fouled us up
again.**

**They called our bluff,
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A modest \$990.00***

* (U.S. Funds, F O B Toronto. Duty and Brokerage Fees Included)

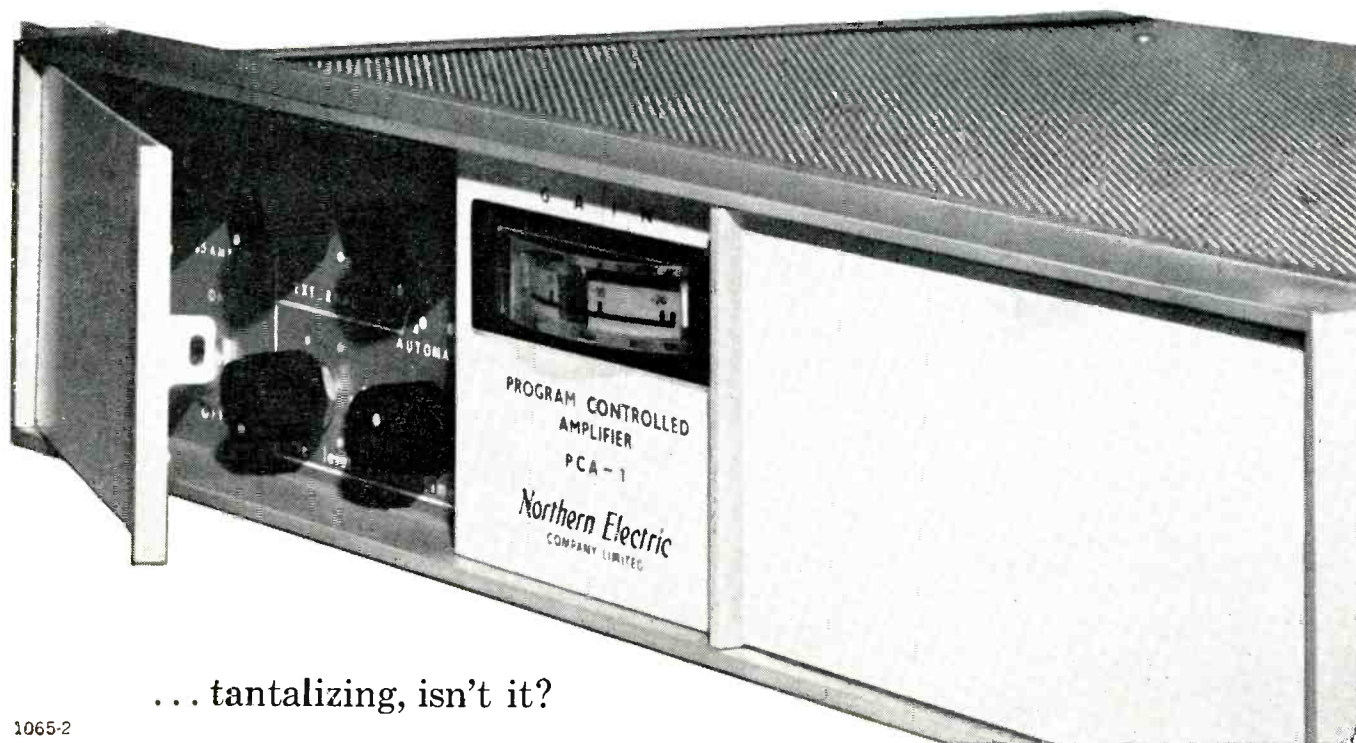
All we asked the lab to develop was a simple forward acting solid state limiter, with 30:1 ratio, fast attack, low distortion, "Set and Forget" operation. Then they surprised us with multifunctional circuitry—a bonus of two additional operating modes *essentially for the same price.*

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**Northern Electric
COMPANY LIMITED**

DEPT. 9950, BELLEVILLE, ONTARIO, CANADA



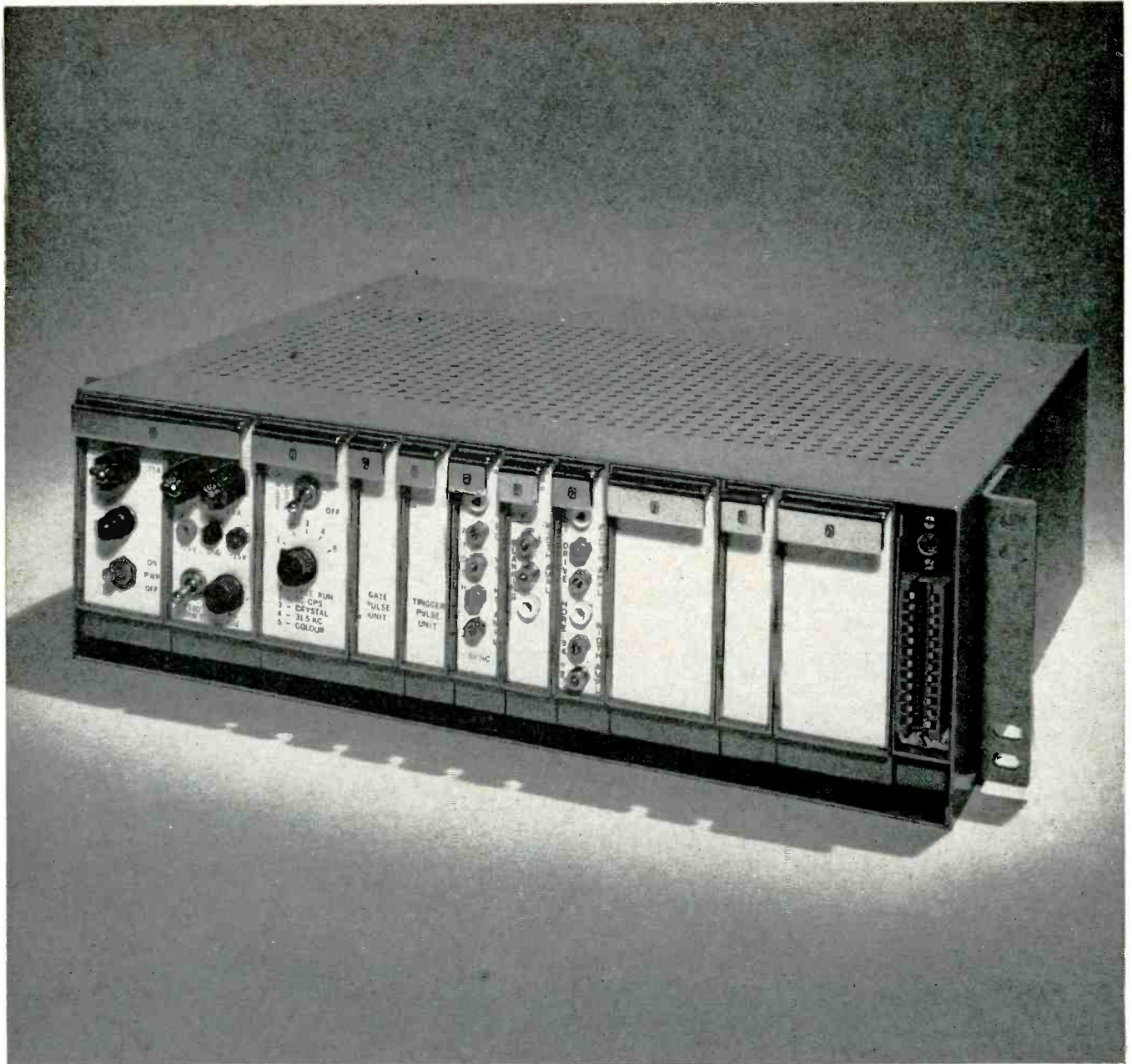
... tantalizing, isn't it?

1065-2

Circle Item 17 on Tech Data Card

March, 1966

39



U.S. funds, FOB Toronto, duty and brokerage included: merely \$1,990.00

Still wishful syncing?

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1065-4

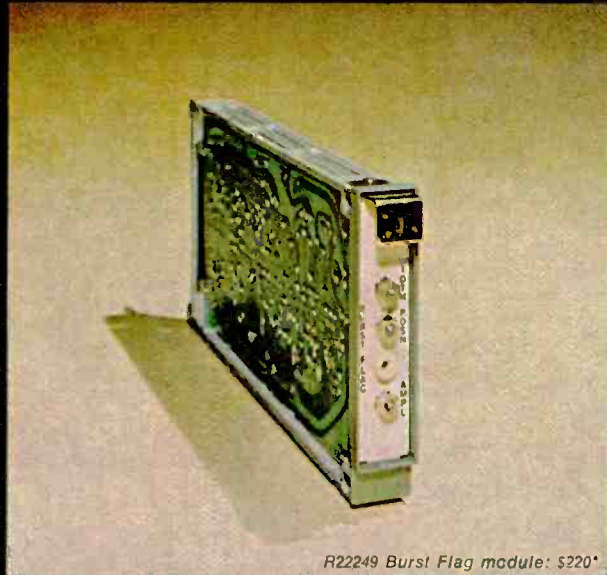


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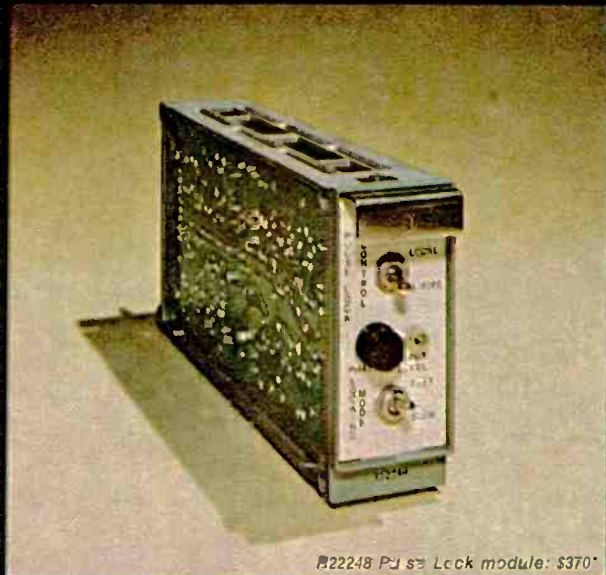
For specifications, write: Department 9950, Belleville, Ontario, Canada

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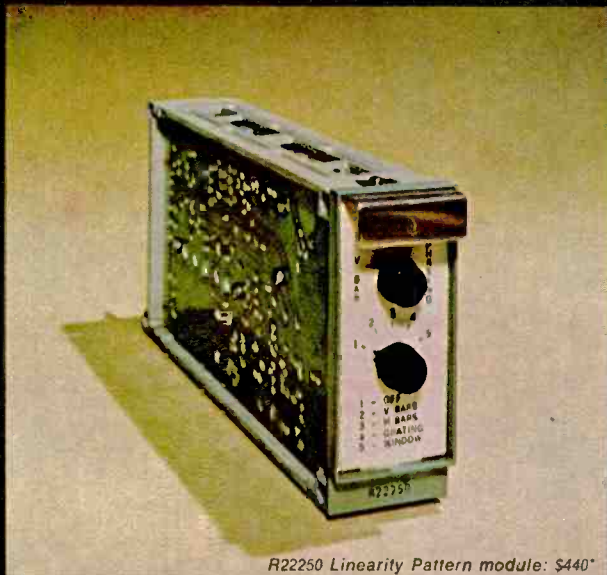
BROADCAST ENGINEERING



R22249 Burst Flag module: \$220*



R22248 Pulse Lock module: \$370*



R22250 Linearity Pattern module: \$440*



R22251 Colour Standard with "Chromalock": \$1,200*

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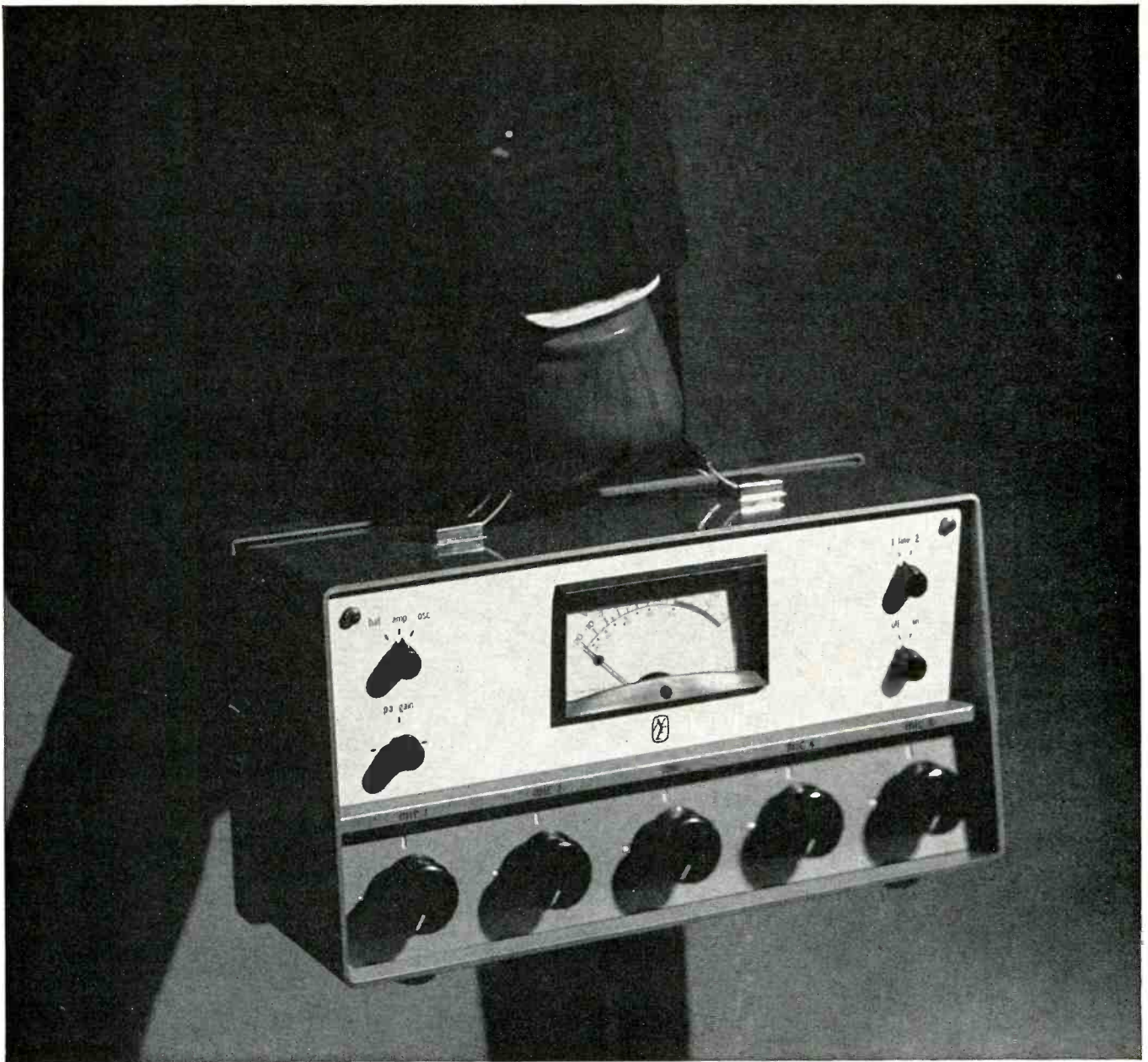
our **PULSELOCK** module locks local sync to any master network or remote sync, has slow and fast lock modes, has phase adjustment for local pulse positioning, provides exact vertical lock to any network or remote signal — monochrome or colour. Operate this pulselock module at the sync generator itself, or by remote control cable from any convenient point. Another optional module, the **LINEARITY PATTERN**, provides four convenient test patterns: vertical bars, horizontal bars, grating, and window; for monitor and camera alignment.



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BROADCAST ENGINEERING

CARTRIDGE CARE FOR BROADCAST TURNTABLES

by **Robert B. Jackson**—Quality reproduction of disc recordings must begin at the source.

The magnetic pickup cartridge in the tone arm of your turntable can be the weak link in your audio chain if it has been neglected, damaged, or worn out. Let's look at a few basic types of professional cartridges to see how they operate. Then we'll see what can be done, short of tossing them out for new units, to put them back into effective working order.

Cartridge Types

One of the most popular cartridge types used in studios, especially a few years ago, is the changing-reluctance, or variable-reluctance, cartridge (Fig. 1). This type uses a fixed permanent magnet attached to a pair of pole pieces each of which is surrounded by a coil of wire. The remaining ends of the pole pieces are connected through a small air gap to the ferromagnetic needle shank which completes the magnetic path back to the magnet. As the needle is

moved by the record groove, the gap between the free end of the needle shank and the pole-piece ends changes length, causing a varying reluctance in the gap. This varying reluctance in the magnetic path causes a variation of flux through the magnetic circuit and in turn induces a varying voltage at the terminal ends of the coil leads.

In the moving-magnet type of cartridge, the voltage at the output terminals results from variation of the flux through a metal core surrounded by a coil of wire just as in the changing-reluctance type. But at this point the similarity ceases. The changing flux is caused by a magnet moving in the space between a pair of pole faces (Fig. 2). In this figure each set of oppositely positioned pole pieces constitutes a channel in the stereo cartridge. The magnet pivots in a rubber bearing, and the position of the magnet with respect to the pole-piece ends is critical. The pole-piece ends should be close to one

end of the magnet for maximum output for a given recorded level. This alignment is assured if the needle is kept pushed all the way into the cartridge.

A third kind of magnetic cartridge found in professional equipment uses a moving coil (Fig. 3). This cartridge is manufactured by only a small number of firms and has certain peculiarities that make it different from the two types already described. The theory of operation is simple. A pair of coils (for stereo) is attached mechanically to a needle shank (usually made of a plastic material). Surrounding, but not touching, the coils is a magnet shaped so that its flux lines pass through the coils. Moving the needle, thereby moving the coils, causes a voltage to be induced in the coils which is measured at the terminal pins.

Associated Circuitry

Because all magnetic cartridges

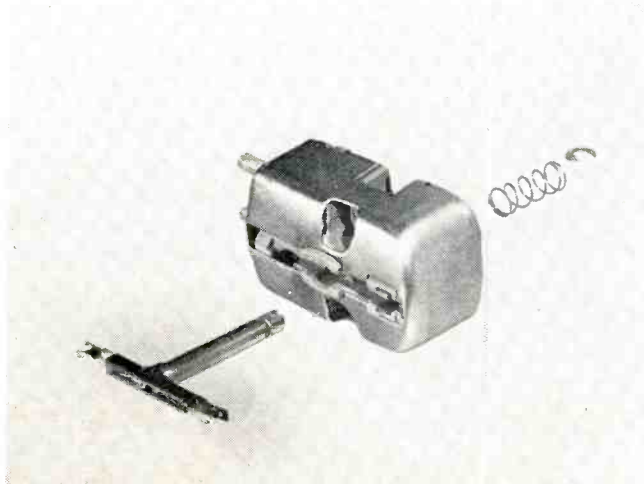
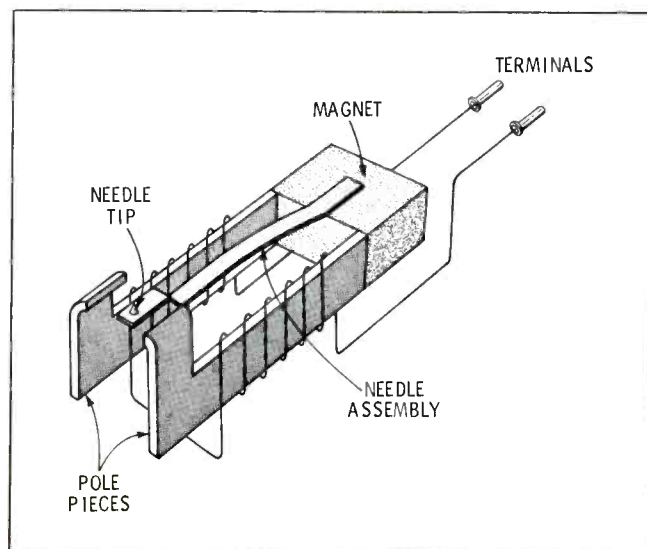


Fig. 1. The variable-reluctance pickup functions by changing air gap in accordance with deviation of the groove.



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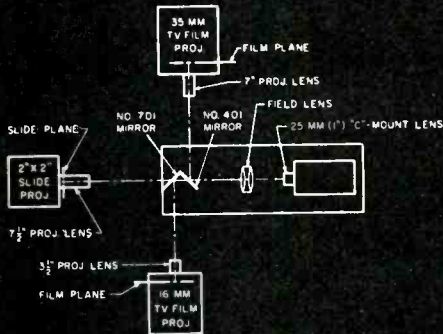


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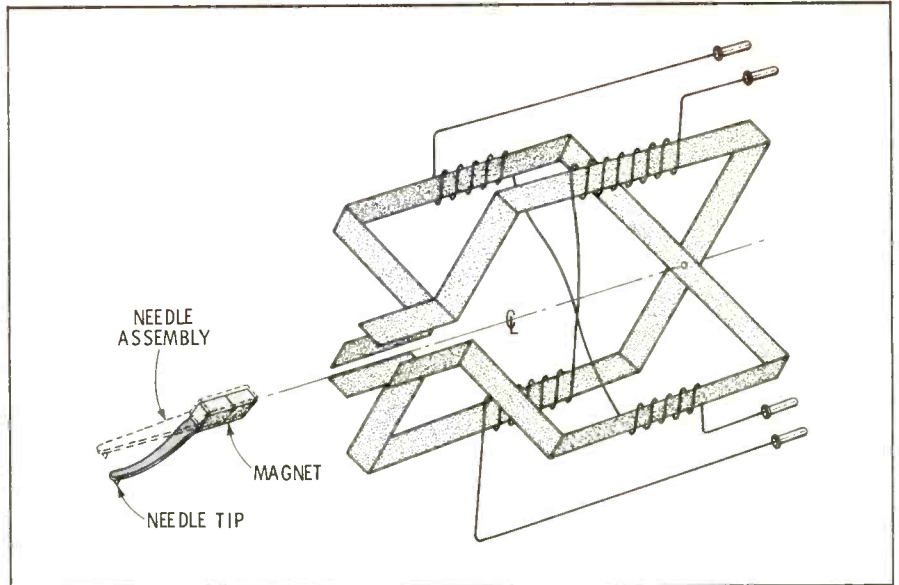


Fig. 2. Diagram of physical construction of stereo moving-magnet cartridge.

operate on the principle of changing flux, they are all velocity-sensitive devices. That is, if one had a disc recording of a frequency sweep from low to high frequencies and the cutter excursion was held constant (i.e. constant amplitude), then the needle velocity would increase 10 times (20db) per decade. This results from the fact that:

$$v = Af$$

Where,

- v is the recorded velocity.
- A is the amplitude of the recorded waveform (which can be measured using a microscope), and
- f is the frequency of the recorded waveform.

The open-circuit output voltage increases with frequency in the same manner. The open-circuit stipulation is included because the inductive nature of the cartridge causes the response to roll off when the cartridge impedance reaches the load impedance. In practice, records are not cut at constant amplitude or constant velocity, but according to a compromise curve.

It is still necessary to make some compensation for the frequency dependence of the cartridge. Most magnetics have an inductance of approximately one-half henry. This results in an impedance of approximately 47K at 15 kc. For this reason 47K to 50K is considered to be the standard load resistance to prevent the cartridge output from being too great at high frequencies.

Trouble Symptoms and Causes

Occasionally something goes wrong, and distortion instead of music results. The following are some common cartridge disorders and methods used to correct them.

The changing-reluctance cartridge will put out a beautifully clipped sine wave that will put any overdriv-

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← Circle Item 18 on Tech Data Card

BROADCAST ENGINEERING

en audio stage to shame if the needle shank is hitting one of the magnetic pole pieces. Straightening the shank will correct the difficulty. The spacing of the needle shank is very important because there is not much room for misalignment. Also, bending the needle up toward the cartridge will increase the output voltage if it is too low.

The moving-magnet and moving-coil types of cartridges do not have any trouble peculiar to them. They do fail sometimes from conditions that affect all types of cartridges. High temperatures, hard knocks, and strong AC fields tend to weaken the magnets.

One important cause of trouble is dirt. The grease from peoples' hands (if only they would keep their hands off the records!) combined with dust from the air can make a hard coating around the tip and hinder its performance. Dirt around the opening where the needle enters the cartridge can also wreck the performance of the unit. This dirt should be removed using a soft brush or a few light blasts of air. An ear syringe can be used for this.

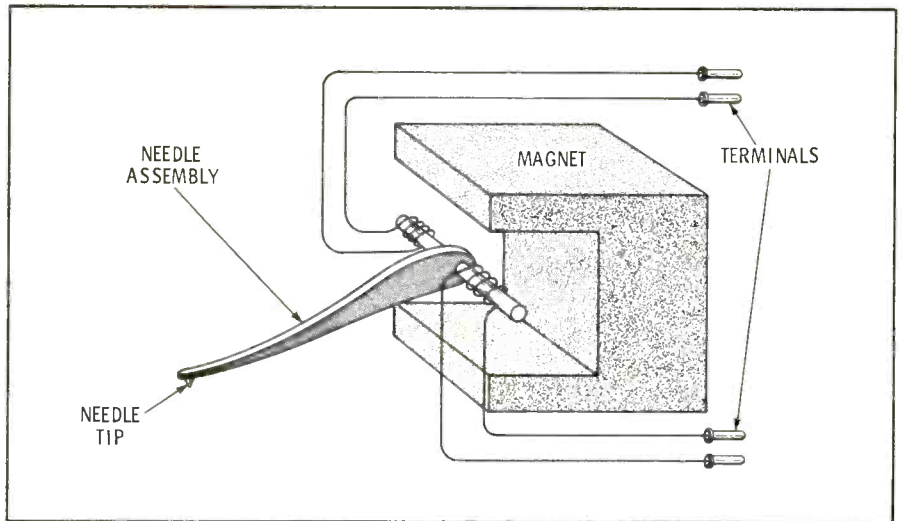


Fig. 3. Moving-coil cartridge acts as small generator to produce its output.

Is The Needle Tip Worn Out?

If everything else checks out properly, there is a strong possibility that the needle tip is either damaged or worn out. Manufacturers of phonograph needles recommend using a sapphire needle for a hundred hours or less of actual playing time; a diamond will last for about a thousand hours. Even though your

needle has been in use for a longer time, yet doesn't sound bad, you should check it; it may be damaging some valuable recordings.

Here are some suggestions for removing and replacing the needle if you assume it is bad, together with some notes on what a bad needle looks like.

The changing-reluctance cartridge is the only one that must be removed from the tone arm before the

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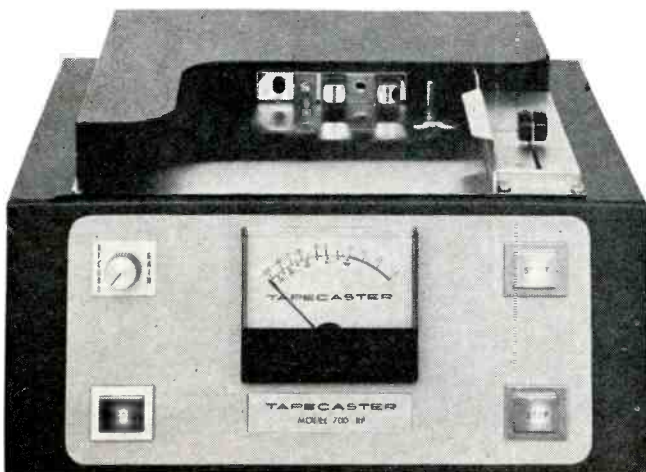
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RA-5



AS-30



A-15



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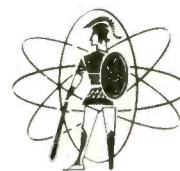
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tetrode for SSB with
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-40 db in typical operation

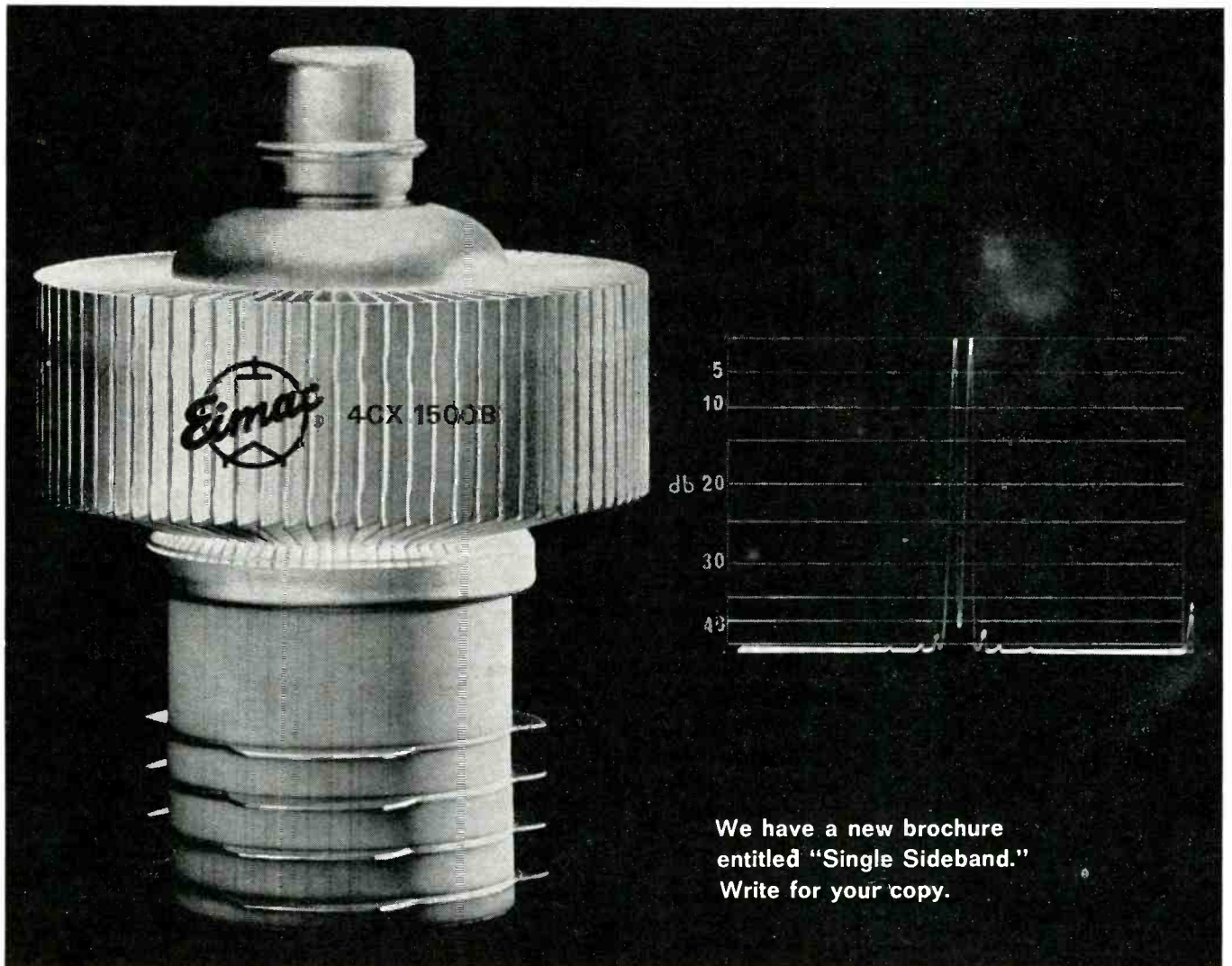
EIMAC's new 4CX1500B power tetrode is the most linear tube on the market; intermodulation distortion characteristics under typical operating conditions are at least -40db at all drive power levels from zero to maximum. The new tube is ideal for advanced single sideband transmitters demanding high linearity to avoid channel-to-channel interference. The 4CX1500B is the product of a four-year development study which included optimization of internal tube geometry by computer techniques. Rated maximum plate dissipation of this radial beam tetrode is 1500 watts, and control grid dissipation rating is 1 watt maximum. Because the 4CX1500B has very low grid interception (typically less than 1.5 mA grid current), it is possible to drive the grid positive without adverse effects upon the distortion level; the tube is therefore recommended for Class AB₂ linear amplifier service. For further information, write Product Manager, Power Grid Tubes, or contact your nearest EIMAC distributor.

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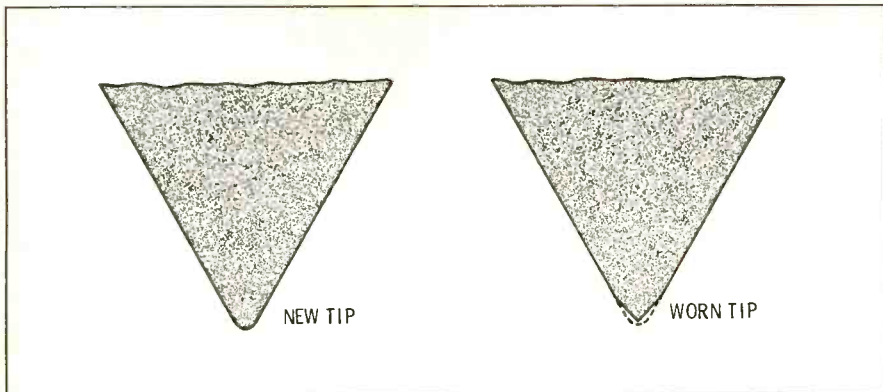


Fig. 4. Worn tip at right shows chisel shape that destroys record grooves.

needle will come out. Some models made in later years avoid this inconvenience, but the turn-a-rounds are best handled this way.

The first rule for successful needle handling is to not grab the needle shank. Take hold of something larger. All these needles are surrounded by a housing having some sort of handle to grasp. The only needle without such a handle is in the moving-coil cartridge; generally it has to be returned to the manufacturer in the cartridge for servicing.

If you have a microscope with a magnification of 50X to 90X or more, you may want to look for yourself. If you don't have one, your needle-and-cartridge jobber has. The most important thing to remember is to look in the direction of groove travel to note the wear. Hold the needle so that you are looking along the shank with the needle tip pointing horizontally. A new tip has a spherical end at the tip of a cone (Fig. 4). The radius of the sphere is between .0005 and .0012", depend-

ing on the tolerances held by the manufacturer and whether the needle is used for stereo or monophonic records. A worn tip will look like a cone with a chisel at the end. A tip with this shape will soon ruin a record. The first damage is done to the high frequencies and might go unnoticed to the less critical ear. The highs are removed because the wedge at the needle tip assumes the general direction of groove travel. The low frequencies have such gradual deflections that they appear to be straight and the chisel edge slides through; but the higher frequencies call for quicker side movements of the tip and are consequently straightened out by the worn tip. Eventually, the whole record will be literally erased.

Conclusion

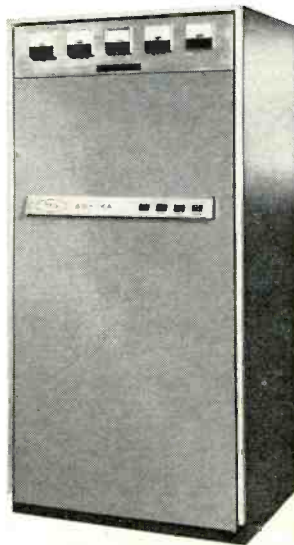
With a reasonable amount of care and maintenance, a magnetic cartridge will last indefinitely. Since the only moving parts are contained in the replacement needle, you can give your cartridge a complete overhaul simply by replacing this assembly. ▲

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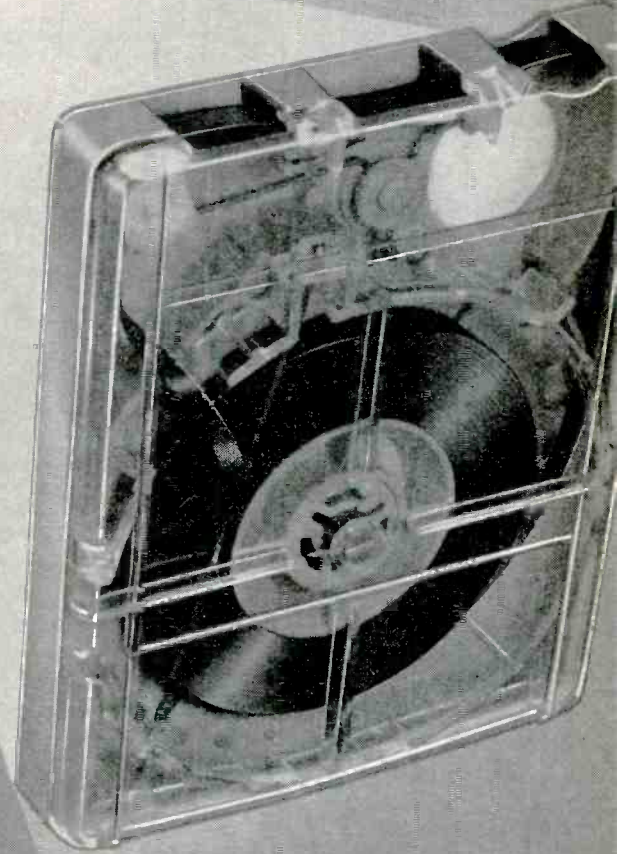
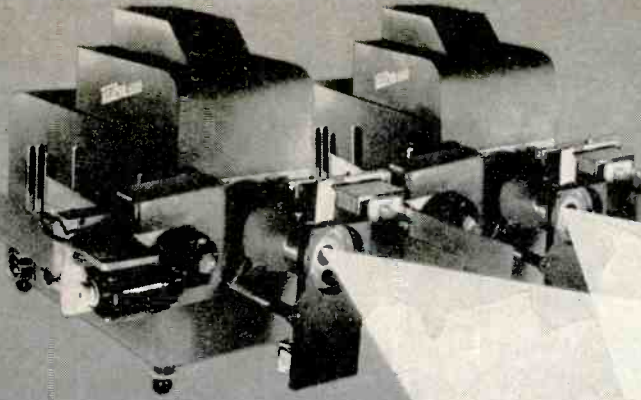
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*Dupont trademark

INVESTMENT TAX CREDIT ON EQUIPMENT

by **Ralph H. Butz**—If you are involved in purchasing decisions at your station, here are some economic facts to remember.

The 1962 business tax law, authorizing business firms to deduct from their tax liability a certain percentage of the cost of new or used equipment purchases, has benefited the Treasury Department as much as the businesses that purchased equipment for replacement or expansion.

The expansion of small businesses, since investment tax credit has become an allowable deduction, reflects a reversal of the trend that prevailed before the new tax law became effective. A recent survey in

one state (Pennsylvania) by the National Federation of Independent Businesses, indicated that the average net profit of small manufacturers was \$20,000 per year. At a tax rate of 30%, this indicates an average tax bill of \$6,000. If each of these businesses had qualified for the investment tax credit of 7% on \$25,000 equipment purchases, each would have been entitled to \$1,750 tax credit.

Projecting these figures on a national scale, the loss to the U.S.

Treasury appears to be about \$313 million. However, because of added equipment and resulting expansion, some 1,400,000 workers were added to payrolls, paying new taxes totaling about \$450 million. The net result was a profit of approximately \$137 million for the Treasury.

Some businessmen complain that the formula to compute tax credits is too complicated. As a result, some equipment buyers have not taken

• Please turn to page 86

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PREVIEW OF THE

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CONTENTS

Statement of Welcome	53
Vincent T. Wasilewski	
>Welcome to the 20th NAB Broadcast Engineering Conference	54
George W. Bartlett	
Agenda of the Broadcast Engineering Conference	55
Some points of Interest in Downtown Chicago	58
NAB News Highlights	60
Exhibit-Hall Floor Plans	
North Hall (Booths 401-424)	65
West Hall (Booths 200-252)	66
East Hall (Booths 101-118)	67
Continental Room (Booths 301-324)	68
NAB Associate-Member Exhibitors	69
Preview of New Products	73

STATEMENT OF WELCOME

by
Vincent T. Wasilewski, President
of the

NATIONAL ASSOCIATION OF BROADCASTERS

It is with great pleasure that I welcome you to the 44th Annual Convention of the National Association of Broadcasters.

All of us on the NAB staff appreciate this opportunity to meet with you; to give serious consideration to the issues confronting our industry and to discuss and plan for the future with you.

This Convention will provide us not only with the opportunity to meet old friends in the spirit of fellowship, but will help us gain new information about the rapid technological changes in our industry. This year, too, will offer an opportunity to rededicate ourselves to those ideals of self-discipline and self-regulation which form the foundation of our profession and which have allowed the continued growth and prosperity of broadcasting while it has served the interests of the American public.

All of us working together can operate as a viable economic force in our society and serve affirmatively, constructively and with enthusiasm—to the benefit of all.

Vincent T. Wasilewski
President
National Association of
Broadcasters

WELCOME TO THE 20TH NAB BROADCAST ENGINEERING CONFERENCE

By

George W. Bartlett
Vice-President for Engineering
NATIONAL ASSOCIATION OF BROADCASTERS

With the sounding of the chairman's gavel at 10:30 sharp on the morning of March 28, 1966, over ten months of diligent planning and preparation will unfold, ushering in the 20th consecutive Broadcast Engineering Conference held in conjunction with the annual NAB Convention.

Again, the Conference and Convention are providing us with the opportunity to employ such descriptive phrases as "bigger and better," "the greatest of all times," and "the largest in the world" as our attendance breaks all records and our exhibit area becomes larger and larger. It is truly a public-relations man's dream, as an inexhaustible supply of superlatives is needed to extol the size and grandeur of this passing parade.

This year, your planning committee has once again developed a star-studded program, including papers of interest to all segments of the industry which undoubtedly will tempt the appetite of all those in attendance. Provocative panels on the Emergency Broadcasting System, Radio Automation, and Color Cameras, and the ever-popular FCC Technical Panel have been included on this year's program. Individual papers on every conceivable broadcast engineering subject have been abundantly sprinkled in between. In all, 20 papers and four panel sessions will be presented.

Each conferee will also have the opportunity of attending three engineering luncheons featuring the finest speakers obtainable, plus the usual socializing so necessary to assure the orderly exchange of ideas. Over 80,000 square feet of exhibit space will be utilized by 90 exhibitors to expose all in attendance to the greatest array of broadcasting equipment ever assembled under a single roof.

Broadcast engineering is a dynamic profession constantly concerned with new ideas, new thoughts, and new techniques. Innovations are continually coming to the forefront which produce radical changes in our methods of operation and our thinking. We must constantly be alert to these changes and strive to be fully informed of these new developments. These are challenges which require aggressive leadership and positive forward thinking.

It is with this background that I take this opportunity, on behalf of the Association and the Broadcast Engineering Conference Committee, to welcome you to the 20th Annual Broadcast Engineering Conference. The program was planned with you specifically in mind and was tailor-made to fit your every need. I hope you will take maximum advantage of its every opportunity and carry back to those at home the knowledge and experiences gained at this gathering. ▲

Agenda

20th NAB Broadcast Engineering Conference

Monday, March 28

- 10:30 AM Joint session with management for opening of convention.
12:30 PM Engineering Conference Luncheon—Williford Room
Presiding: Benjamin Wolfe, Vice-President for Engineering, Westinghouse Broadcasting Company, Inc.
Speaker: Georges Hansen, Director of the Technical Center, European Broadcasting Union (EBU).

Monday Afternoon

- Presiding: Philip B. Laeser, Manager of Engineering, WTMJ Radio & Television, Milwaukee
Coordinator: William S. Duttera, Director, Allocations Engineering, National Broadcasting Company, Inc.
- 2:30-2:40 PM Opening of the Conference—Vincent T. Wasilewski, President, NAB
- 2:40-3:05 PM Researches in Loudness Measurement—Benjamin B. Bauer, Vice-President for Acoustics & Magnetics, CBS Labs.
- 3:10-3:20 PM NAB Engineering Advisory Committee Report—Clyde M. Hunt, Chairman, NAB Engineering Advisory Committee; Vice-President for Engineering, Post-Newsweek Stations
- 3:25-4:10 PM Emergency Broadcasting System Panel
Moderator: Clure H. Owen, Manager of Allocations, American Broadcasting Companies, Inc.
Panelists:
Arthur F. Barriault, Washington Representative, National Industry Advisory Committee
Joseph F. Keating, Vice-President, Programs & Operations, Mutual Broadcasting System
Thomas O'Brien, Vice-President, WABC News
Thomas H. Phelan, Mgr., Technical Facilities & Maintenance, National Broadcasting Company
Davidson M. Vorhes, Vice-President, Operations & Engineering, CBS Radio
- 4:15-4:40 PM A New Portable Television Recording Camera—Joseph M. King, Broadcast Applications Director, Westel Co.
- 4:45-5:15 PM Modern Equipment for Measuring TV Transmission Systems—Dr. Herbert Mangold, Rohde & Schwarz

Tuesday Morning, March 29

Radio

- Presiding: J. B. Epperson, Engineering Vice-President, Scripps-Howard Broadcasting Company, Cleveland
Coordinator: Leslie S. Learned, Director of Engineering, Mutual Broadcasting System, New York
- 9:00-9:25 AM A New Concept for Radio Broadcasting of Commercials—W. M. Fujii, Ampex Corporation
- 9:30-9:55 AM ABC Remote Control and Automatic Logger—Robert M.

- Morris, Staff Consultant, Engineering Department, American Broadcasting Companies, Inc.
- 10:00-10:25 AM Units of Measurement in Equipment Performance—W. J. Kabrick, Advance Development Engineer, Gates Radio Company
- 10:30-10:55 AM (to be announced)
- 11:00-11:10 AM Remote Control Operation of Turntables—Stephen F. Temmer, Gotham Audio Corporation
- 11:15 AM-12:10 PM Automation Panel
 Moderator: Wilson Raney, Chief Engineer, Cowles Broadcasting Service, Inc., Memphis, Tennessee
 Panelists:
 James H. Butts, Director of Programming & Engineering, Mullins Broadcasting Co., Denver, Colo.
 Eldon Kanago, Chief Engineer, KICD, Spencer, Iowa
 Allan T. Powley, Chief Engineer, WMAL AM-FM-TV, Washington, D. C.
 Ross H. Beville, President, Broadcast Electronics
 Don W. Clark, Continental Electronics Mfg. Co.
 Danny Coulthurst, Eng. Dir., International Good Music, Inc.

Television

- Presiding: Russell B. Pope, Director of Engineering, Golden Empire Broadcasting Company, Chico, Calif.
 Coordinator: James W. Cooper, Director of Engineering, WFAA AM-FM-TV, Dallas
- 8:45-9:10 AM Setup Facilities and Operational Tests to Assure Quality TV Camera Signals—N.L. Hobson, RCA
- 9:15-9:40 AM Color Film for Television—John R. Whittaker, Photographic Engineer, CBS Television Network
- 9:45-10:10 AM Automatically Controlling the Performance of a Color Film Camera—Hugh H. Martin, Engineering Consultant, General Electric Company
- 10:15-10:40 AM Testing the 4-V Color Film System—Frank Haney, Manager, Audio & Video Systems, American Broadcasting Companies, Inc.
- 10:45-10:55 AM SMPTE Color Television Subjective Reference Test Films—John M. Waner, Board of Governors, SMPTE
- 11:00-11:25 AM CBS Experience With Plumbicon Color Cameras—Richard Streeter, Senior Project Engineer, CBS Television Network; and Robert Cobler, Manager of Maintenance & TVR, CBS Television Network
- 11:30-12:15 PM Color Camera Panel
 Moderator: Benjamin Wolfe, Vice-President for Engineering, Westinghouse Broadcasting Company
 Panelists:
 R. E. Putman, Manager, Audio/Video Development Engineering, General Electric Company
 Norman N. Parker-Smith, Studio Development Manager, Marconi Company Ltd.

R. T. Cavanagh, Gen. Mgr., Studio Equip., North American Philips Company
Dr. H. N. Kozanowski, Radio Corporation of America
Dale Buzan, Mgr., TV Studio Equip. Design, Sarkes Tarzian, Inc.

12:30 PM

Engineering Conference Luncheon

Presiding: James D. Parker, Director, Transmission Engineering, CBS Television Network, New York
Speaker: John Chancellor, Director, Broadcasting Service, United States Information Agency

Tuesday Afternoon

No sessions scheduled to permit delegates to visit exhibits and hospitality suites.

Wednesday, March 30

Presiding: Clure Owen, Manager of Allocations, American Broadcasting Companies, Inc.

Coordinator: Russell B. Pope, Director of Engineering, Golden Empire Broadcasting Company, Chico, Calif.

9:00-9:25 AM

Automated Switching Center—Robert D. Post, Engineering Department, National Broadcasting Company

9:30-9:55 AM

Techniques for Multiple Generation Color Video Tapes—Today and Tomorrow—Charles H. Coleman, Senior Staff Engineer, Ampex Corporation

10:00-10:25 AM

Remote Control of High Power TV Transmitters—Radio Corporation of America

10:30-10:55 AM

CBS Stop-Action Magnetic Video Disc Recorder—Adrian Ettlinger, Associate Director, Technical Development, CBS Television Network

11:00 AM-12N

FCC Technical Panel

Moderator: Leslie S. Learned, Director of Engineering, Mutual Broadcasting System

Panelists:

Hart S. Cowperthwait, Chief, Rules & Standards Div.
Ralph H. Garrett, Chief, New and Changed Facilities Branch

Otis T. Hanson, Chief, Existing Aural Facilities Branch

Wallace E. Johnson, Assistant Chief, Broadcast Bureau
Harold L. Kassens, Assistant Chief, Broadcast Facilities Division

Harold G. Kelley, Supervision Engineer, TV Applications Branch

Curtis B. Plummer, Chief, Field Engineering Bureau

12:30 PM

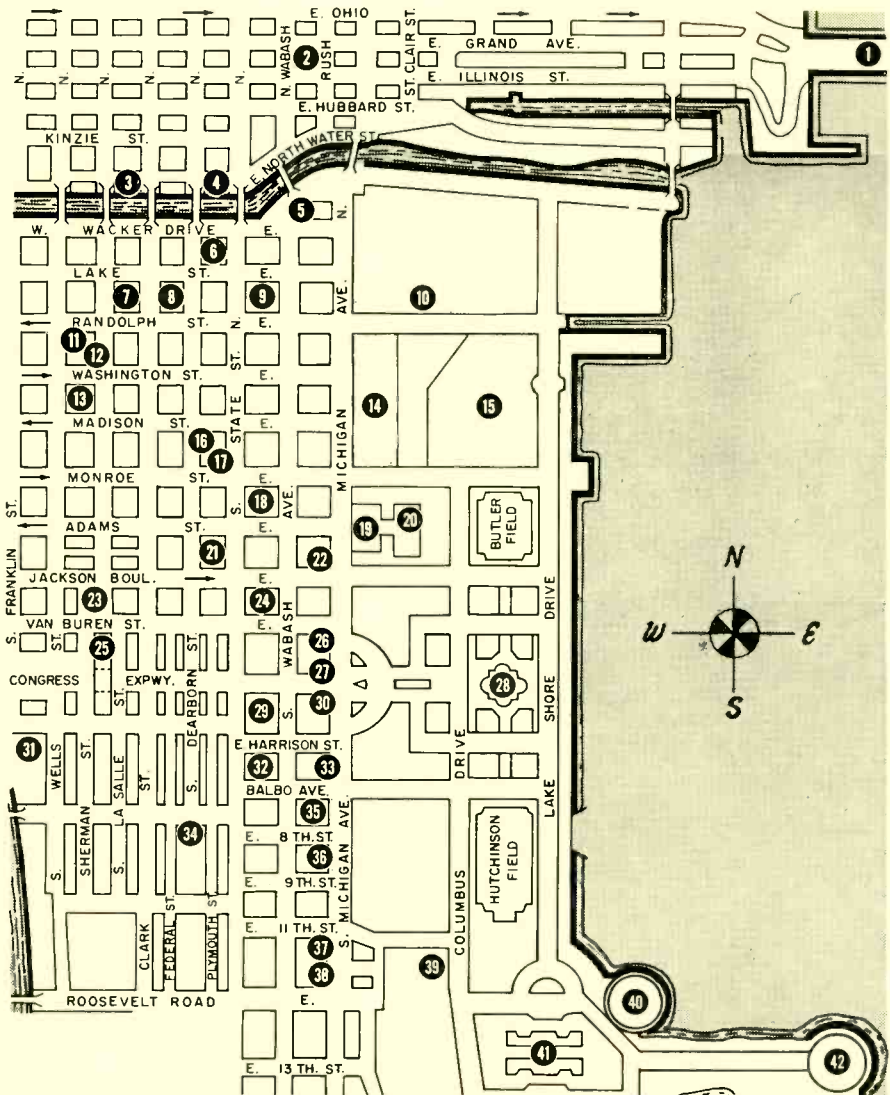
Engineering Conference Luncheon

Presiding: Thomas E. Howard, Chairman, Broadcast Engineering Conference Committee

Presentation of Engineering Achievement Award to:

Carl J. Myers, Senior Vice-President and Director of Engineering, WGN, Inc., Chicago

Speaker: Dr. Joseph V. Charyk, President, Communications Satellite Corporation



Some Points of Interest in Downtown Chicago

For more information, you can contact the Chicago Association of Commerce and Industry Visitors Bureau, 30 West Monroe Street, Chicago 3, Ill.

Hotels and Motels

- 37. Ascot Inn
- 38. Avenue Motel
- 11. Bismarck
- 35. Conrad Hilton
- 36. Essex Inn
- 5. Executive House
- 13. LaSalle
- 18. Palmer House
- 30. Pick-Congress
- 33. Sheraton-Blackstone
- 7. Sherman House

Theaters

- 32. Blackstone
- 20. Goodman Memorial
- 22. Orchestra Hall
- 17. Schubert
- 26. Studebaker

Transportation

Bus Stations:

- 9. Continental Trailways
- 8. Greyhound

Railroad Stations:

- 34. Dearborn Station
- 31. Grand Central Station
- 39. Illinois Central Station
- 25. LaSalle Street Station
- 2, 3, 6, 12, 14, 15, 29. City Parking Garages

Other Points of Interest

- 42. Adler Planetarium and Astronomical Museum
- 19. Art Institute
- 23. Board of Trade (Observation Tower)
- 28. Buckingham Fountain
- 41. Chicago Natural History Museum
- 24. DePaul University
- 4. Marina City
- 1. Navy Pier
- 10. Prudential Building (Observation Tower)
- 27. Roosevelt University
- 40. Shedd Aquarium
- 16. Visitors Bureau
- 21. United States Courthouse

The Museum of Science & Industry is at 57th Street and South Shore Drive (not shown on the map).

NAB News Highlights

Record Convention Expected

Attendance at this year's NAB Convention is expected to equal or surpass the record 4175 registered in Washington last year. The exhibit of broadcast equipment at the Convention will be the largest ever assembled anywhere; the display of electronic gear will require four exhibit halls at the Conrad Hilton—two more than in 1964—and will take up approximately 50,000 square feet of floor space, 12,000 more than last year's record 38,000 square feet. More than 90 exhibitors will be represented.

The Convention Committee has approved staff plans for arranging a legal panel discussion as the closing Convention feature at the Wednesday afternoon general assembly. The panel, featuring outstanding legal authorities, will be moderated by Douglas A. Anello, NAB's general counsel.

FCC Chairman to Address Convention

Chairman E. William Henry of the Federal Communications Commission will address the management luncheon on Tuesday, March 29. Mr. Henry's acceptance of the invitation to address more than 3500 radio-television executives expected to attend was announced by NAB president Vincent T. Wasilewski, who will make the traditional Convention keynote address at the opening management luncheon on Monday, March 28.

Previously announced as the speaker at the final management luncheon on Wednesday is General

Maxwell D. Taylor, former Chairman of the Joint Chiefs of Staff and onetime U.S. Ambassador to South Viet Nam, who is now a special consultant to President Johnson.

The Engineering Achievement Award will be presented at the final engineering luncheon to Carl J. Meyers, senior vice-president and director of engineering, WGN, Chicago, in recognition of his "pioneering and experimental efforts in color telecasting."

Georges Hansen, director of the European Broadcasting Union's Technical Centre in Brussels, Belgium, will address the engineering luncheon on Monday, and John Chancellor, director of the Voice of America, will speak on Tuesday.

'FM Day' Program

Reports on FM radio's selling power as a local advertising medium and on the profitable operation of FM stations are among the program features to be presented during the traditional "FM Day" rally at the NAB Convention.

The March 27 session at the Conrad Hilton Hotel also will feature a talk by Robert E. Lee, member of the Federal Communications Commission, and a report on "The Changed Scene" in FM broadcasting by Sherril Taylor, NAB vice-president for radio.

Mr. Taylor and Everett Dillard, president and general manager of WASH, Washington, D. C., NAB Radio Board member and Chairman of NAB's FM Committee, announced these agenda highlights:

"Big Sales in Your Own Back Yard With FM" — A panel presentation moderated by Ben Strouse, vice-president and general manager of WWDC, Washington, that will feature three leading local FM advertisers.

"Make Money Now With FM" — Another panel presentation featuring Harold Krelstein, president of WMPS, Memphis, Tenn.; David Polinger, vice-president and general manager, WTFM, New York, N.Y., and Harold Tanner, president and general manager, WLDM, Detroit, Mich. Mr. Krelstein, a member of NAB's Radio Board, will act as moderator.

Remarks by Mr. Lee.

As in the past, the NAB program is scheduled for the afternoon. Mr. Dillard will preside.

The morning session, presented by the National Association of FM Broadcasters, will be devoted to ideas on selling FM Radio time.

Colorcasting to be Examined

The boom in color television will be examined from the broadcaster's point of view at a "Color Conference '66" for TV management delegates Monday afternoon, March 28, in the Great Hall of the Pick Congress Hotel (a short distance from Convention headquarters in the Conrad Hilton Hotel).

William Carlisle, NAB vice-president for station services, who supervises TV session arrangements, said the Color Conference will delve into five main areas of colorcasting—the mechanics involved, decision-making on equipment purchases, problems and solutions in program production,

and promotion and sale of the end product.

The Conference will be produced and moderated by Charles H. Tower, executive vice-president of the Corinthian Broadcasting Corp., New York, who is a member of both the NAB Television Board of Directors and its 1966 Convention Committee.

Mr. Carlisle gave this rundown on the Conference from its opening to its closing features:

"The Electronics of Color" A visual presentation in layman's language on the mechanics involved in colorcasting by John Wentworth of the Radio Corporation of America. Mr. Wentworth is manager of RCA's Current Concept in Science and Engineering program.

"How to Buy Color Equipment" Representatives of Ampex, General Electric, North American Phillips, and RCA will be queried by a management / engineering broadcasting team headed by John T. Wilner, vice-president in charge of engineering for radio and TV, The Hearst Corp., Baltimore, Md., a former chairman of NAB's Engineering Advisory Committee. Questions also will be invited from the floor.

"How to Program for Color" A presentation by Carlton Winkler, the CBS Television Network's director of production standards and practices, with additional remarks by Milton Altman, NBC's director of scenic design in Burbank, Calif. Both will answer questions from the floor.

"How to Promote Color" A presentation by Casey Cohlma, president of the Broadcasters Promotion Association, who also is promotion manager for WFAA-TV, Dallas, Tex.

"How to Sell Color" A presentation by Norman E. (Pete) Cash, president of the Television Bureau of Advertising, New York.

Mr. Carlisle said that no tickets or special credentials will be required for the Conference and that representatives of Chicago stations, advertising agencies, and station-representative associations as well as others interested are welcome to attend.

Record Membership

Overall NAB membership climbed to a record 3755 total during 1965. A report presented to the Radio Board of Directors in January by Everett E. Revercomb, NAB's secretary-treasurer, gave the following membership breakdown as of January 1, 1966.

AM radio stations	2157
FM radio stations	933
Television stations	460
Radio and Television Networks	7
Associate Members (equipment manu- facturers, etc.)	198

The over-all total of 3755 members represents a net gain of 216 over comparable figures for Jan. 1, 1965.

Comsat President to Address Engineering Conference

Joseph V. Charyk, president of the Communications Satellite Corp. and former Under Secretary of the Air Force, will address the closing-day luncheon of the Broadcast Engineering Conference on Wednesday, March 30.

Mr. Charyk began his aeronauti- can career in 1945 as an instructor

at the California Institute of Tech- nology. He later joined the staff of Princeton University and was ap- pointed an associate professor of aeronautics. During his six years at this post, he helped establish the University's Guggenheim Jet Propul- sion Center at its Forrestal Research Center.

Following his academic work, Mr. Charyk joined Lockheed Aircraft Corp. and then Aeronutronic Sys- tems, Inc., where he was general manager of the space technology division.

In 1959 he was appointed Chief Scientist of the U.S. Air Force and later that year became its Assistant Secretary for Research and Develop- ment. He was named Under Secre- tary in 1960 and was reappointed the following year. He became COMSAT president in 1963.

Mr. Charyk is a member of the Technical Advisory Committee on Aeronautics of the Office of the As- sistant Secretary of Defense for Re- search and Engineering and a mem- ber of the USAF Scientific Advisory Board.

Speaking at the opening day lunch- eon, Monday, March 28, will be Georges Hansen, director of the Technical Center of the European Broadcasting Union.

John Chancellor, director of the Voice of America, will be the Tues- day luncheon speaker.

Publisher to Receive Award

The 1966 NAB Distinguished Service Award will be presented to Sol Taishoff, editor and publisher of *Broadcasting* and *Television* mag- azines.

The presentation will be made at the opening General Assembly of the Convention.

Mr. Taishoff was chosen for the honor by the NAB Convention Committee on the recommendation of its Award Subcommittee in recognition of his "significant and lasting" contributions to the American system of free broadcasting.

Previous recipients include the late President Herbert Hoover, comedian Bob Hope, and top station and network executives.

1966 Radio Program Clinics

Six radio program clinics will be held this spring for personnel of NAB member stations. This is the third year the clinics will be held. Registration fee for the one-and-one-half-day meetings will be \$20.

Dates and sites of the clinics are: Monday-Tuesday, May 9-10—Portland Hilton, Portland, Ore.

Thursday-Friday, May 12-13 — America Hotel, Houston, Tex.

Monday-Tuesday, May 23-24 — Mayfair Lennox Inn, St. Louis, Mo.

Thursday-Friday, May 26-27—Radisson Hotel, Minneapolis, Minn.

Monday-Tuesday, June 6-7—Hilton Inn, Tarrytown, N. Y.

Thursday-Friday, June 9-10—Sheraton Hotel, Ft. Lauderdale, Fla.

Fall Conference Sites

Beginning in 1967, Fall Conference sites of the NAB will be selected from among 14 major cities, according to a decision by the Board of Directors. Eight Fall Conferences

still will be held each year, with the 1967 sessions set for Boston, Washington, Atlanta, Chicago, Kansas City, Dallas, Denver, and Los Angeles. Dates and hotels for the Conferences will be decided later.

The other six cities included in the list of 14 are New York, Pittsburgh, Cincinnati, St. Louis, New Orleans, and San Francisco.

The schedule for 1966 previously had been approved. It is:

Oct. 13-14 Statler Hilton, Dallas, Tex.

Oct. 17-18 Mark Hopkins, San Francisco, Calif.

Oct. 20-21 Hilton, Denver, Colo.

Oct. 24-25 Radisson, Minneapolis, Minn.

Nov. 10-11 Chase Park Plaza, St. Louis, Mo.

Nov. 14-15 Waldorf - Astoria, New York, N. Y.

Nov. 17-18 Queen Charlotte, Charlotte, N. C.

Nov. 21-22 Robert Meyer, Jacksonville, Fla.

Radio's New Sounds to be Featured

New and profitable sounds in radio programs and commercials will be featured at two management radio assemblies during the Convention.

Another program highlight will be a report on radio's past, present, and future by Jack W. Lee, vice president of WSAZ, Huntington, W. Va., and Chairman of the NAB Radio Board of Directors.

Sherril Taylor, NAB vice-president for radio, said that two sessions for radio management registrants are planned—on Monday afternoon, March 28, and on the following

Tuesday morning. Mr. Taylor, who will preside at the Monday session, said the program includes a presentation of radio "Sounds of '66," both live and on tape, from modern to country and western music, from talk and information shows to all-news and sports.

The first session also will feature Mr. Lee's report and a presentation by Earl Nightingale of Nightingale-Conant, Chicago, on programs that can be both inspirational and profitable.

Grover C. Cobb, vice-president and general manager of KVGB, Great Bend, Kans., will preside at the Tuesday assembly. Mr. Cobb is vice-chairman of the Radio Board and Co-Chairman of the 1966 Convention.

One Tuesday program feature is a panel presentation by the Station Representatives Association on "The New Sound of Radio Commercials." Hastings Baker, SRA's managing director, will moderate a panel composed of Stan Freberg of Freberg, Ltd., Los Angeles; Steve Frankfurt of Young & Rubicam, New York; and Howard Gossage of Freeman, Gossage and Shea, San Francisco.

There also will be a Radio Advertising Bureau presentation on sales techniques by Miles David, RAB president, and Robert Alter, its executive vice-president.

Rounding out the Tuesday program are progress reports by Howard H. Bell, NAB Code Authority Director, on self-regulation under the Radio Code and by Howard Mandel, NAB vice-president for research, on audience studies to measure more accurately the audience and selling power of modern radio.

NAB Chairmanship Now Part-Time Job

The NAB Board of Directors, on recommendation of its Chairman, has voted to modify the Board Chairmanship in two principal respects. Instead of requiring a majority of his time and residence in Washington, the position will require closer to a quarter of his time. The allocation of \$50,000 annually to the office, intended to cover all expenses incurred through Washington residence as well as compensation, is modified to cover actual expenses only.

The Board also accepted these other recommendations of Chairman John F. Dille, Jr.:

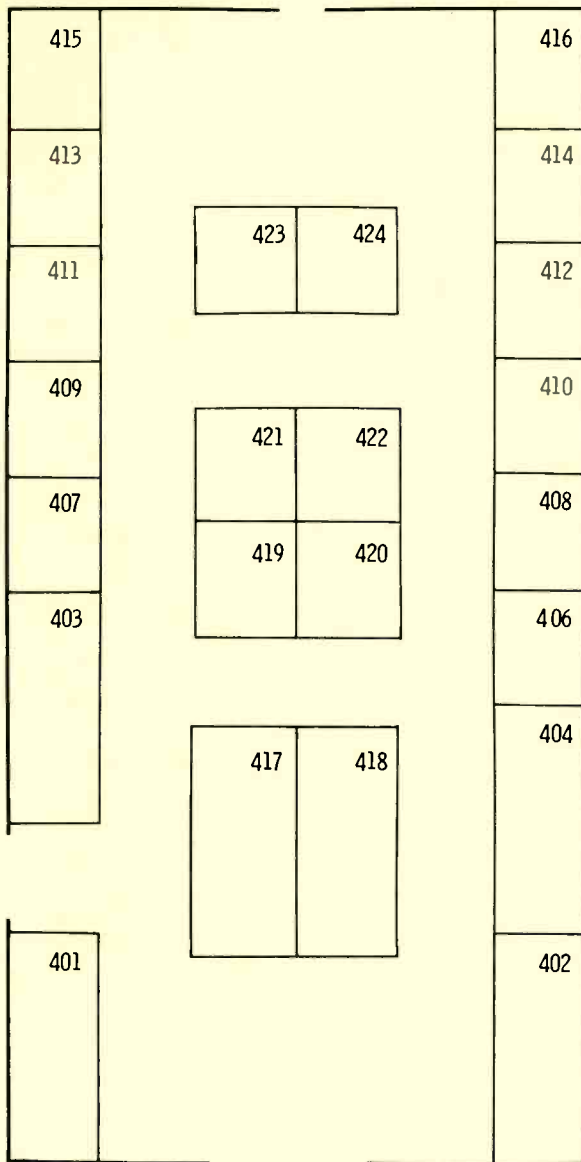
Expand the five-man Executive Committee to seven and empower it to act for the Board of Directors between meetings of the Board.

Permit the election of a Chairman who, while a broadcaster, is not necessarily a member of the NAB Board.

Establish a nominating committee which will submit the name or names of proposed Board Chairmen at the Board's summer meeting each year.

The present five-man Executive Committee consists of the Chairman of the Joint Board and the Chairmen and Vice Chairmen of the Radio and Television Boards, with the NAB President an ex-officio member. Under the new procedure, the past Joint Board Chairman and the NAB President would be added as full members.

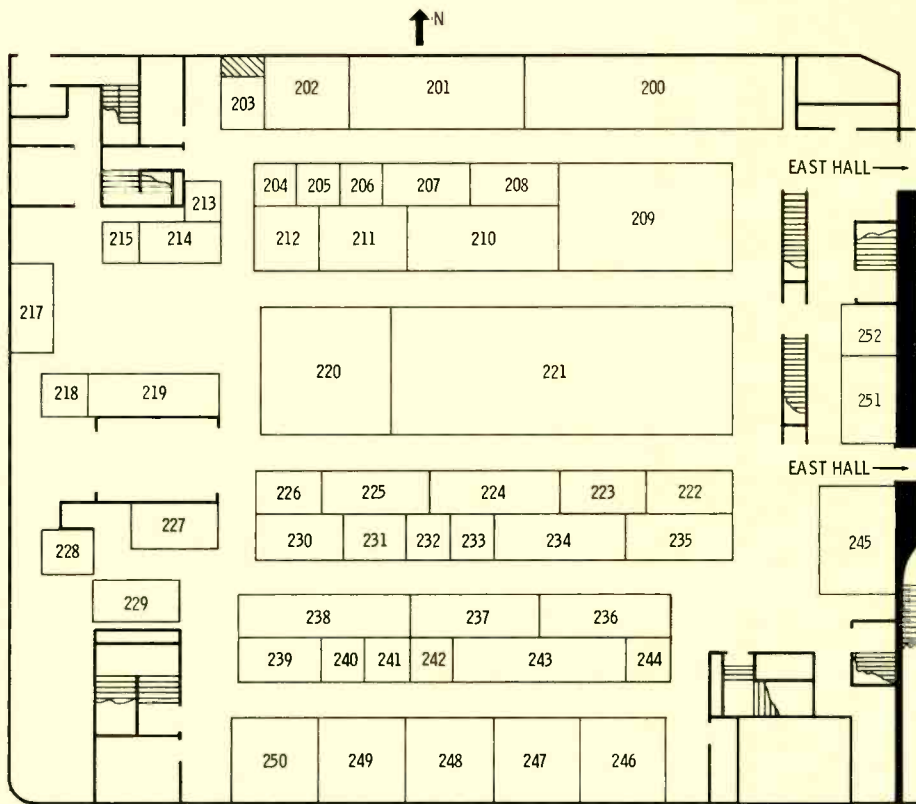
The changes will take effect June 30. ▲



NORTH HALL

Conrad Hilton

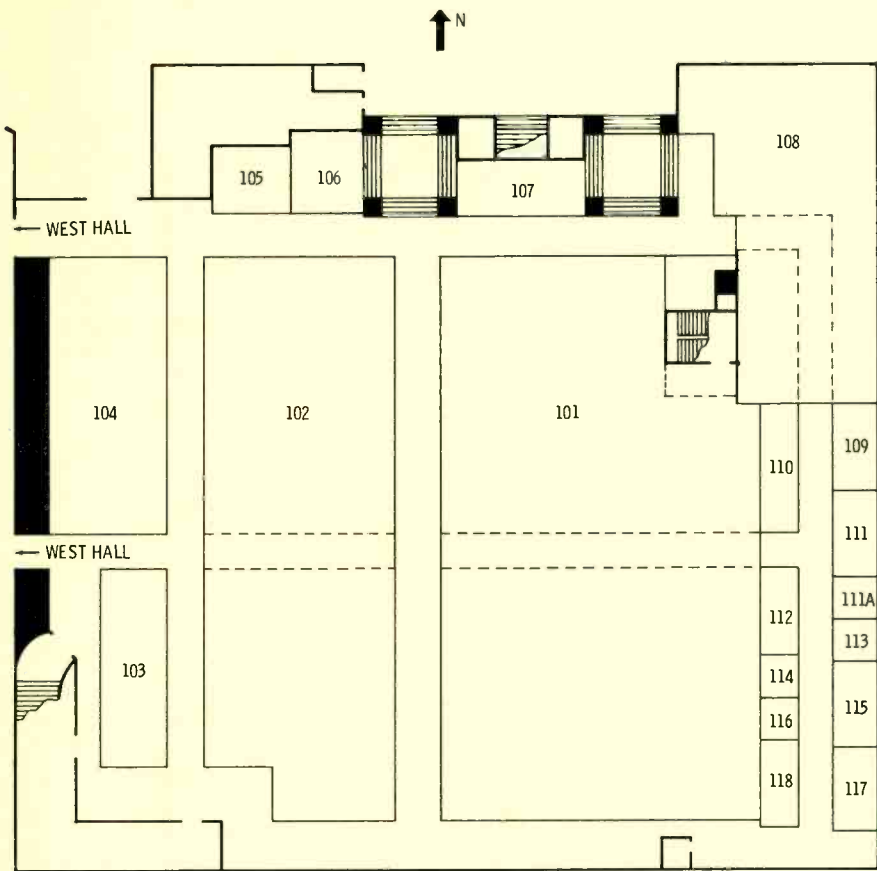
Booths 401 through 424



WEST HALL

Conrad Hilton

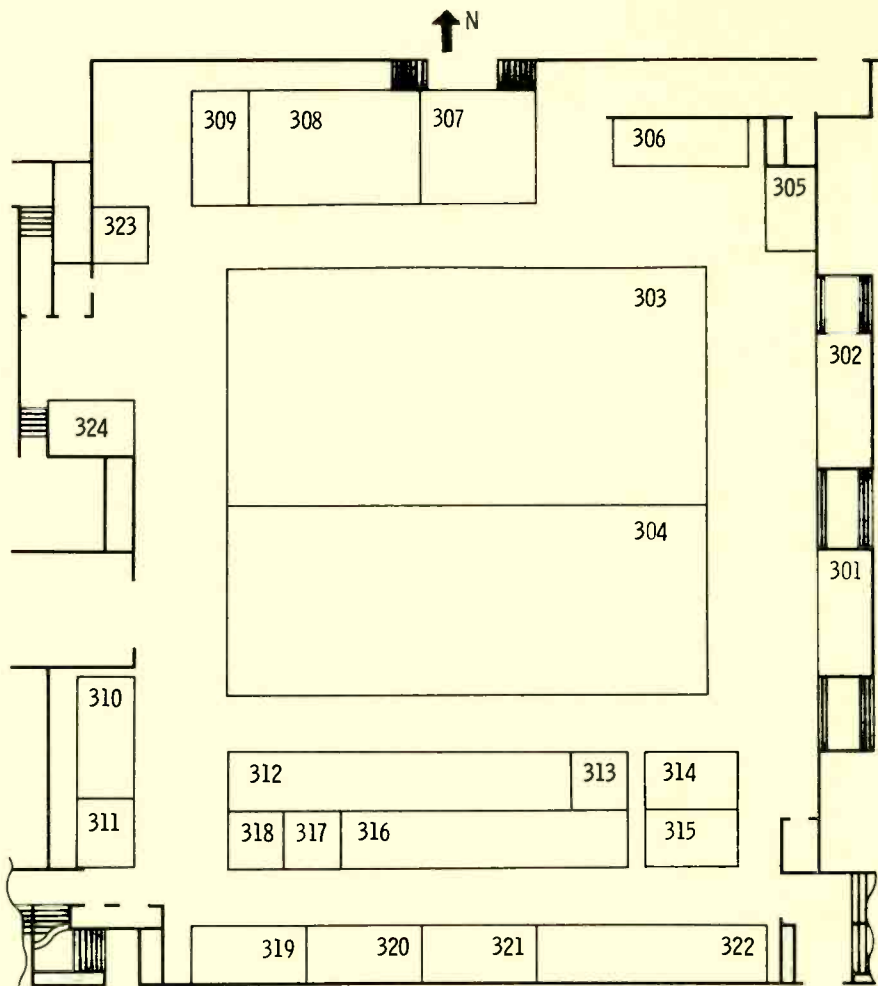
Booths 200 through 252



EAST HALL

Conrad Hilton

Booths 101 through 118



CONTINENTAL ROOM

Conrad Hilton

Booths 301 through 324

NAB ASSOCIATE MEMBER EXHIBITORS

NAB Convention

Conrad Hilton Hotel, Chicago, March 27-30, 1966

Addressograph Multigraph Corporation
1200 Babbitt Road
Cleveland, Ohio 44117
(Booth No. 238)

Albion Optical Company, Inc.
15 Virginia Avenue — P.O. Box 463
West Nyack, New York 10994
(Booth No. 251)

Alford Manufacturing Company
299 Atlantic Avenue
Boston, Massachusetts 02110
(Booth No. 208)

Altec Lansing
1515 South Manchester Avenue
Anaheim, California 92803
(Booth No. 206)

Amecco, Inc.
P.O. Box 11226 — 2949 West Osborn Rd.
Phoenix, Arizona 85017
(Booth No. 312)

American Electronic Laboratories, Inc.
Richardson Road
Colmar, Pennsylvania 19446
(Booth No. 313)

American Pamcor, Inc.
P.O. Box 1776
Paoli, Pennsylvania 19301
(Booth No. 111)

Ampex Corporation
401 Broadway
Redwood City, California 94063
(Booth No. 108)

Andrew Corporation
P.O. Box 807
Chicago, Illinois 60642
(Booth No. 244)

Arriflex Corporation of America
257 Park Avenue South
New York, New York 10010
(Booth No. 318)

Audio Devices, Inc.
235 East 42nd Street
New York, New York 10017
(Booth No. 232)

Automatic Tape Control, Inc.
1107 East Croxton
Bloomington, Illinois 61702
(Booth No. 201)

Ball Brothers Research Corporation
Boulder Industrial Park
Boulder, Colorado 80301
(Booth No. 214)

Bauer Electronics Corporation
1663 Industrial Road
San Carlos, California 94070
(Booth No. 222)

Beckman & Whitley, Inc.
441 Whisman Road
Mountain View, California 94041
(Booth No. 401)

Borg-Warner Corporation
Ingersoll Products Division
1000 West 120th Street
Chicago, Illinois
(Booth No. 217)

Boston Insulated Wire & Cable Company
65 Bay Street
Boston, Massachusetts 02125
(Booth No. 240)

Broadcast Electronics, Inc.
8800 Brookeville Road
Silver Spring, Maryland 20910
(See Visual Electronics Booth)

CBS Laboratories
227 High Ridge Road
Stamford, Connecticut 06902
(Booth No. 236)

CCA Electronics Corporation
716 Jersey Avenue
Gloucester City, New Jersey 08030
(Booth No. 237)

Century Lighting, Inc.
521 West 43rd Street
New York, New York 10036
(Booth No. 116)

Cleveland Electronics, Inc.
1974 East Sixty-First Street
Cleveland, Ohio 44103
(Booth No. 115)

Cohu Electronics, Inc.
P.O. Box 623
San Diego, California 92112
(Booth No. 311)

Collins Radio Company
Dallas, Texas 75207
(Booth No. 209)

Colortran Industries

1015 Chestnut Street
Burbank, California 91502
(Booth No. 117)

Conrac Division

19217 East Foothill Boulevard
Glendora, California 91740
(Booth No. 107)

Continental Electronics Manufacturing Company

P.O. Box 17040 — 4212 S. Buckner Blvd.
Dallas, Texas 75217
(Booth No. 200)

Cummins Engine Company, Inc.

1000 Fifth Street
Columbus, Indiana 47201
(Booth No. 227)

Dage-Bell Corporation

455 Sheridan Avenue
Michigan City, Indiana 46360
(Booth No. 308)

Dresser-Ideco Company

875 Michigan Avenue
Columbus, Ohio 43215
(Booth No. 205)

Dynair Electronics, Inc.

6360 Federal Boulevard
San Diego, California 92114
(Booth No. 211)

Eastman Kodak Company

343 State Street
Rochester, New York 14650
(Booth No. 231)

Electronics, Missiles & Communications, Inc.

160 East Third Street
Mount Vernon, New York 10550
(Booth No. 323)

Entron, Inc.

2141 Industrial Parkway
Silver Spring, Maryland 20904
(Booth No. 320)

Fairchild Recording Equipment Corp.

10-40 45th Avenue
Long Island City, New York 11101
(Booth No. 314)

Filmline Corporation

43 Erna Street
Milford, Connecticut
(Booth No. 118)

Fort Worth Tower Company, Inc.

5201 Bridge Street — P.O. Box 8597
Fort Worth, Texas 76112
(Booth No. 315)

Gates Radio Company

123 Hampshire Street
Quincy, Illinois 62302
(Booth No. 221)

General Electric Company

Electronics Park, Building 7, Room 311
Syracuse, New York 13201
(Booth No. 102)

The Grass Valley Group, Inc.

P.O. Box 1114
Grass Valley, California 95945
(Booth No. 109)

Hancock Telecontrol

143 Sound Beach Avenue
Old Greenwich, Conn.
(Booth No. 403)

The Harwald Company

1245 Chicago Avenue
Evanston, Illinois 60202
(Booth No. 225)

Hewlett-Packard

1501 Page Mill Rd.
Palo Alto, Calif. 94304
(Booth No. 418)

Houston Fearless Corporation

11801 West Olympic Boulevard
Los Angeles, California 90064
(Booth No. 110)

International Good Music, Inc.

P.O. Box 943
Bellingham, Washington 98225
(Booth No. 224)

Jampro Antenna Company

6939 Power Inn Road
Sacramento, California 95828
(Booth No. 305)

Jerrold Electronics Corporation

15th Street and Lehigh Avenue
Philadelphia, Pennsylvania 19132
(Booth No. 322)

Johnson Electronics, Inc.

P.O. Box 7
Casselberry, Florida 32707
(Booth No. 242)

Kliegl Bros. Universal Electric Stage Lighting Company, Inc.

32-32 48th Avenue
Long Island City, New York 11101
(Booth No. 100)

KRS Instruments

780 S. Arroyo Pkwy.
Pasadena, Calif. 91105
(Booth No. 215)

Lenkurt Electric Company, Inc.

1105 County Road
San Carlos, California 94070
(Booth No. 404)

MaCarTa, Inc.

709 Railroad Avenue
West Des Moines, Iowa 50265
(Booth No. 212)

Marti Electronics

P.O. Box 661 — 105 Poindexter
Cleburne, Texas 76031
(Booth No. 252)

McMartin Industries, Inc.

605 North 13th Street
Omaha, Nebraska 68102
(Booth No. 235)

Melcor Electronics Corp.

1750 New Highway
Farmingdale, L. I., New York
(Booth No. 241)

Memorex Corporation

1180 Shulman Avenue
Santa Clara, California 95052
(Booth No. 319)

Microwave Associates, Inc.

Northwest Industrial Park
Burlington, Massachusetts 01804
(Booth No. 111A)

Midwestern Instruments, Inc.

P.O. Box 1526
Tulsa, Oklahoma 74101
(Booth No. 317)

Minnesota Mining & Manufacturing Co.

2501 Hudson Road
St. Paul, Minnesota 55119
(Booth No. 248)

Miratel Electronics, Inc.

3600 Richardson Street
St. Paul, Minnesota 55112
(Booth No. 219)

Moseley Associates, Inc.

P.O. Box 3192 — 135 Nogal Drive
Santa Barbara, California 93105
(Booth No. 223)

North American Philips Company, Inc.

900 South Columbus Avenue
Mount Vernon, New York 10550
(Booths No. 304, 310)

The Nortronics Company, Inc.

8101 Tenth Avenue North
Minneapolis, Minnesota 55427
(Booth No. 233)

Q-TV, Incorporated

342 West 40th Street
New York, New York 10018
(Booth No. 112)

Quick-Set, Inc.

8121 Central Park
Skokie, Illinois 60078
(Booth No. 309)

Radio Corporation of America

Front and Cooper Streets
Camden, New Jersey 08102
(Booth No. 101)

Raytheon Company

141 Spring Street
Lexington, Massachusetts 02173
(Booth No. 106)

Reeves Soundcraft

15 Great Pasture Road
Danbury, Connecticut 06813
(Booth No. 204)

Rohde and Schwarz Sales Co. (USA), Inc.

111 Lexington Avenue — P.O. Box 148
Passaic, New Jersey 07056
(Booth No. 239)

Rohn Systems, Inc.

P.O. Box 2000
Peoria, Illinois 61601
(Booth No. 229)

Rust Corporation of America

168 Tremont Street
Everett, Massachusetts 02149
(Booth No. 245)

Schafer Electronics

9119 DeSoto Avenue
Chatsworth, California 91311
(Booth No. 210)

Shibaden Corporation of America

58-25 Brooklyn-Queens Expressway
Woodside, New York 11377
(Booth No. 226)

Shure Brothers, Inc.

222 Hartrey Avenue
Evanston, Illinois 60204
(Booth No. 213)

Sony Corporation of America

580 Fifth Avenue
New York, New York 10036
(Booth No. 114)

Sparta Electronic Corporation

6450 Freeport Boulevard
Sacramento, California 95822
(Booth No. 246)

Spencer-Kennedy Labs.

1320 Soldiers Field Rd.
Boston 35, Mass.
(Booth No. 417)

Standard Electronics Corporation

P.O. Box 677
Freehold, New Jersey 07728
(Booth No. 307)

Sunmit Engineering

P.O. Box 98
White Haven, Pa. 18661
(Booth No. 324)

Sylvania Electric Products, Inc.

730 3rd Ave.
New York, N. Y.
(Booth No. 402)

Tapcaster Electronics

P.O. Box 662
Rockville, Maryland 20851
(Booth No. 230)

Sarkes Tarzian, Inc.

East Hillside Drive
Bloomington, Indiana 47401
(Booth No. 104)

Tektronix, Inc.

P.O. Box 500
Beaverton, Oregon 97005
(Booth No. 202)

Telemet Company

185 Dixon Avenue
Amityville, L. I., New York 11701
(Booth No. 247)

Telequip Corporation

224 Glen Cove Avenue
Glen Cove, Long Island, New York
(Booth No. 103)

Telesync Corporation

43 New Street
Englewood Cliffs, New Jersey 07632
(Booth No. 218)

Television Zoomar Company

500 Fifth Avenue — Suite 5520
New York, New York 10036
(Booth No. 105)

Townsend Associates, Inc.

P.O. Box 215
Feeding Hills, Massachusetts
(Booth No. 243)

Trompeter Electronics, Inc.

7238 Eton Ave.
Canoga Park, Calif.
(Booth No. 406)

UPI Audio

220 E. 42nd St.
New York, N. Y., 10017
(Booth No. 249)

U. S. Navy

Department of the Navy
Washington, D. C.
(Booth No. 228)

Utility Tower Company

3200 N. W. 38th Street — P.O. Box 12027
Oklahoma City, Oklahoma 73112
(Booth No. 234)

Varian Associates

611 Hansen Way
Palo Alto, Calif.
(Booths No. 408, 410, 412)

Video Medical Electronics

Time & Life Building
New York 20, N. Y.
(Booth No. 407)

Viking Industries, Inc.

830 Monroe Street
Hoboken, New Jersey 07030
(Booth No. 316)

Visual Electronics Corporation

356 West 40th Street
New York, New York 10018
(Booths No. 301, 302, 303)

Vital Industries

3614 S. W. Archer Road
Gainesville, Florida 32601
(Booth No. 203)

Vitro Electronics

919 Jesup-Blair Drive
Silver Spring, Maryland 20910
(Booth No. 207)

Ward Electronic Industries

1414 East St. George Avenue
Linden, New Jersey
(Booth No. 220)

Westel Company

1777 Borel Place
San Mateo, California
(Booth No. 113)

Wilkinson Electronics, Inc.

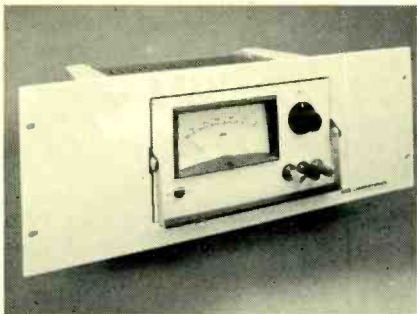
1937 West MacDade Boulevard
Woodlyn, Pennsylvania 19094
(Booth No. 321)

PREVIEW OF NEW PRODUCTS

Audio

CBS Laboratories (Division of Columbia Broadcasting System, Inc.)

New products for 1966 are the Model 600 (shown here), wide-range program monitor, and FM Volumax, automatic peak controller. The Model 600 all-solid-state meter permits measurement of noise and low-level audio on a single scale, even with the program on the line. This meter has a 60db-wide scale and ballistics similar to the standard volume indicator.



The FM Volumax is an instrument designed specifically for the FM, MPX, and TV broadcaster. It is intended to replace conventional limiters and clippers for prevention of FM overmodulation and SCA crosstalk, without distortion.

Other products displayed are the Audimax III automatic level control; the Volumax automatic peak controller, an AM-broadcasting device for audio peak limiting; and Model DDU-1A digital display units.

This year Sparta will introduce the A-20 Audio Console, a completely transistorized unit with eight channels and twenty-two inputs. Rounding out the console line will be the Model RA-5 two-channel, three-input, battery-powered remote amplifier-mixer. Added to the company's tape-cartridge equipment is the solid-state Stereo 600 series.

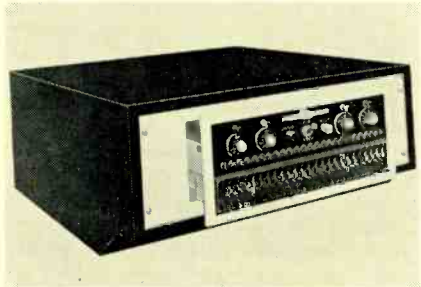
A new line of turntable cabinets and console desk will be shown also.

Sparta will also display the Vega line of products, including their capacitor microphone, Vega-Mike wireless microphone and FM receiver, and the Vega Sound-Servo compressor/limiter.

Automation

Automatic Tape Control, Inc.

New products on display include, first, the ATC Simplex Timer, Model 10. This unit was designed primarily for to-the-second timing of recorded cartridge material; however, it may be used with any recording source capable of remote start/stop operation. The timer has controls for remote machine control—record set, start, stop, secondary and auxiliary tones—and an easily reset timer.



Next is the ATC Card-O-Matic punched-card system for automation control. In its operation, up to 500 IBM-type cards, each representing a program element, are placed in a card-reading device. The card-reader then programs the system from the information punched on the card. As the system plays, the program log is automatically typed with all information for FCC-approved, automatic logging. The punched cards may be used in existing IBM accounting systems if desired.

Completing the trio of new products, ATC will show the Simplex Programmer, Model 100 (in photo). Thumb-wheel switches enable the operators to control up to five program sources in any random combination of up to 24 plays without repetition of the sequence. Also, any one of up to four separate sources may be inserted into the play sequence on a timed basis by selector knob operation.

Other items to be featured include a full line of Criterion cartridge tape equipment and a complete line of automation equipment. ATC informational and instructional literature also will be on hand.

A special demonstration will be made of a simplified traffic and logging proced-

ure through the use of the Acme Visible Record and Xerox reproduction systems.

Chrono-log Corp.

The STEP system for TV station-break automation will be shown operating a Riker Industries solid-state switcher with automation of transitions and preset monitors. The demonstration will be held at the Riker Industries booth.

International Good Music, Inc.

The "Actan" memory drum switcher will be unveiled as an optional feature of the audio control equipment. The plug-in unit increases the normal capacity of the IGM Series 500 control from two music channels to as many as eight, and provides sequential control in up to sixty different steps.

The equipment display will include a Model 510-4 IGM control unit with both standard and Actan switch units, stereo transports for music, 24-cartridge carousel, time announcer, program logger, and network switcher. Also exhibited will be a new Model 620-5 IGM audio control with three music transports, carousel, and cartridge playback unit.

Audition facilities are being included for demonstrations of IGM's taped music services. Sample tapes on three machines will enable customers quickly and privately to audition the range of music services available.



Rust Corp.

The spotlight at the Rust exhibit will be on the company's automatic transmitter logging systems for TV, AM, and/or FM broadcast installations. Augmenting the Autolog systems will be the new series of AP alarm panels such as the one above, for continuous supervisory monitoring of parameters. This series includes expanded-scale upper- and lower-limit power, and current alarm units, plus frequency-alarm circuits for almost every type of frequency monitor. The alarm-unit series is completed with the BCR-11 system, designed to monitor di-

rectional-array base current ratios, which will be in actual operation in conjunction with a demonstration of the Vitro remote phase monitor. A "Dial-Operated Monitor Switching" system also will be in operation.

For stations presently possessing Rust remote-control systems, the "Cost Saver" attachment will be shown. In addition, Rust will display its full line of remote-control equipment and samplers for all types of stations, including directional AM and UHF-TV. A representative display of FM stereo transmitters will complete the exhibit.

Components and Materials

Andrew Corp.

The heatless automatic dehydrator, Type 1920A, will be shown. Specifications of this unit are: dewpoint of output below -37° F, capacity of 75,000' of $\frac{7}{8}$ " line, 20,000' of $1\frac{1}{8}$ " line, and 5,000' of $3\frac{1}{8}$ " line. Also to be displayed are Heliex, flexible coaxial cables for AM, FM, and TV; coaxial transfer switches for UHF and VHF; and antenna positioners for STL systems. Andrew's new catalog 24 will be available, consisting of 104 pages of product and technical information on antennas and associated equipment, flexible and rigid coaxial transmission lines.

Dresser-Ideco Co.

This display will feature information on many styles of towers in heights ranging up to 2,000'. These will include self-supporting towers with Candelabra® tops. Personnel will be available to discuss design engineering problems, maintenance programs, tower locations, soil investigations, and construction programs.

Rohn Systems, Inc.

Featured this year, but not physically exhibited, will be the new Rohn line of angle towers, which was actually introduced at last year's show. This line of angular towers is currently being manufactured in 36" and 48" face sizes, known as Type 36 and Type 48 tower models, and is basically used in the microwave field.

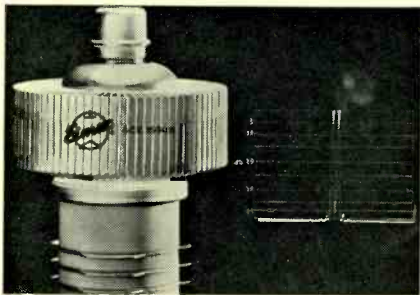
Literature handouts will be the new catalog comprised of all descriptive sheets

and line folders concerning Rohn products.

The company will sponsor a hospitality room in its own suite of rooms.

Utility Tower Co.

Making their debut will be the No. 4800 leg-splice insulator and an AM tower-sectionalizing insulator. Other hardware to be featured includes all types of Utility towers for AM, FM, microwave, TV, CATV, and two-way communications; Microflexor solid-face microwave reflector; and Utility base insulators for AM towers.



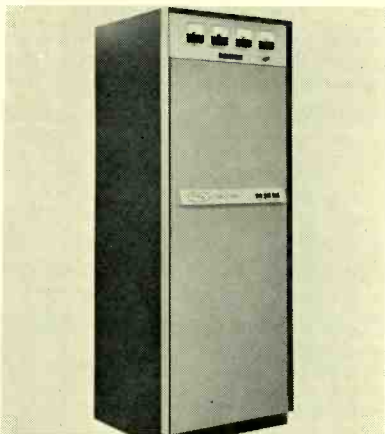
Varian Associates

Broadcast products from Varian and from its new Eimac Division (formerly Eithel-McCullough, Inc.) include the Eimac 4CX1500B tetrode, Eimac and Varian brand power klystrons for UHF-TV broadcast service, and vapor-phase cooled tubes.

The 4CX1500B is of ceramic-metal construction (see photo) and is intended for use in single-sideband transmitters where low-intermodulation-distortion characteristics are required to avoid channel-to-channel interference. This radial-beam tetrode has a maximum plate dissipation rating of 1500 watts and a control-grid dissipation rating of 1 watt maximum. Because the tube has a low grid-interception figure (typically less than 1.5 ma grid current), it may be driven positive without adverse effects on the intermodulation level.

Also on display will be the 5-500A, a 500-watt power-grid tube; the 5CX-1500A, a power-amplifier pentode rated at 1500 watts plate dissipation and intended for the 1000-to-1500 watt PEP range; and the 4CV100,000C, a vapor-cooled power-grid tube with an output level of 100 to 200 kw.

Radio



American Electronics Laboratories, Inc.

AEL's prototype fully solid-state CATV amplifiers will be unveiled. Also to be shown are two transmitters, the AM-IKA and FM-IKA. Occupying less than 7 square feet of floor space, the AM transmitter features a built-in load and power cutback. The FM transmitter, which is illustrated above, requires less than 5 square feet of floor space; it requires no neutralization and has less than 1% distortion, grounded-grid PA, and ceramic tubes. Both transmitters are designed for remote control and feature automatic recycle, running-time meter, one-button operation, and complete accessibility.



Bauer Electronics Corp.

A new 7500/5000-watt FM transmitter, Model 605 (in the photo) will be in-

roduced. Selling price of this transmitter will be \$10,500. Audio equipment will include: Model 910D dual-channel audio console (\$1450, \$1150 in kit form); Model 910S, new stereo version of the Model 910 exhibited last year (\$1950, \$1550 in kit form); Model 912 audio console, with 5 mixing positions and 17 inputs (to be priced under \$800); and the Model 912S stereo console with 5 mixing channels and 17 stereo inputs (to be priced under \$1000). The Model 440B "Log Alarm" automatic transmitter logging system will be shown in brand new packaging.

Belar Electronics Laboratory

Three new products will be introduced by Belar; these comprise a building-block system to enable the FM broadcaster to expand to stereo and SCA broadcasting without having to discard his monitor. Starting with the FMM-1 FM frequency and modulation monitor, he monitors both subcarrier frequency deviation and subchannel modulation in addition to measuring subchannel injection and cross-



talk. Adding the FMS-1 stereo monitor, he monitors pilot injection and the individual channel modulation in addition to channel separation, cross-talk, noise, distortion, and pilot phase.

Collins Radio Co.

New and featured equipment will be a custom audio installation, speech input consoles, an AM transmitter, and an FM stereo modulation monitor.

Collins' new 212S-1 solid-state stereo console features photoconductive control. The unit handles five dual stereo inputs from local sources plus one of four remote stereo inputs or one network stereo input. The 212M-1 speech input console



is the monaural equivalent of the 212S-1.

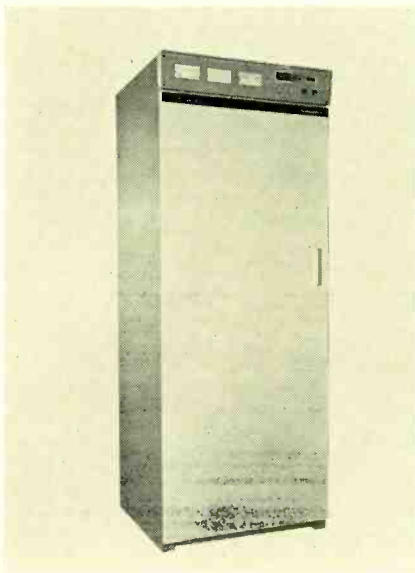
The 820E/F-1 AM transmitter for 5-10kw operation features solid-state devices in low-level audio and driver, power-supply, and RF-exciter circuits. The exciter has a highly stable ovenless crystal operating in the 2.1-to-4.3mc range, with division to standard broadcast frequency by thin-film components.

Pictured is the fully transistorized 900C-1 stereo modulation monitor, which measures and monitors FM stereo-multiplex programming according to FCC standards.

Also to be shown are the Collins 20V-3 1-kw AM transmitter, 830D-1A 1-kw FM transmitter, 830F-1A 10kw FM transmitter, and the 81M single-cabinet phasor.

Gates Radio Co.

Equipment to be introduced includes



the Vanguard II 1-kw, 1-tube AM transmitter (illustrated), the Stereo Statesman audio console, and the Producer and Diplomat production centers.

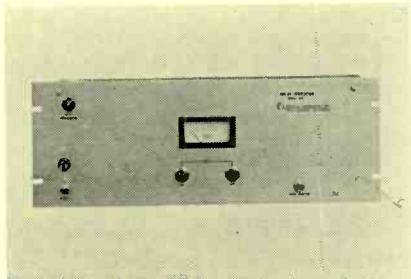
Also on display will be a complete line of transmitting equipment including a 50-kw AM transmitter, a 5-kw AM transmitter, and the Vanguard I. FM transmitters include the 1-kw FM-1G, 3-kw FM-3G, 5-kw FM-5G, 10-kw FM-10G and 20-kw FM-20G. A complete line of Solid Statesman consoles will be shown in addition to four completely transistorized remote amplifiers: four-channel Dynamote 70, three-channel Attache 70, two-channel Courier 70 and single-channel Unimote 70. Cartritape II tape-cartridge recording equipment will also be displayed.

McMartin Industries, Inc.

Three demonstrations are planned, featuring the TBM-4500 FM-stereo monitor, the TBM-3500A main-channel monitor, and the TBM-4000A main-channel and SCA-multiplex monitor. All three monitors are fully transistorized.

The TBM-4500 will be fully demonstrated under field conditions by using an FM-Stereo generator. Demonstrations of the TBM-3500A and the TBM-4000A will feature the operation of monitors without tuned circuits.

Another feature in the display will be the first public showing of McMartin's newly styled and colored equipment. In addition to the demonstrations, the full line of broadcast and SCA-multiplex equipment will be exhibited.



Moseley Associates, Inc.

Above is Moseley's new Model RFA-1

solid-state RF amplifier, designed to drive remotely located AM modulation and frequency monitors. A ceramic filter is used to provide wide bandpass with high selectivity. Tuning is not critical, and complete proof-of-performance measurements can be made using the RFA-1. A ferrite-core antenna is available.

Another item on exhibit is the Model PBR-21, completely silicon-solid-state transmitter remote-control unit for AM, FM, and TV. This model does not require a DC path; it needs only a voice quality line or STL circuit. The unit features push-button control, 21 telemetering channels, and 42 control functions. Model WRC-10T, newly introduced 10-channel, solid-state remote control system, requires only one DC pair for operation.

Also on display will be the Model RPL-1 remote-pickup system; Model LPE-10 10w direct FM exciter; Model SGG-3 stereo generator; and Model PCL-2B 950-mc STL, which handles an audio program channel, subcarriers, and remote-control signals.



Vitro Electronics

A new Nems-Clarke solid-state field-intensity meter, designated the FIM-135, will be introduced this year. Accuracy in this unit is improved by a factor of two over the previous tube types. A taut-band meter movement is employed to eliminate "meter-face tapping." The FIM-135 employs optional crystal operation eliminating the need for tuning, but not eliminating the tuning capability. Other features are dial locks that end the require-

ment of recalibration for each reading taken, a front-panel speaker (just below the meter), and mercury-battery power giving a longer, more linear battery-life curve, and reducing the weight.

Vitro will also introduce its new line of stainless-steel jacks and plugs.

In addition to the new products, phase monitors for directional antenna systems, HF and VHF field-intensity meters, spectrum display monitors, and FM re-broadcast receivers will be featured.



Wilkinson Electronics, Inc.

Highlight of the Wilkinson display will be this solid-state field-intensity meter, TM-1A. The unit weighs less than 12 lbs, including batteries which are chargeable from 110 volts AC or 12 volts DC. It features a free-running receiver and a passive, attenuated, calibrated oscillator. The oscillator can be used separately as a standard signal generator at frequencies from 535 to 1,605 kc.

Other items to be featured are the AM frequency monitor, AM modulation monitor, stereo generator, FM exciter, limiting amplifier, and silicon rectifier replacements for mercury-vapor tubes.

Recording

Broadcast Electronics, Inc.

On display will be improved versions of the Spotmaster Super B and series 400A tape-cartridge recording and reproducing systems as well as a second-

generation version of the Spotmaster Ten Spot multicartridge reproducing equipment designed for use in automated and semi-automated broadcasting. Also featured will be an all-solid-state audio-distribution amplifier designed for individually controlled distribution of program material to multiple points with 60 db isolation between channels, and a new solid-state, compact remote amplifier.

Other equipment on display will be the completely self-contained, battery-operated Spotmaster PortaPak I, the TP1A tape-cartridge winder, three versions of tape-cartridge storage racks, the TT20A NAB equalized turntable preamplifier, and a number of accessory items in support of cartridge tape systems.

Television



Ampex Corp.

Ampex brings to the NAB Show a new VR-1200 high-band color videotape recorder for broadcast use, along with its VR-1000 HB high-band color videotape recorder. Also on exhibit will be the AG-300 solid-state professional audio recorder/reproducer. Other equipment featured by Ampex includes:

Two VR-2000 high-band videotape recorders for broadcast use.

VR-1100 videotape recorder for broadcast use.

322V studio vidicon camera.

321 and 323 closed-circuit vidicon cameras.

VR-660B videotape recorder and Videtrainer for closed-circuit use.

VR-7000 videotape recorder and Videtrainer for closed-circuit use.

AG-350 solid-state professional audio

recorder/reproducer for studio and broadcast use.

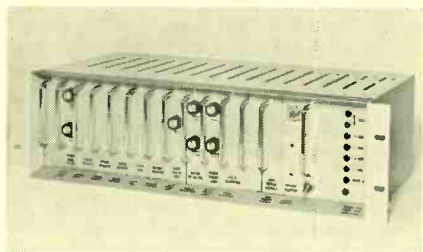
AG-100 Cue-Matic recorder/reproducer for broadcast use.

AV-770 portable audio recorder/reproducer.

Audio and video accessories.

Also in the Ampex booth will be an extensive display of Marconi equipment, which Ampex markets in the United States. Shown here is the highlight of the display, the Mark VII four-Plumbicon color television camera. Also new from Marconi are the Mark V picture and waveform monitor, type B3901; grating and dot generator, type B4106; and special-effects equipment, type B3740.

Mort Fujii of Ampex will present a technical paper, "A New Concept for Short Duration Audio Recording and Reproduction," on Tuesday, March 29. On Wednesday, Charles H. Coleman will present "Techniques for Multiple-Generation Color Video Tapes."



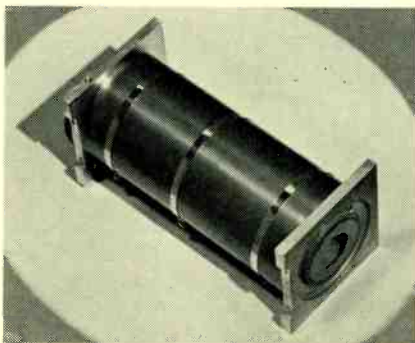
Ball Brothers Research Corp.

The new Mark VIII AGC video amplifier (above) and the Mark IX video pulse distribution amplifier will be featured. The Mark VIII provides continuous monitoring of video signals from a variety of originating equipment. This solid-state unit automatically adjusts video gain and setup and is ideally suited to follow film chains and live cameras or network originations.

In addition to AGC action, the Mark VIII stabilizes low-frequency disturbances and noise at the input terminals. Extraneous 60-cps hum is attenuated by at least 30 db. When desired, the input video signal may be routed directly to the output terminals by means of a relay and remote by-pass switch.

Also on display will be the Mark VI-A and VI-AR special effects generators and

the Mark VII color special effects generator.



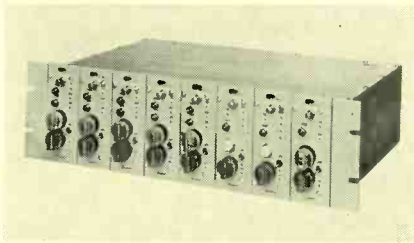
Cleveland Electronics, Inc.

Cleveland Electronics will bring to the convention its complete line of vidicon, image-orthicon, and Plumbicon® deflection components. The photograph shows the new Plumbicon® deflection assembly for use in color applications. This assembly, affording adjustments needed in color use, is designed to operate with the presently available tube manufactured by North American Philips Co.

Included in the exhibit from the EDI Division is a line of transformers representative of Cleveland's capabilities as related to the broadcast-transmitter industry. Products will include a plate transformer used in a 50-kw transmitter and other related devices.

Conrac (Division of
Giannini Controls Corp.)

Conrac Division of Giannini Controls will have a working demonstration of professional monochrome and color monitors, including their transistorized monochrome monitors. New products from Giannini will be on display.



Dynair Electronics, Inc.

Newly introduced items are: Model

AG-7394A AGC Amplifier, a solid-state plug-in module with self-contained electronically regulated power supply; Model DA-5864A video distribution amplifier, a solid-state modular unit providing four 75-ohm source-terminated video outputs from one high-impedance looping video and looping sync input; Models PD-5841A and PD-5843A pulse distribution amplifiers, regenerative pulse distribution amplifiers with self-contained electronically regulated power supply; Model SA-5842A sync adder, a solid-state, modular unit mounted in FR-5800A module frame with Dynair series video distribution amplifiers. Also new are the Model SD-7393A sync delay amplifier and the Model TS-100A television sideband analyzer. The illustration shows, left to right, five DA-5864A's, two PD5841A's, and one SA-5842A mounted in an FR-5800A frame assembly.

Established products include: Model DA-30C self-contained video distribution amplifier, Model DA-60C self-contained video distribution amplifier, Model PD-81C self-contained pulse distribution amplifier, Model TX-1B closed-circuit television transmitter, Model TX-4A solid-state closed-circuit television modulator, Model RX-4A solid-state television tuner, and Model BU-1029A balanced universal amplifier.

The 1966 catalog and price list will be available at no charge.

Entron, Inc.

Solid-state CATV equipment will be featured. New products include an in-a-line all band solid-state terminating distribution amplifier with a regulated power supply, an in-a-line multiple-tap directional coupler with variable attenuation, and an in-a-line solid-state repeater amplifier with automatic level control.

Complete product literature will be available, together with a company brochure which describes the principles of a CATV system and defines the services Entron affords.

Hewlett-Packard

A new television-waveform oscilloscope, Model 191A, will be on display. This oscilloscope is designed to provide

more accurate measurements of vertical-interval test signals than were possible previously.

T/2, T, and 2T sine-squared test pulses, widely used to test TV transmission facilities, are brief and infrequent. The Model 191A is equipped with a high-brightness CRT to display these signals full screen. Aside from the CRT, the instrument is fully solid-state.



Other features and specifications include 1% vertical accuracy for most measurements, 1% stability for all operations, a field-select switch, and an automatic discrete line select of lines 16 through 21 for rapid VIT measurements. The vertical amplifier has five response positions for measuring TV test waveforms. The low-pass position was designed for a sharp notch at 500 kc. In the flat position, the vertical amplifier is flat within 0.05 db from 100 cps to 1 mc, monotonically decreasing to -0.10 ± 0.05 db at 4.5 mc, -3 db at 10.5 mc, and more than -20 db at 20 mc. The oscilloscope is priced at \$1295.

Jerrold Electronics Corp.

On display will be the 440 Series solid-state microwave equipment, employing a solid-state crystal-controlled local oscillator that eliminates the receiver klystron and AFC circuitry; the Channel Commander, a unitized head-end that controls the signals so that adjacent channels on both high and low bands can be fed to a distribution system; and the Starline solid-state, all-band distribution equipment.

Literature and price lists covering the Jerrold CATV line of more than 500 items will be distributed at the show. The company will have a hospitality suite. Entertainment will be provided by Don Allen, magician.



North American Philips Co., Inc.

A live-studio exhibit will feature Norelco's latest three-Plumbicon® color camera chain, the PC-70 (shown in the illustration). The PM-50 monochrome and PC-60 color models introduced last year will also be demonstrated.

The new color camera has a much smaller console and completely transistorized circuitry. Its ability to deal with variations in flesh tones and shadows will be illustrated through color monitors with live models. Model PC-70 features zoom optics, prism beam split, printed circuit cards in modular construction, and transistor circuitry. The camera control unit, 15¾" high, mounts in a standard 19" rack.

Two lenses are available: type 10x18J (equivalent focal-length range 1.4 to 14") for normal studio use and type 12x50A (equivalent focal length range 4 to 48") for long focal-length pickup.



Radio Corporation of America

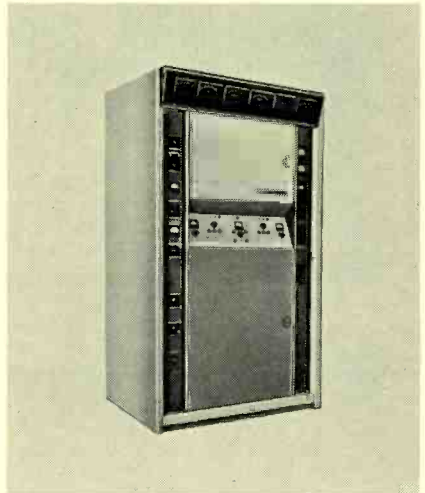
Complete color TV studio systems and a display of color originating equipment

will highlight the RCA exhibit. With "matched" color broadcast apparatus as the theme of the exhibit, the central attraction will be the new TK-42 camera shown in the accompanying photograph.

Supporting the TK-42 camera demonstrations will be operating exhibits of the RCA four-tube color-film system, the TK-27, and several operating units in the television tape line, all colorized.

Also featured will be a complete studio control system, keyed by RCA's styled console, including switching, special effects, and automated control.

In the transmitter display area, new and higher-powered transmitters for VHF, UHF, and FM service will be shown.



Standard Electronics Corp.

Standard will be showing the first production model of its new Solid-State TV transmitter. The company also expects to exhibit a visual amplifier rated 25kw singly and 35kw or 50 kw when used in pairs. The display will include a part of the line of FM transmitters along with a few items of associated equipment for FM and TV.

Standard will welcome its customers and friends to its suite every evening.

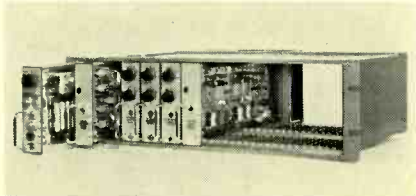
Television Zoomar Co.

To be introduced this year is the Zoomar Lens, Model 10X40C. This unit is 11" long, weighs 11½ lbs, has a

zoom ratio of 10 to 1, and provides zoom range of 40-400mm (1.6 - 16"). Minimum focusing distance is 5'.

Also featured will be the Autocam remote-control system, which allows one operator to control one to four TV cameras. Pan, tilt, focus, and zoom can all be preset. There will be demonstrations of Autocam-controlled cameras at WFLD, Chicago.

Mr. Pierre Angenieux, inventor of the 10-to-1 zoom ratio for zoom lenses and director of Est. Pierre Angenieux will attend the NAB Show for the first time.



Ward Electronic Industries

Having their premiere showings will be a solid-state audio distributor amplifier (\$325), a solid-state color phase equalizer (\$3450), a solid-state demodulator (\$3750), a solid-state audio preamplifier, a solid-state audio monitor amplifier, and a solid-state audio program amplifier. Vertical-interval switching systems and a master-control/station-break switching system will be featured.

The AA-601 solid-state audio distribution amplifier is analogous to a video distribution amplifier—one input and a number of identical high-level outputs, highly isolated, balanced or unbalanced. Each module provides up to 6 outputs (60 in a 5¼" frame) at +24 dbm, 600-ohm balanced. The modules plug into connector assemblies at the rear of the rack frame. These assemblies determine the input-output configuration and contain all the connection terminals needed.

The TA-860 color-phase equalizer system (illustrated) is designed to pre-compensate television transmitters for video-signal phase errors introduced by the transmitter, vestigial sideband filter, notch diplexer, and receiver. The specified overall frequency response of the equalizer system, including the video low-pass filter is ± 5 db, 10cps to 4.0 mc; -1.0 db max at 4.2mc; -20 db min at 4.75mc; and more than 20db down above 4.75mc.



Visual Electronics Corp.

To be introduced this year are the Norelco PC-70 color camera (described previously under the North American Philips listing), the Visual/Allen Model V/A 100G master color video tape recorder, the English Electric Valve ELCON color tubes, Visual video switching systems, McCurdy SS2400 and SS2600 portable consoles, and Spotmaster spot-cartridge equipment.

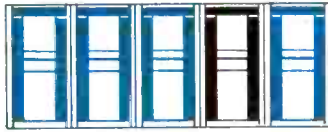
Also new are the Visual AM and FM transmitters. The AM-5K-A 5000-watt transmitter has a modulator capable of continuously handling positive peaks of 120%. The power amplifier is capable of 6000 watts output with a plate-dissipation safety factor of 100%.

The FM-20-K-B FM transmitter has grounded-grid final and driver stages. The power is adjustable by a single knob from 600 to 20,000 watts. The FM-250-A 250-watt FM transmitter is 47" high and contains space for a stereo generator. Completing the trio of new FM units is the DFM-10-A 10-watt, solid-state direct FM exciter.

A variety of other equipment, both new and previously shown, will be in the Visual exhibit, including the Mark 10 zoom image-orthicon camera shown here.

Visual Electronics will again sponsor its Post-NAB Technical Seminar at the close of the convention. Visual's hospitality suite will be open to all attending the NAB Show. ▲

PICK ANY VHF-UHF* POWER COMBINATION



...BUILD IT—EASIER, MORE ECONOMICALLY—



with
SE
UNIQUE
NEW
ADD-
A-
UNIT!

* UHF Now Available in AIR COOLED High Power Combinations.

Now, thanks to SE's advanced transistorized design, you can build almost any power level and aural/visual power ratio that you need to meet the new FCC ruling and your pocketbook.

COMBINE THEM ANY WAY YOU WISH . . . The only "building blocks" you need are a transistorized driver and one or more SE amplifiers. These highly compatible units can be grouped in countless combinations to give you aural/visual power combinations varying from 10% to 50%; at any power output level.

SE AMPLIFIERS COMPLETELY SELF-CONTAINED . . . All SE amplifiers are identical regardless of their output power . . . and each is completely self-contained in a newly designed unit that includes power supply, cavity, blower, control circuits, metering, etc.

SIMPLY ADD AMPLIFIERS TO BOOST POWER . . . Thus, whenever you wish to add to your present transmitter, regardless of make, or change your aural/visual power ratio, you simply add to or change your amplifier combination.

SAVINGS UP TO 50% . . . Best news of all . . . SE amplifiers are compatible with any driver/transmitter. Savings to you can be as much as 50% in equipment costs! Like more details? Drop us a line.

SE ADD-A-UNIT CAN SOLVE YOUR FM PROBLEMS, TOO! Ask us about our quality line of FM Multiplex Transmitters, Amplifiers and Multiplex Exciters. They'll help you put more punch in your signal!

Visit us at NAB, Booth #307, next to Visual Electronics.



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Representatives in Albuquerque, Birmingham, Chicago, Jacksonville, Minneapolis, New York, San Francisco and Washington, D. C.

Circle Item 26 on Tech Data Card

Yes, we have no ^{blue} bananas

TELEMET COLOR EQUIPMENT does its part to keep yellow bananas yellow. Although color definitely adds an important dimension to TV viewing, it also places an additional burden of responsibility on the broadcaster. Station equipment becomes more complex—and the subjective picture effects of even minor deviations in equipment performance can be most severe.

These requirements for reliability and top color performance are met with this precision TELEMET color equipment:

3514A1 COLOR STANDARD features proportional oven-controlled 3.58 Mc crystal oscillator with full binary division. Filtered 31.5KC output.

3516A1 COLOR SUBCARRIER REGENERATOR regenerates 3.58 Mc for switcher or color sync lock operation. Phase locks to back porch burst of external 3.58 Mc within ± 1 degree.

3518A1 COLOR BAR GENERATOR computer circuitry generates accurate RGB drives for the encoder. Split field or full field bars or I, White and Q signals.

3507C1 EIA SYNC GENERATOR provides accurate jitter-free timing from external color lock.

3512A1 DOT GRATING GENERATOR permits extremely accurate convergence of color monitors. Dot and line widths in the order of $.1\mu\text{sec}$. Both dots and grating available simultaneously.

3248A1 SUBCARRIER DISTRIBUTION AMPLIFIER for multiple distribution of 3.58 Mc; input bridging or terminated, with three identical isolated outputs and built-in 360 degree phase shifter.

Don't gamble with color equipment. Call TELEMET today for full information and assistance. No obligation, of course.



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Circle Item 28 on Tech Data Card

BOYNTON HAS IT!



THE NEW SYNCRON AU-7a CONDENSER MICROPHONE

FOR PREMIUM SOUND PICKUP
AT A FRACTION OF USUAL COST!

At last! An American made quality condenser microphone in a self-contained 9 $\frac{3}{4}$ " unit that is reshaping the recording industry.

Now . . . P. A. engineers, broadcasters, studios and audiophiles can utilize the full potentials of "condenser" sound without the bulk and expense of conventional condenser mikes.

Connect the cable and it's ready to go. Over 2500 hours transistor battery life with low cost mercury cells.

Frequency range: ± 3 db 40-20,000. Directional characteristics: cardioid, with front to back ratio of better than 20 db.

Output level: -50 db. Distortion: less than 0.5%. Rugged diaphragm provides broad, smooth frequency response with total absence of annoying peaks. Maximum sensitivity, outstanding clarity of sound. **PRICE \$169.50**

ONLY SYNCRON MAKES IT. ONLY BOYNTON SELLS IT.



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295 Main St., Tuckahoe, N.Y. 10707 Tel. (914) SP 9-5278

SOLE DISTRIBUTOR FOR

SYNCRON AU-7a CONDENSER MICROPHONE

Dealerships available

Circle Item 29 on Tech Data Card

Tax Credits

(Continued from page 50)

advantage of credits to which they were entitled. The base upon which the 7% tax credit is computed depends upon the useful life of purchased equipment. There is no tax credit on purchased equipment with a useful life of less than 4 years.

Equipment with a useful life of 4 to 6 years is subject to the 7% tax credit on 33 $\frac{1}{3}$ percent of cost; cost includes both freight and installation of equipment. Assuming that equipment with a projected useful life of 4 to 6 years costs \$9,000, the tax credit is figured on \$3,000, or $\frac{1}{3}$ of \$9,000, and the tax credit amounts to \$210. Equipment with an estimated useful life of 6 to 8 years qualifies for the 7% tax credit on 66 $\frac{2}{3}$ percent of cost. A firm purchases a truck for \$6,000, intending to use it for 7 years. Here the 7% tax credit is computed on \$4,000, or $\frac{2}{3}$ of the \$6,000 paid, yielding \$280 tax credit. Equipment with a useful life of more than 8 years qualifies for the tax credit on 100 percent of cost.

Do the same rules apply on purchases of new, used or rebuilt equipment? Yes, with the exception that the tax credit on used equipment is limited to purchases up to but not exceeding \$50,000. Rebuilt equipment is classified as used equipment. No limit has been set on the amount of new equipment that may qualify for tax credit.

Assuming that your tax liability on business income is \$9,000, and that you paid \$20,000 for equipment qualifying for the 7% tax credit, you would deduct the \$1,400 credit by attaching Form 3468 to your income-tax report.

The investment tax credit you may deduct in one year is limited by the amount of your tax liability. Obviously, it is not possible to deduct more tax credit than the total tax liability as shown on your tax report. Assuming that you file a tax report showing \$10,000 tax due on business income, and you have investment tax credits totaling \$11,000, the excess credit of \$1,000 is carried forward to be deducted the following year. If there is no profit the following year, the credit

may be carried forward up to five years from the year the credit was due.

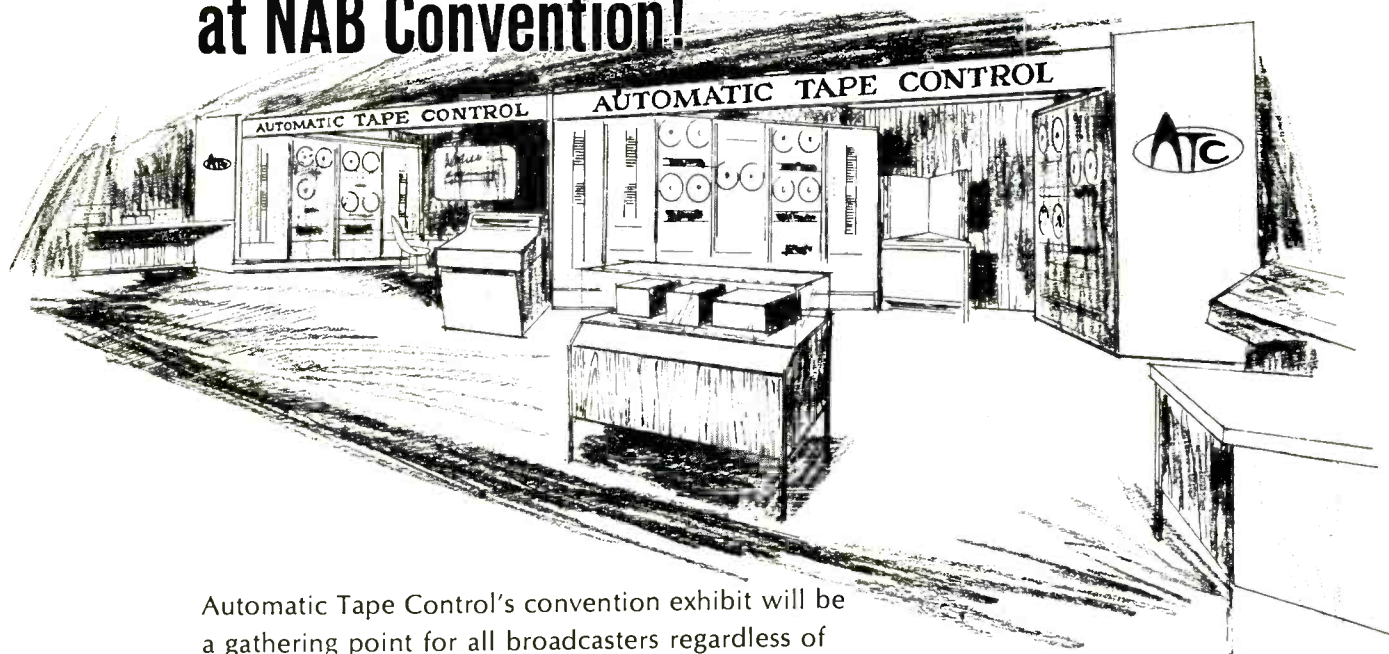
The regulations also state that if you report income-tax liability in excess of \$25,000, you are permitted to deduct only \$25,000 tax credit, plus 25 percent of the income tax liability that exceeds \$25,000. If your report shows \$49,000 tax due on business income, the tax credit you may deduct is limited to \$25,000, plus 25 percent of \$24,000, resulting in an allowable deduction of \$31,000.

It is also important to know the rule regarding recapture of tax credits, and how this rule is applied. Assuming that a piece of equipment was purchased for \$20,000 and that the 7% tax credit was claimed on the basis of useful life of more than 8 years, if the equipment was then sold after having been in use less than 4 years, the tax credit would be disallowed. You would be required to add \$1,400 to your tax payment on the report submitted after the equipment was sold.

If you used the equipment only 7 years before it was sold, the recapture rule provides that you must recompute the tax credit. Based on a useful life of 6 to 8 years, the tax credit would be computed on $\frac{2}{3}$ of the original cost, reducing the tax credit from \$1,400 to \$933.34. The difference, \$466.66, is added to your tax liability in the year it was sold.

Investment tax credit for a partnership is divided among the partners according to the percentage of profit each partner receives from the business. For example, Brown and Jones operate a business as partners, and their partnership agreement specifies that Brown, the active partner, is to receive 70 percent of the business profits, while Jones is to receive 30 percent. Since each partner is required to file a report on his income from the business, the 70-30 ratio applies to the tax credit on equipment purchased for the business. The partnership business earns a profit of \$20,000 for the year, \$14,000 for Brown and \$6,000 for Jones. The tax credit on equipment purchased totals \$2,000. Therefore, Brown is entitled to deduct \$1,400 from his income tax, while Jones can take credit for \$600. ▲

National attention on automatic broadcasting will center in Booth 201 at NAB Convention!



Automatic Tape Control's convention exhibit will be a gathering point for all broadcasters regardless of station size. Here will be demonstrated all the ATC equipment that provides broadcasters with an almost unlimited flexibility in station automation.

In operation will be:

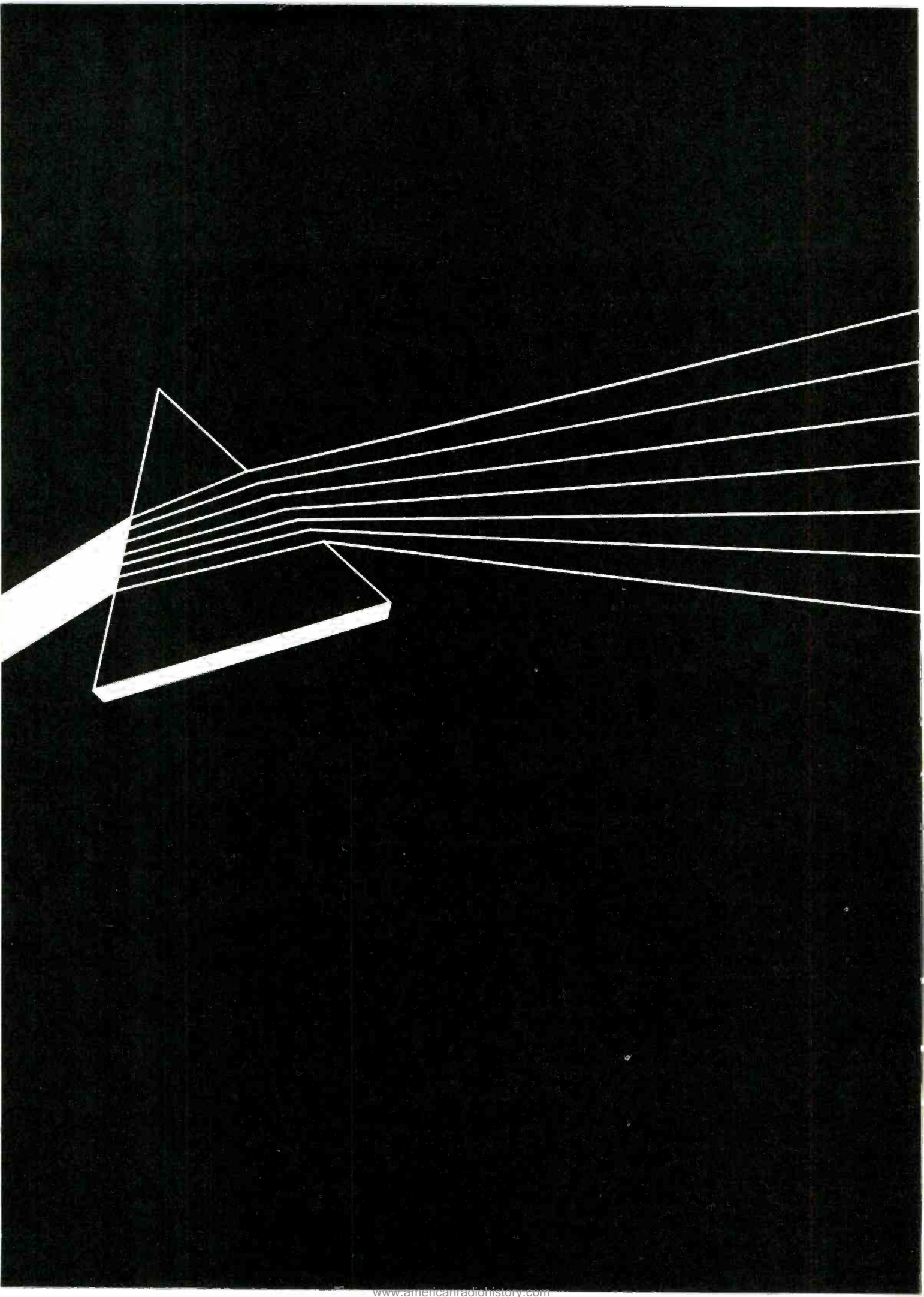
- Punch card automation programmer and logger.
- Tape memory automation programmer and logger.
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- Standard Criterion tape cartridge equipment.
- ATC-55 multiple cartridge handler.
- The unique ATC automatic program logging equipment.
- Remote control panel which automatically indicates elapsed time in production recording.
- New efficient method of traffic control and program schedule preparation.

We extend a warm welcome to all broadcasters to visit Booth 201.

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Circle Item 31 on Tech Data Card



COLOR TV TAKES A GIANT LEAP FORWARD WITH THE REVOLUTIONARY NEW...



Polychrome Camera

Sarkes Tarzian, Inc. brought a fresh outlook to the problems of color television. We were free to explore all possibilities. We had no commitment—economical or philosophical—to an existing system, with its inherent faults.

We had no hesitation to innovate, where innovation was called for. Likewise, where we found a proven concept, we adopted it.

Results? The revolutionary, full-color Polychrome Camera system—the only color system offering a choice of tubes.

Here is color television previously unknown. Here is color performance to still the remaining skeptics. Here is rare purity of color . . . rigid stability . . . delicate detail.

And while our engineers were at it, they designed out heaviness and awkward appearance—giving the Polychrome Camera a trim, eye-pleasing silhouette in a unique magnesium housing. Like its monochrome predecessors, Tarzian's Polychrome Camera systems feature 100% transistorized circuitry.

The first Polychrome Camera systems are scheduled for June delivery.



Symbol of Excellence in Electronics

Circle Item 32 on Tech Data Card

Tower Marking

(Continued from page 28)

Surface Orange Paint, (b) Federal Specification TT-E-489, Aviation Surface Orange Enamel, (c) Federal Specification TT-P-102, Outside White Paint.

The FAA booklet also lists recommended lamp equipment. For code beacons, it lists the 500-watt PS40, with 1000-hour life, and the 620-watt PS40, with 3000-hour life. For obstruction lights, it lists the A21 lamp, with 2000-hour life; it is available in 100-, 107-, and 116-watt versions.

The number and spacing of lights required for towers are given as "A" specifications. ("B" specifications cover trees, "C" specifications cover electrical transmission lines, "D" specifications cover smokestacks, etc.) Generally, the taller the tower, the more lights are required. For instance, a tower between 150 and 300' in height requires a flashing code beacon at the top and a pair of obstruction lights at the midpoint

of the tower. A tower between 300 and 450' requires a code beacon on top and obstruction lights at the one-third and two-third levels. Taller towers continue this pattern.

Finally, the FAA booklet contains drawings to illustrate the exact methods of painting and lighting.

FCC Rules

Section 303(q) of the Communications Act of 1934 and Paragraph 17.1(a) of the FCC Rules and Regulations both note that the FCC has the "... authority to require the painting and/or illumination of radio towers if and when in its judgment such towers constitute, or there is a reasonable possibility that they may constitute, a menace to air navigation." Part 17 of the FCC Rules contains the pertinent regulations governing construction, marking, and lighting of towers.

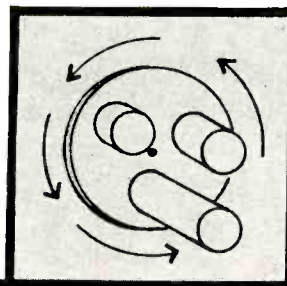
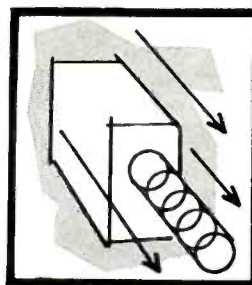
In general, FCC antenna regulations parallel FAA regulations. When a broadcast station is under construction, Part 17 should be read carefully to determine what regula-

tions will apply. Unless the proposed tower is located near an airport or a landing approach area, if it is under 170' or does not increase the height of natural formations or manmade structures *other* than existing antenna structures, it will not require special aeronautical study. A tower 500' or over will require special aeronautical study. Those from 170 to 500' may require study depending on where they are located with respect to airports. If a tower does require special aeronautical study, the FAA must be notified of the proposal and must approve it.

Sec. 17.21 provides that antenna structures shall be painted and lighted when they require special aeronautical study or when they exceed 170' in height above the ground. The specifications for the exact method of painting and lighting are identical with FAA specifications already mentioned.

Par. 17.40 states: "All lighting shall be exhibited from sunset to sunrise unless otherwise specified." Par. 17.41 mentions a point not covered

From the discontent of man...



the world's best progress springs

Ella Wheeler Wilcox

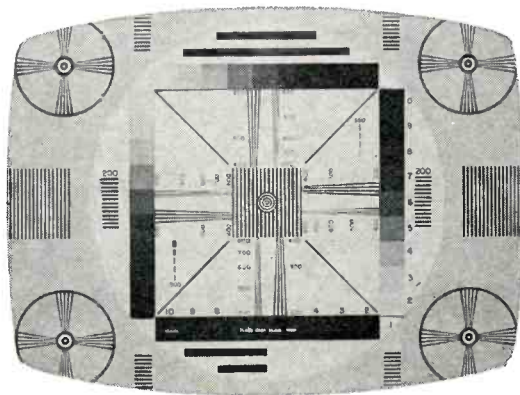
Challenged by the limitations imposed by the cumbersome device of the turret, Zoomar has given the camera a new dimension—an exciting lifelike versatility approaching that of the human eye—a tool that dramatically helps to translate into being the skill and imagination of the engineer and operator. Zoomar, pioneer in the development of the zoom lens, continues its program of further progress and perfection.

Remote control zoom lenses for ITV cameras: Mark III, Mark IV, Mark VI, Mark X, Mark XX.

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PRECISION MAGNETIC TAPE

Two important points of superiority you'll find in Memorex video tapes—both of which result in visibly better pictures—are their super-smoothness and their high-conductivity coating. These features result in absence of dropouts, picture clarity, and freedom from static build-up. You'll also get significantly reduced head-wear and a greater number of re-plays—a direct benefit from Memorex's experience in

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If you'll write Memorex Corporation at 711 Memorex Park, Santa Clara, California 95052, we will send you video tape specification data and a bibliography of technical information available from the Memorex library of reprints. Also let us know, by letter, if you'd like a free sample reel of Memorex video tape.

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Circle Item 34 on Tech Data Card

in FAA Rules: "A sufficient supply of spare lamps shall be maintained for immediate replacement purposes at all times." Par. 17.44 states: "Replacing or repairing of lights, automatic indicators or automatic alarm systems shall be accomplished as soon as practicable." In addition, Par. 17.45 covers alteration in the height or location of the tower. Before undertaking such alteration as authorized by the FCC, the licensee must file a Form 844 with the Director of the U.S. Coast and Geodetic Survey, noting in detail the proposed alteration so that aeronautical charts may be amended to provide accurate data for pilots.

Not only is tower marking and lighting information furnished in Part 17 of the FCC Rules, the Commission always attaches to a station's construction permit or license a specific list of regulations (FCC Form 715), some of which are applied to that particular station. These regulations are the same ones already discussed: the painting of alternate bands of white and orange, the use of code beacons and ob-

struction lights, etc. However, the Commission provides the list to avoid misunderstanding by any station as to what is required of it. Form 715 must be posted with the station's current instrument of authorization, and the licensee must be familiar with it.

National Electrical Code

Broadcast stations are not exempt from the provisions of the NEC, and there are two sections of it which relate to tower lighting. Sec. 210.25 requires that the conductors on a 15-ampere branch circuit be not less than No. 14 wire (AWG); those on a 20-ampere circuit must be not less than No. 12 wire; and those on a 30-ampere circuit shall be not less than No. 10 wire. Note, however, that the FAA 3% socket-voltage rule is more strict and requires conductors larger than those specified by the NEC. Sec. 300.19 requires that conductors in vertical conduit runs be supported by wire supporters. For conductor sizes from No. 18 to No. 8. (AWG), the required spacing of the supporters is

100'. Insulated clamping devices which positively grasp the conductors are recommended.

Local Electrical Codes

The particular municipality, county, or state within which the tower is located will usually have some sort of building or electrical code. Most simply provide that the National Electrical Code shall be complied with, and add a few other requirements. Following any electrical work, an inspection by the local municipal agency and the payment of a fee are usually required. A certificate is then issued, without which the electric company may be prohibited from furnishing service. Should electrical wiring become defective while in service, the electric company may be required to disconnect service until the defects are repaired.

This part has described the need for tower marking and the rules governing it. Next month, the concluding part will discuss planning the installation and the maintenance of tower lighting and painting. ▲

From ColorTran...

Solid-State Dimming Control Systems for Television and Theatrical Lighting...

Flexible modular design to meet all lighting control requirements.



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Circle Item 34 on Tech Data Card

March 1966

We interrupt this magazine to bring you...

Late Bulletin from Washington

by Howard T. Head

FCC Loses Forfeiture Cases

The U.S. District Court in Minnesota's Fourth Division has handed down a summary judgment, dismissing the Federal Government's suit against three Minneapolis television stations to recover forfeitures (fines) imposed by the FCC in Notices of Apparent Liability. The Commission had charged that the stations had "willfully and repeatedly" broadcast video tape recordings without the sponsor identification required by Section 73.654(a) of the Commission's Rules and Regulations.

In dismissing the cases, the Court held that the Government had failed to make its case against the defendants, not having proved that the failure to include sponsorship identification was either willful or repeated, or the result of anything more than inadvertence.

The Minnesota suit points out a little-understood aspect of the procedure required by law for forfeitures arising from Notices of Apparent Liability. These notices are issued by the Commission when it believes there has been an infraction of the law or its regulations of sufficient importance to justify the levying of the forfeiture. The licensee to whom the notice is directed is given an opportunity to respond and to offer reasons why the forfeiture should be cancelled or mitigated. In many instances, the Commission has reduced or cancelled proposed forfeitures upon receipt of a satisfactory response from the licensee involved.

If after appeal to the Commission the Notice is not cancelled and the licensee is still not persuaded that the forfeiture should stand, the Government must institute further proceedings in court; the burden of proof is on the Government. In the Minnesota case, the Court concluded that the Government had not sustained the burden of proof.

FM Changes to Avoid TV Interference Discontinued

As previously reported (May 1965 Bulletin), there has been a steady stream of complaints of FM interference to television reception, particularly in outlying areas. Invariably these complaints arise from the harmonic relationship between the FM band (88 mc - 108 mc) and television Channels 7 through 13 (174 mc - 216 mc). The sources of these complaints have been traced both to actual second-harmonic radiation from FM transmitters, and to second-harmonic generation in television tuners and preamplifiers caused by overloading from strong FM signals.

Although the Commission has endeavored to make changes in the FM allocation table wherever feasible to eliminate or minimize this interference, it has concluded that this is an inefficient use of the spectrum, and has announced that effective March 1, 1966, requests for FM channel changes to avoid television harmonic interference will be considered only on the basis of special showings.

In its Notice, the Commission pointed out the spectrum wastage caused by inadequacies in television receiver design. The Commission has stated that if voluntary efforts are not sufficient to alleviate the problem, it may be necessary to seek Congressional authority to prescribe receiver design criteria.

Liberalization of TV Translator Facilities Proposed

The Commission continues to entertain proposals intended to provide greater expansion for television translator stations, and to permit improved coverage by translators. As reported in the August 1965 Bulletin, the Commission now permits VHF translators to employ output powers up to 100 watts on regularly assigned television channels, and permits UHF translator operation on any unoccupied UHF assignment in the Commission's allocation table.

In a recent case involving UHF translator K7OCL, Fort Dodge, Iowa, the Commission waived the maximum output-power requirement and permitted the translator to increase output power to 1 kw. This was done with the consent of a UHF broadcast station in Fort Dodge, in the belief that the second UHF signal would foster the development of UHF in the area.

In a related move, the Commission has proposed permitting television translators to be served by microwave links rather than solely by direct off-the-air pickup as at present. The proposal contemplates the use of the 2000-mc band, with standard picture and sound modulation in a 6-mc bandwidth. This would permit the use of equipment already developed and would allow simple heterodyne frequency conversion.

The Association of Maximum Service Telecasters, Inc., (MST) has also petitioned the Commission for further liberalization of the UHF-translator rules. Under this proposal, Channels 70-83 would be reserved exclusively for translator use, and translator operation would be permitted on a shared basis on Channels 14-69 so long as no interference was caused to regular broadcast reception. A liberalization of the ownership Rules is also proposed to encourage the use of UHF translators by television-broadcast licensees.

Short Circuits

Proposals have been made for a new type of loudness meter having a response similar to that of the human ear...The Communications Satellite Corporation (COMSAT) has issued invitations for proposals for an earth satellite capable of handling 40 television channels simultaneously...Rumors persist that the Commission will shortly issue its long-awaited new program form for television applications...Controversy continues over limitations to be imposed on importation of distant signals by CATV systems; NAB has urged that such importation be forbidden beyond the station's 100 uv/m contour, except for the purpose of furnishing otherwise unavailable network service...The island of Guam, under U.S. jurisdiction, has received its first FM broadcast authorization...Conditions on two recent television-translator grants at Gwinn, Michigan, would require nonduplication protection of any future television broadcast service.

Howard T. Head...in Washington

The soundest sound in broadcasting is the new sound of GATES



ATTACHE "70"



DYNAMOTE "70"



COURIER "70"



UNIMOTE "70"

Four new portable transistorized remote amplifiers from GATES

Four handsome, fully transistorized models. All rugged, compact and lightweight. Studio console quality.

ATTACHE "70"—three microphone mixing channels. Two are switchable to accommodate tape recorders or turntables. Extremely light weight — 10 lbs. with batteries.

DYNAMOTE "70"—four channels. Broadcasting's newest and most deluxe. Accommodates nine signal sources, including two high-level inputs, two magnetic phonos and built-in tone oscillator. Weighs 12¼ lbs., including batteries. Ideal

for major news coverage or complex remote originations.

COURIER "70"—two-channel amplifier provides two microphone mixing channels, master gain control, illuminated VU meter. Weighs only 8¾ lbs. with batteries.

UNIMOTE "70"—single-channel, fully transistorized remote or utility amplifier is no larger than a table radio. Ideal for mounting under a lectern or pulpit.

For full details, write for ADV-160, our new attractive 8-page illustrated brochure.



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Circle Item 38 on Tech Data Card

NEWS OF THE INDUSTRY

Heads of State Associations Meet

An NAB-sponsored meeting of executives of State Broadcaster Associations was held in Washington February 17th and 18th. NAB President Vincent T. Wasilewski, in brief welcoming remarks, said the two-day meeting at the Sheraton Park Hotel, like those in other years, is "... an excellent forum for an exchange of opinion and ideas ..." between broadcasters around the country and their Washington representatives. It is out of such an exchange, he said, that broadcasting can "... continue to grow in service to the American people."

Paul B. Comstock, NAB vice-president for government affairs, said the Association plans to ask Congress to amend the Communications Act to provide that radio-TV station licenses run for seven years instead of three. Among other things, this would relieve stations—and the FCC—of much of the staggering amount of paper work now required in three-year renewals. He sought the aid of the State groups in seeking the change.

Also asked was solid opposition to the trend to enact "use taxes" and to include radio-TV programs as taxable items. Such taxes now are in force in one form or another in 41 states, and a bill pending in Congress would give them national status.

Robert Lambe of WTAR AM-FM-TV, Norfolk, and president of the Virginia Association, reported that his Association is seeking to have the Virginia legislature exclude program material from a pending sales-tax bill. TV towers and transmitters already are excluded, he said, and the Association hopes it can do the same for programming.

In another opening-session presentation, Douglas A. Anello, NAB's General Counsel, reviewed a host of regulatory matters pending before the Federal Communications Commission from the proposed new TV program form to the recent decision on community antenna television.

Mr. Anello said the CATV decision has created "considerable consternation and confusion" but that one point should be emphasized:

"The decision did not take away any existing CATV service from anyone.

All existing systems are grandfathered in and will be operating in the future as they have in the past."

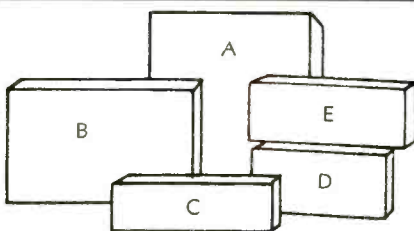
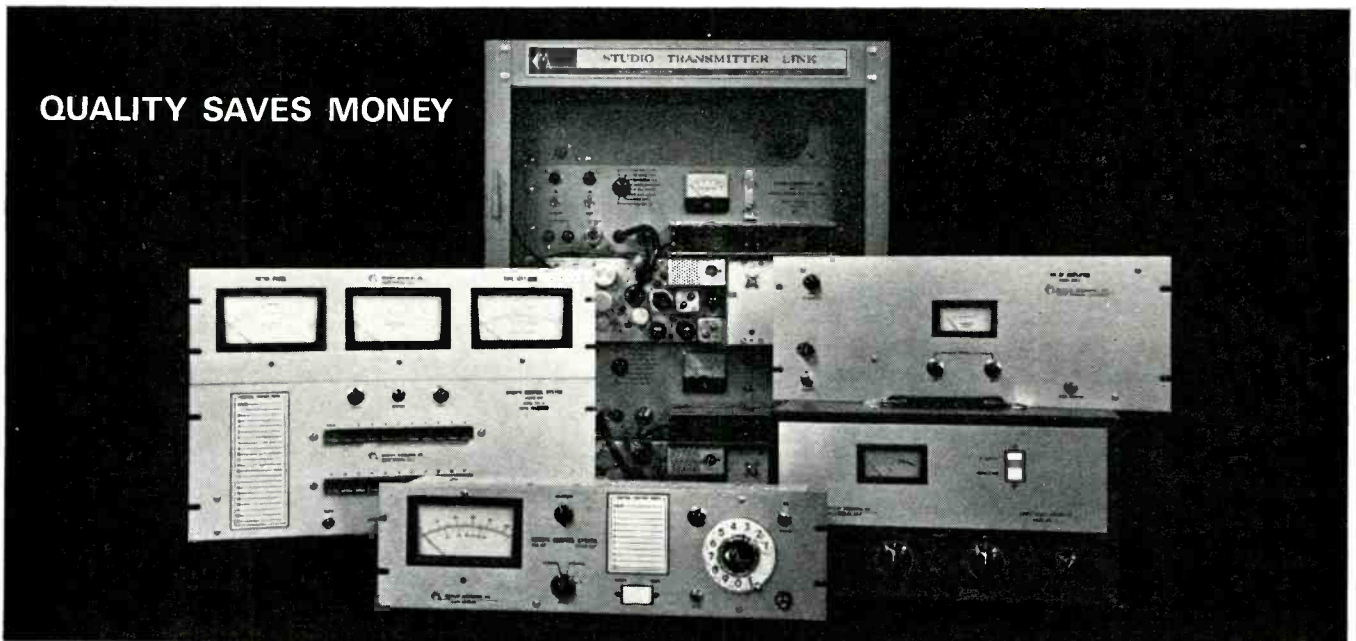
An unscheduled highlight was the presentation by Mr. Wasilewski of an "Award of Merit" to Jack Williams, executive-secretary of the Georgia Association of Broadcasters. The plaque was presented in recognition of Mr. Williams' efforts in broadcasting's behalf and NAB's "respect and admiration."

During a panel discussion on public relations, John M. Couric, NAB vice-president for public relations, said broadcasting should be promoted through broadcasting. "If stations would devote more time to building the overall image of the broadcasting media by use of broadcasting facilities, the broadcasting industry would be able to confound most of its critics and solve most of its public-relations problems," he said.

He told the conferees to take advantage of the many opportunities on the state level to "... inform the public of broadcasting's contributions and to create a greater understanding of broadcasting's problems."

Hank Parkinson, executive secretary of the Kansas Association of Radio Broadcasters and president of Parkinson-Krebbs and Associates, a

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Pictured on the left is the monitoring, combining and automatic switching cabinet of the CCA AM-5000DX, 5KW Dual Reliable Transmitter. This cabinet constantly monitors the audio and RF of two independent 2.5KW transmitters and combines their outputs to provide 5KW output. In the unlikely event of a fault, the defective transmitter will be instantly turned off and the second transmitter will automatically feed the antenna. This reduction to half power will have negligible effect on station coverage.

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The 1966 NAB Convention In Review



A special report on events and trends at the Convention and Engineering Conference.

In the APRIL issue of
Broadcast Engineering

Wichita public-relations firm, said a state association's public relations program "... is a communications vehicle by which the organization's activities come to the attention of various publics." He said associations should operate in "... the best interests of the general public and the specific public it is trying to reach ... " or their public relations program will fail. Every association, he said, should have a "... salable package ... and a continuing well-directed public-relations effort carried out on a day-to-day basis."

Also addressing the meeting was Howard H. Bell, NAB Code Authority director, who said, "... the job of self-regulation is really everybody's job ..." and called on American businessmen to "strengthen the self-regulatory process." Although important strides are being made in business and advertising, he said, "... we need to close ranks and join forces in preserving free enterprise by collective responsibility."

While applauding the codes and statements of good intentions now in existence, the NAB executive said "... there must be some means of assuring compliance ..." if these efforts are to "... continue to grow in meaning and value." He said it isn't enough "... to have them merely framed in the office lobby or printed on fancy parchment."

He told the state association presidents and executive secretaries that they can be proud of their industry's Codes which have the machinery for implementation.

"But we need to build even greater support for our own program of self-regulation," he said and urged the conferees to help strengthen the process within their states.

Mr. Bell said the whole of American business has a stake in voluntary restraints and self-improvement. "The businessman, the advertising man, and certainly the broadcaster have the continuing need to maintain and preserve their freedom, to enhance their service, and to win the public's confidence and support," he said.

He told the broadcasters that the job of building confidence in advertising "... is of concern to all of us ..." and cited the campaign for complete truth in advertising that led to the establishment of the Better Business Bureau. The broadcasters were given an explanation of the Bureau's operation and how it can be of assistance in a slide presentation by William Maki, director of industry relations of the Association of Better Business Bureaus.

2500-mc TV System in Houston

Houston's two-channel 2,500-mc ITV network has broadcast more than 10 hours daily since going on the air last September. Since the start of the present school year, one channel has been utilized seven and one-half hours daily for broadcasting films, while the second channel has simultaneously carried district-produced video-taped enrichment material two to three hours per day.

Assigned call letters KRZ-68, the instructional TV is received in classrooms on channels 7 and 9. A weekly TV log, published by the instructional media department, provides classroom teachers with complete schedules and summaries of program content. Channel 9 is used primarily for broadcasting instructional films, and channel 7 is used for enrichment material taped at the studio, a remodeled school-board meeting room.



Total cost for the studio and transmitting equipment was \$70,000, and, for each school's receiving antennas, signal converters, distribution circuits, and 325 classroom monitors on wheeled dollies, an additional \$142,000.

The 2,500-mc TV system was produced by Micro-Link Systems, Copiague, L.I., unit of Varian Associates, Palo Alto, Calif. Taft Broadcasting Co., Houston, installed the Micro-Link transmission and receiving equipment for the 24-school network. Only 11 months elapsed between initial discussions and the completion of final tests for broadcasts on the first day of school.

Micro-Link Systems is currently installing a 236-school, 2-channel ITV system for the Roman Catholic Diocese of Brooklyn, N.Y., and is completing a 52-school network for Rochester, N.Y. City School District.

The Plainview, L.I., multibuilding school district was the first of 9,000 such U.S. districts to install a 2500-mc system, beginning transmission March 1, 1964.

Long-Distance UHF Remote Control

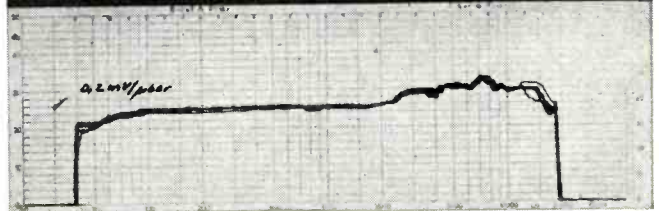
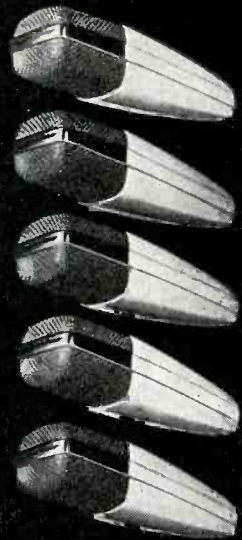
WKBS, covering the Burlington, N.J.-Philadelphia area, has become one of the nation's first UHF television stations to operate its transmitter from a distant location. (Other broadcasters have remotely controlled their transmitters from within the same building.) The FCC approved remote control of UHF transmitters effective May 6, 1963, and is considering similar action for VHF.

The control equipment for the RCA transmitter is located in the Kaiser Broadcasting Company station's South Philadelphia studios, ten miles from the antenna farm in the Roxborough section of Philadelphia where transmitting facilities of WKBS and other TV stations are based.

The unattended transmitter operation made possible by remote control enables the engineer, who normally would be stationed at the transmitter site, to work in the studio equipment area where he is available for other duties. WKBS, which began broadcasting on channel 48 earlier this year, can now locate its studios at a point readily accessible to talent, client, and staff personnel. Control of the transmitter is accomplished through a system which includes audio and video gain and monitoring circuits, picture and waveform monitors, and the lights, switches, and meters needed for normal operation.

March, 1966

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You may think this kind of quality control is unusual for a production instrument. However, we are very particular about the kind of equipment bearing our name. Shouldn't this kind of 'insured performance' be built into *your* audio facilities, or those you install?

Model MD 421 cardioid dynamic microphone, 40-17,000 cps + 3 db, \$114.00 professional net; MD 421HN (same as above, but with selectable high-low impedance), \$117.00.

For further details, including full technical specifications, and a list of microphone accessories available for the MD 421, please write or call.



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LOOK TO VISUAL FOR NEW CONCEPTS IN BROADCAST EQUIPMENT

NAB Urges Sound Preservation, Conducts Blackout Survey

A special committee of the **National Association of Broadcasters** has urged radio and television stations and networks to record—and preserve—on audio tapes the contemporary events and voices that may be treasured by future generations.

The committee said that many significant events, outstanding speeches, and historic milestones are recorded on tape, but erased and lost after use.

The Encyclopedia of Recorded Sound Committee was set up by NAB last year to study the feasibility of compiling a master index of all sounds now available on tapes, discs, cylinders, wire, and film, and possibly establishing a national archives for storage. Carleton D. Brown, president and general manager of WTVL, Waterville, Me., is Committee Chairman.

The committee is launching a campaign among radio and TV stations and networks to preserve on audio tape the more significant happenings in daily life so future generations can obtain insight into history through a quick playback of the recordings.

Conceding that cost and circumstance often rule out film or video tape, the committee pointed out, "An audio tape recording is easy to make, inexpensive, and easily stored."

The committee added, "Every community has its celebrities and interesting

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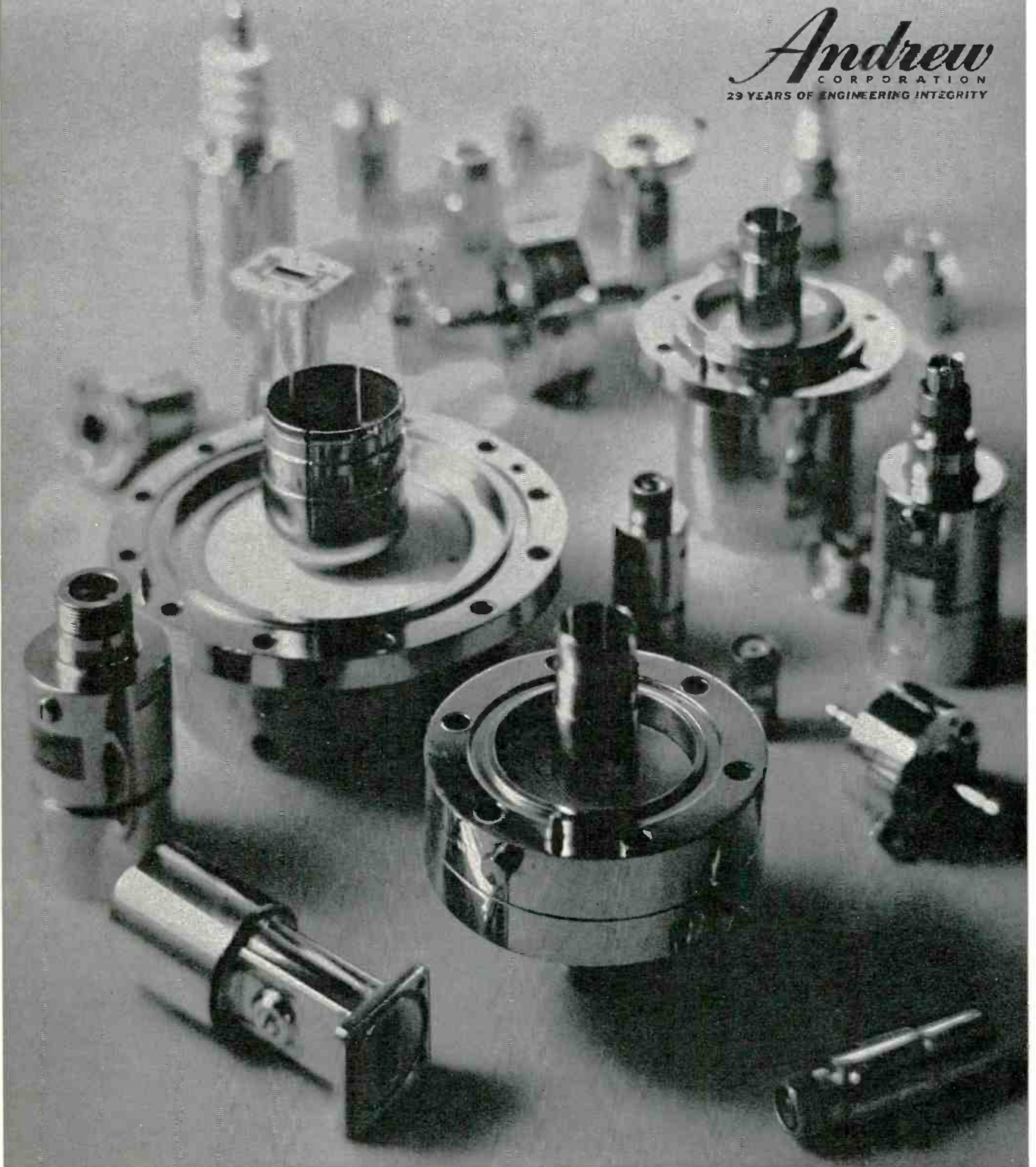


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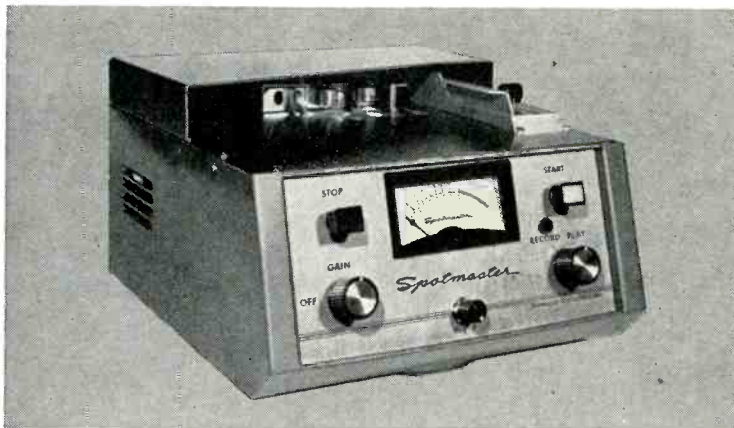
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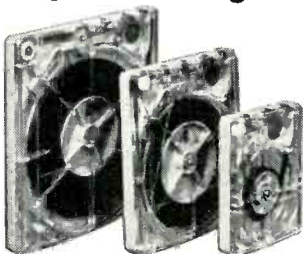


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Introducing the Super B, today's truly superior cartridge tape equipment.

New Super B series has models to match every programming need—record-playback and playback-only, compact and rack-mount. Completely solid state, handsome Super B equipment features functional new styling and ease of operation, modular design, choice of 1, 2 or 3 automatic electronic cueing tones, separate record and play heads. A-B monitoring, biased cue recording, triple zener controlled power supply, transformer output . . . all adding up to pushbutton broadcasting at its finest.

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people. Every town has its own history and milestone events which are often of national interest and importance . . .

"All over the country, every day, broadcasters are missing opportunities to record colorful events and voices of historic importance, or, systematically are erasing what they do record."

NAB's in-depth survey conducted among New York City residents has shown that three out of four persons interviewed were tuned in to radio during the northeast power failure, and that many felt radio's calm and cheerful reports averted panic. Most of those who listened to radio believe the situation would have been much worse without it.

The study was conceived by Howard Mandel, NAB vice-president for research, and Sherril Taylor, vice-president for radio, to obtain information about the role radio played when the lights went out. Who listened?—for how long—How did people feel about radio's performance?

The research was conducted under Mr. Mandel's supervision by **Oxtoby-Smith, Inc.**, and based on interviews with 494 residents — 284 women and 210 men — in Manhattan, Bronx, Brooklyn, Westchester, and Queens and Nassau Counties.

"The purpose of the NAB study was to assess, as precisely as possible, the true importance of radio's role in time of stress and emergency. The data we have obtained offer information that can help not only us who are involved directly in radio but the entire populace in dealing with similar emergencies," Mr. Taylor said.

Of those interviewed, 77% had listened to radio at some time during the blackout, mostly on their own battery-operated transistor receivers.

Of those who listened, 28% were tuned in by 5:30 pm—shortly after the blackout began—and another 47% were listening by 6:00 pm. Seventy percent listened for four hours or more, and about three percent listened throughout the night.

Most of them felt things would have been much worse without radio. Many said they would have been frightened and panicky (29%), or concerned and worried (16%). Only five percent said radio made no difference.

Almost all who listened — 96% — believed that radio did a good job providing information and maintaining listeners' morale.

Of those who did not listen, 89% said they would have liked to but couldn't. Sixty-two percent said they got reports from people who were tuned in.

Oxtoby-Smith stated in its report to NAB:

" . . . Probably the major factor in relieving people's minds was the feeling expressed by many respondents: namely, that radio was doing all it could to present the facts about the situation. They were relieved to learn that the blackout was only temporary and the result of power failure — not enemy action. They also derived comfort from hearing on radio that the situation was under investigation and that there was no public panic or crime in the streets. . .

"Another positive dimension came through — that is, the part the announcers themselves played in allaying people's fears. Some respondents made a point of mentioning how calm and reassuring these men were, and a few praised them for being cheerful, honest, and sincere."

The report will be printed in booklet form for distribution to NAB's entire radio membership.

SMPTE Conference

Senator George Murphy, California Republican, will be the guest speaker at the Get-Together Luncheon when the **Society of Motion Picture and Television Engineers** meets for its 99th Technical Conference and Exhibit May 1 at the Sheraton Park Hotel, Washington, D.C.

The five-day conference, with attendance expected in the thousands, will mark the 50th Anniversary of the Society, incorporated in Washington in 1916.

The amazing changes in technology over the 50-year span will be amply demonstrated during the conference. At one end of the scale, the very latest technical advances in space photography hopefully will be highlighted by the presentation of special awards to astronauts McDivitt and White, the first cinematographers to operate literally in space. At the other extreme, the Library of Congress, the Smithsonian Institute, and the National Archives will display treasures from their collections of historical motion pictures from the earliest days of the industry.

Federal Grants for ETV

Approval of grants totaling \$1,825,457 to establish four new educational television stations and expand facilities of four others has been announced.

A federal grant of \$400,381 to Southern Illinois University will be used to activate a noncommercial educational television station on channel 45 in Olney. The University of Southern Illinois has operated WSIU-TV, channel 8, in Carbondale for the past four years. It proposes to use the new station for production of local programs in addition to those broadcast over channel 8.

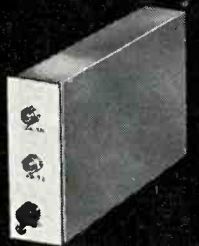
Channel 45 will begin operation with a broadcasting schedule of 60 hours per week to serve 468,000 persons in parts of Illinois and Indiana, including 131,000 students in 500 schools. Funds will be used for the purchase of a 1,000' tower, antenna, transmitter, two cameras, two video-tape recorders, and other studio equipment.

A grant of \$177,768 to the Board of Public Instruction of Escambia County, Florida, will assist in construction of an educational TV station on channel 21 in Pensacola. Estimated total cost is \$355,536.

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Units may be ganged for up to 10-channel operation.

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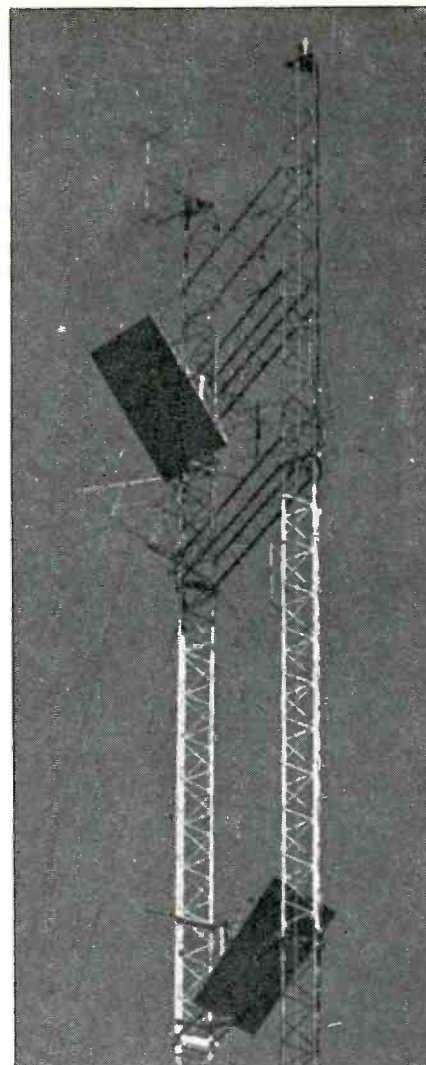
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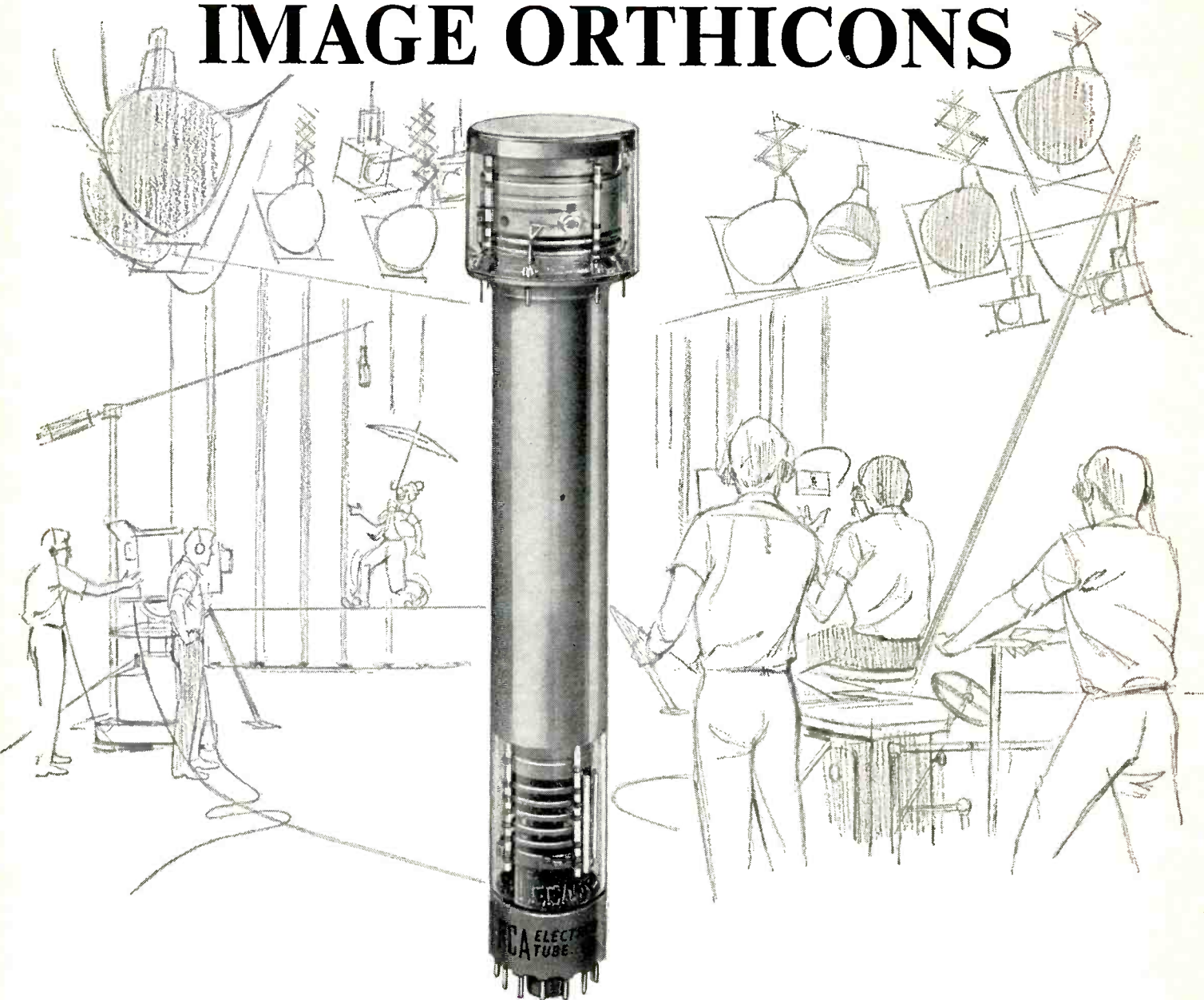
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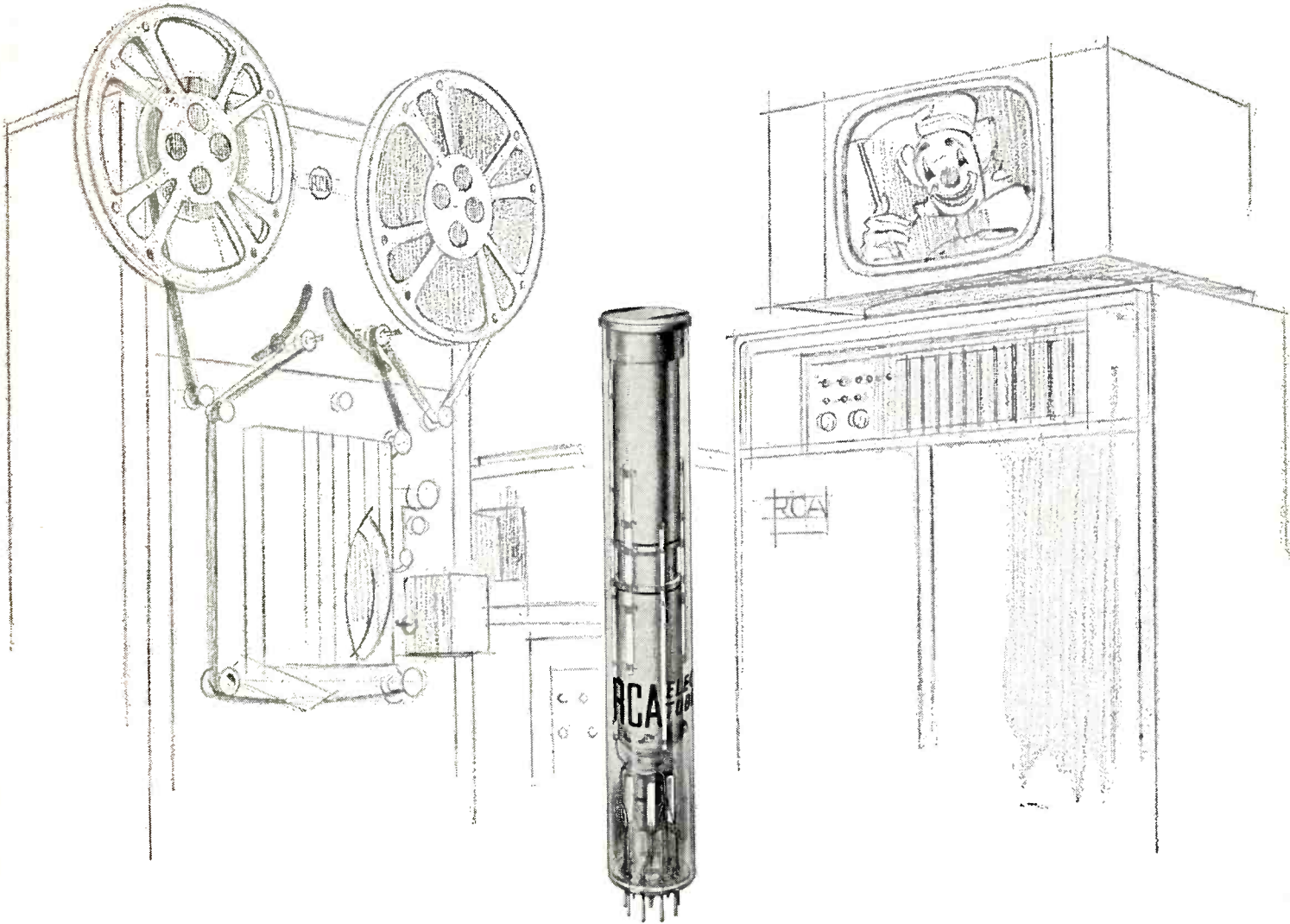
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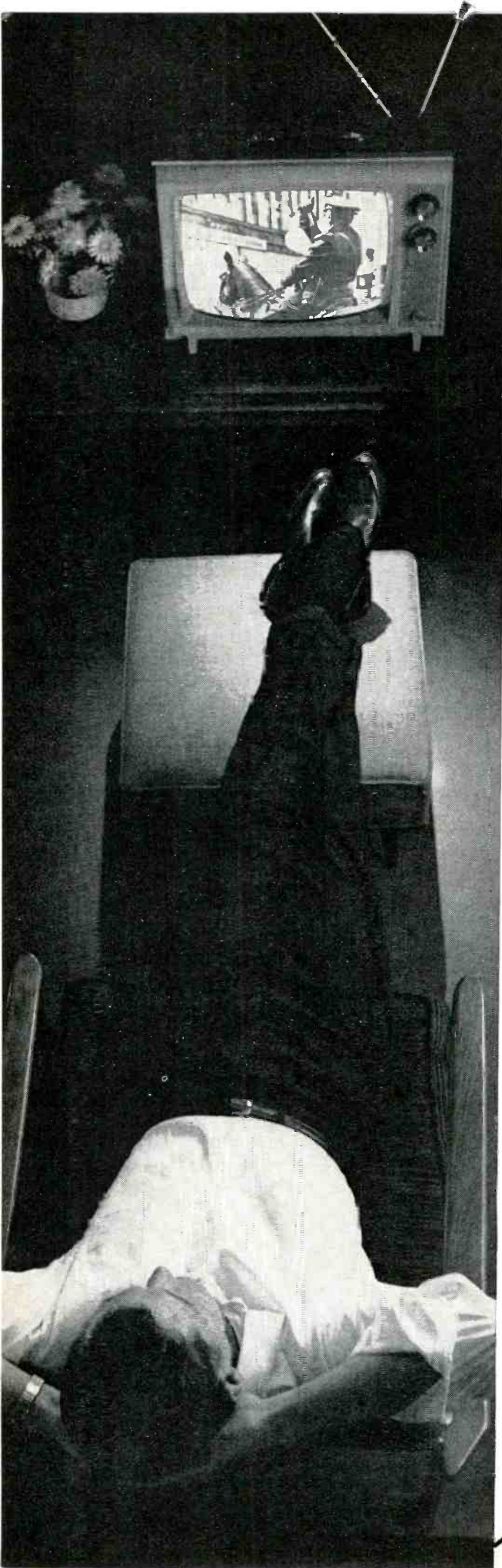
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maintenance and revenue losses from STL outages are gone forever. The equipment can handle up to four audio channels for AM, FM, stereo, or TV, and will transmit NTSC color with 1.0+ watt output. If your station is considering improving color performance and the replacement of overworked tube-type equipment, check the Dual Link II, first. It's warranted for 5 full years and "guaranteed" to get you home on time, everytime. Mail this coupon for complete information.



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The Pensacola station will serve as a major production center in the state educational television system. Broadcasts will serve a population of more than 204,000 people, including 62,000 students in 90 schools. ETV programming will provide instruction in art and music for the first time to 90% of Escambia County students.

A grant of \$200,000 to the Northeastern Pennsylvania Educational Television Association will assist in activation of channel 64 in Scranton, as the seventh educational television station in Pennsylvania's developing network. Channel 64 will make ETV available for the first time to 1.3 million people in the Scranton-Wilkes-Barre area of the state, including 263,096 students in 751 schools.

The new station will produce local classroom, teacher training, and vocational training programs. In addition, it will broadcast adult cultural and college credit and non-credit courses originating in other states.

A grant of \$93,484 to Vincennes University will be used to activate channel 34 in Vincennes, Indiana, providing new educational television service to 245,000 persons in Indiana and Illinois, including 54,000 students in 184 schools.

A grant of \$652,390 to WHYY-TV, operating on channel 12 in Wilmington, will help the station acquire equipment to produce and transmit in color. WHYY, Inc. began broadcasting on Channel 35 in 1957 in cooperation with the Philadel-

phia Board of Education.

A grant of \$78,042 to the WGBH Educational Foundation, Boston, will help the Foundation's first station, WGBH-TV, channel 2, improve its transmission and production facilities. The grant is the second made to the Foundation under a program of federal assistance to establish or expand noncommercial ETV. First grant was made last December in the amount of \$725,190 to activate channel 44 in Boston as the first ETV station in the nation to transmit in color.

Channel 2 serves an estimated 1.5 million students in 3,244 schools in five

states. Expansion of its facilities will provide ETV to an estimated additional population of 336,000.

A grant of \$110,000 to Florida West Coast Educational Television, Inc., will be used to expand facilities of WEDU-TV, channel 3, Tampa. The funds will be used to purchase new transmitting equipment, extending the broadcast range of WEDU to the major population areas of Florida's central west coast, including more than 307,000 students in 562 schools.

A grant of \$113,392 to the Weber

A True Master Color Video Tape Recorder

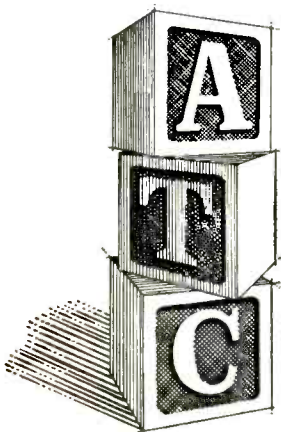
- The highest performance
- Simpler operation
- Less operating controls and adjustments



Plan for the Finest in High Band VTR Color Performance . . .

Visual/Allen Model V/A 100G Master Color Video Tape Recorder

Automatic Broadcasting as easy as



Send for FREE 35-pg. booklet "Planning for Automated Broadcasting." Or call collect today 309-829-7006.

AUTOMATIC ATC TAPE CONTROL
1107 E. Croxton Ave. Bloomington, Ill.

Circle Item 51 on Tech Data Card

March, 1966

S-10 SYNCRON SOLID STATE



CONDENSER MICROPHONE

Self Contained Convenience

FET circuitry eliminates external power supply • Permanently polarized Powered by 1000-hour battery • Frequency Response: 40 — 20,000 Hz Pressure gradient • Mylar diaphragm • Cardioid Pattern • 20 db discrimination • No overload protection needed • Low noise (less than 23 db) High output (-53 dbm) • Connector is on-off switch • Beautiful satin nickel finish • Only 9 ounces with battery • Full accessory line • Wind screen • Elastic suspensor • Desk stand • Fully guaranteed • \$240 complete (with battery, case, swivel mount, 20-feet of cable) • Made in U.S.A.

SYNCRON CORPORATION
WALLINGFORD, CONN., U. S. A.

Circle Item 50 on Tech Data Card

Our Model TCA7 all transistorized preamps can replace tube-type amplifiers in your color camera.



Specifically designed for use in RCA TK-41 color camera chains, the all transistorized TCA7 has many benefits. For instance, there is complete elimination of microphonics caused by the amplifier; also a reduction of noise; higher gain-bandwidth product; a reduction in the amount of heat created within the camera and a much higher order of stability.

Yes, our Model TCA7 all transistorized preamps can replace tube-type amplifiers in your color camera. It can be installed in about thirty minutes. The mounting dimensions and hardware are identical to the replaced tube-type amplifier. The TCA7 can be powered by our TPS7 solid state power supply or directly from the 280 volt camera supply by using our TR7 dropping resistor with each TCA7. *Like we say, the Model TCA7 really can replace tube-type amplifiers in your color camera . . . and do a better job, too!*

MODEL TCA7 COLOR CAMERA AMPLIFIER, \$316.00 EA., MODEL TPS7 POWER SUPPLY, \$50.00 EA.,
MODEL TR7 PLUG-IN RESISTOR, \$10.00 EA., ALL PRICES ARE F.O.B. NASHVILLE, TENNESSEE

We invite your inquiry, write or phone collect today.

INTERNATIONAL NUCLEAR CORPORATION

608 NORRIS AVENUE • NASHVILLE, TENN. • PHONE 615-254-3366

Circle Item 67 on Tech Data Card

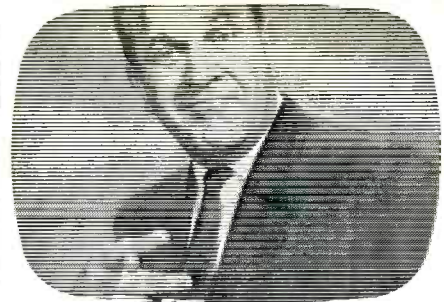


County School District will be used to expand and improve educational television broadcasting facilities of KWCS-TV, channel 18, Ogden, Utah.

Station KWCS, which began broadcasting in October, 1960, serves an area of 178,700 persons in northeastern Utah, including 65,895 students in 99 schools. The improvements will extend ETV broadcasts to an additional 76,400 people. Plans call for increasing production of instructional and college credit programs, and additional public service programs for evening presentation.

Background-Music Firm Wins Suit

A west-coast holder of a background-music franchise has won a permanent injunction and cash damages in a suit charging unauthorized interception of its service. The suit alleged that the defendants had installed in restaurants, stores, and other places of business, receivers that could be tuned to any sub-carrier frequency. The judgment restrains the defendants from manufacturing, selling, leasing, distributing, installing, giving away, or using an SCA variable tuner or SCA adapter.



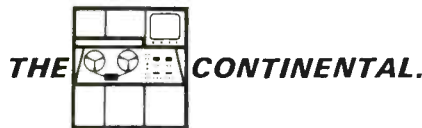
For real satisfaction from your equipment, be sure that the monitors are made by Miratel. They bring out the best performance your installation can give.

Miratel designs and manufactures a complete line of superior transistorized and tube type monitors for professional and general purpose use. You can choose exactly the features that meet your requirements. Scores of control and performance options! Standard line of video monitors in all types and sizes — custom designs available. For catalog, write to Miratel Electronics, Inc., 3600 Richardson St., New Brighton, St. Paul, Minn. 55112.



First with Transistorized Monitors
 Circle Item 68 on Tech Data Card

**A
 NEW CONCEPT
 IN
 VTR**



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 in High Band VTR
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Available locally from
 your distributor . . . NOW!

**NORTRONICS
 8000 SERIES
 PROFESSIONAL
 REPLACEMENT HEADS!**



Full Track, 2 Track or 4 Track in Record, Playback or Erase Heads as well as 3 or 4 Channel Heads in Record or Playback Types for . . .

AMPEX, MAGNECORD, CONCERTONE, RCA, CROWN

Now you can reduce "downtime" by using Nortronics replacement heads—available locally and immediately from your distributor! Pick the head and track style YOU want from Nortronics' full professional line. After initial changeover, replace heads or convert track styles in minutes! Precision engineered adapters and mounting brackets let YOU make the initial changeover . . . let YOU service your recorders according to your needs.



See your distributor today. Write for full details! Or call 612-545-0401.

Nortronics®

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See Us at 1966 NAB Show
 Booth 233, West Hall,
 Conrad Hilton

Circle Item 55 on Tech Data Card



**Now
color TV
has reached
maturity!**

***(Now TAYLOR-HOBSON-COOKE has
perfected the color lens)***

With every show that's any show in color this year, with TV receivers and cameras at a new level of electronic sophistication, it was bound to happen. The perfected color TV lens. And it was bound to be Taylor-Hobson-Cooke that perfected it.

When you specify lenses for your new Plumbicon, Image Orthicon or Vidicon camera, get the lens that brings your viewers bright and uniform color pictures, across the spectrum, across their screens, across the country.

SPECIFY

TAYLOR-HOBSON-COOKE

VAROTAL LENSES

Albion Optical Company, Inc. 15 Virginia Avenue West Nyack, New York 10994

Sole U.S. Agents for RANK TAYLOR HOBSON

Circle Item 56 on Tech Data Card

British TV Group Expands to U.S.

A new American company, **Power-Optics, Inc.**, a subsidiary of the United Kingdom Group, **Evershed Power-Optics, Ltd.**, has been established to serve professional television engineering needs in Canada and the United States.

This new U.S. company is located at the plant of the **James G. Biddle Co.**, Plymouth Meeting, Pa. It will provide servicing facilities for Power-Optics products, particularly for zoom lenses and servo-drive systems. The new group will cater primarily to the rapidly growing

color-TV industry. U.S. engineers appointed to the company will spend several months in training at Evershed Power-Optics in Britain to familiarize themselves with the equipment.

PERSONALITIES

Two new product divisions have been organized by **Ampex Corporation** to permit more specialized attention to the needs of the company's markets.



Thomas E. Davis, (in photo) former vice president for marketing, has been named vice-president, general manager of the new audio/video communications division. Headquartered in Redwood City, Calif., with additional manufacturing facilities in Colorado Springs, Colorado, the division manufactures Ampex video and professional audio equipment for broadcasting, education, industry, and other fields.

Robert J. Weisman, who is the former vice-president for manufacturing of the video and instrumentation division, has been named vice-president, general manager of the new instrumentation division. Headquartered in Redwood City, with additional manufacturing facilities in Burlingame, the division manufactures Ampex instrumentation recorders and systems for aerospace, scientific, industrial, and medical markets.

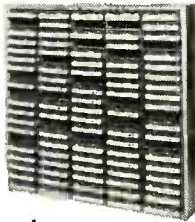
SPOTMASTER

RS-25



Tape Cartridge Racks

RM-100



... from industry's most comprehensive line of cartridge tape equipment.

Enjoy finger-tip convenience with RM-100 wall-mount wood racks. Store 100 cartridges in minimum space (modular construction permits table-top mounting as well); \$40.00 per rack. SPOTMASTER Lazy Susan revolving cartridge wire rack holds 200 cartridges. Price \$145.50. Extra rack sections available at \$12.90.

Write or wire for complete details.

Spotmaster

BROADCAST ELECTRONICS, INC.
8800 Brookville Road
Silver Spring, Maryland

Circle Item 58 on Tech Data Card

Plan for the Finest
in High Band VTR
Color Performance . . .



Visual/Allen Model V/A 100G
Master Color Video Tape Recorder

The only
complete
color
VTR

SOUNDMEN GET SOUND ANSWERS FROM FAIRCHILD!



FAIRCHILD DYNALIZER MODEL 673

The newest approach for the creation of "apparent loudness"—the Dynalizer is an automatic dynamic audio spectrum equalizer which redistributes frequency response of the channel to compensate for listening response curves as developed by Fletcher-Munson. Adds fullness and body to program material.

NEW! FAIRCHILD BASS-X

A dynamic low frequency roll-off filter—that can roll off high level low frequency information, starting at 500 cycles, with a maximum obtainable attenuation of 12 db at 30 cycles. Device is automatic, is in use only when needed—therefore it does not alter overall apparent low end response to the ear. THE FAIRCHILD BASS-X allows higher levels to be maintained in disc recording, and particularly assists AM stations in increasing their effective signal by automatically controlling the often troublesome low end response.

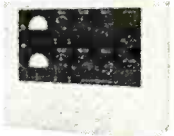


FAIRCHILD CONAX

The world-accepted way to control high frequency spillovers in FM due to pre-emphasis. Lets your station maintain real high levels even with brass and crashing cymbals and still avoid FCC citations.

FAIRCHILD LIMITER MODEL 670

Fast attack stereo limiter (50 microseconds) with low distortion and absence of thumps. Sum and difference limiting position eliminates floating stereo image. Includes regular channel A and B limiting. Dual controls, dual meters provided. Used throughout the world. (Mono model available).



Write to FAIRCHILD — the pacemaker in professional audio products — for complete details.

FAIRCHILD

RECORDING EQUIPMENT CORPORATION
10-40 45th Ave., Long Island City 1, N. Y.

Circle Item 57 on Tech Data Card

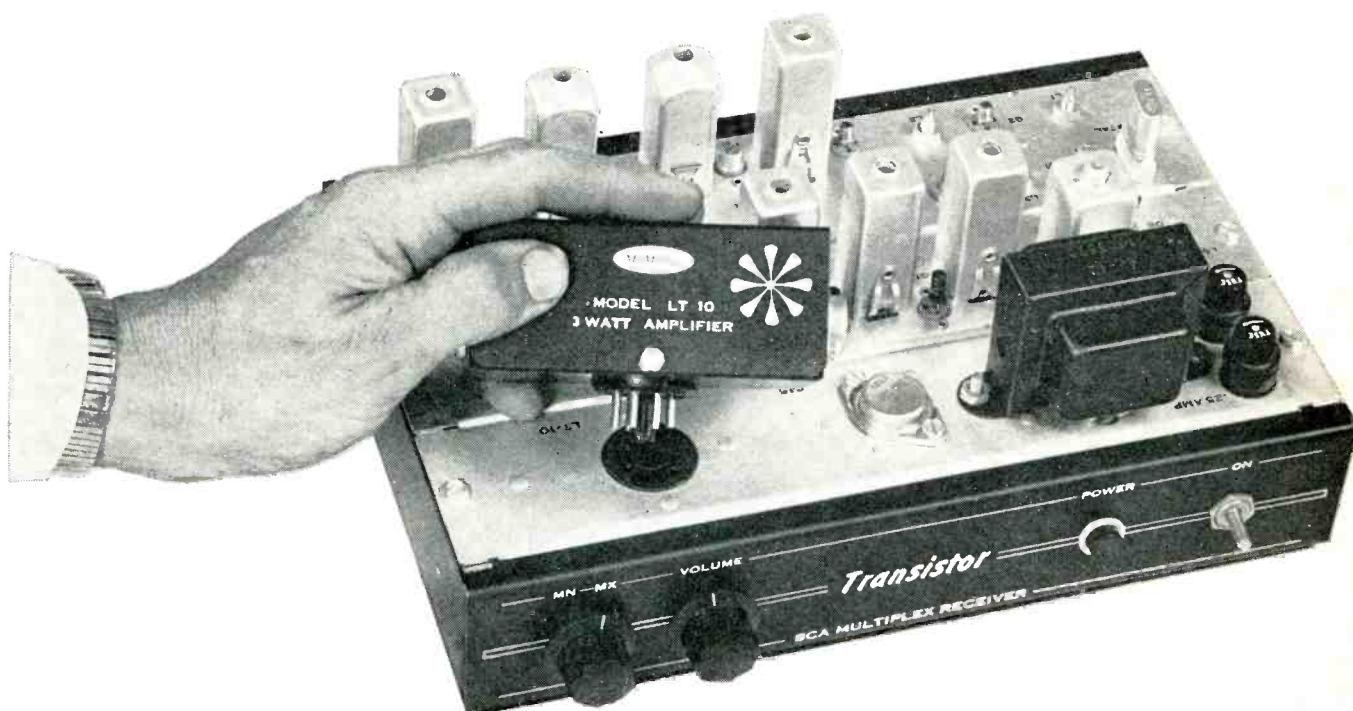
McMartin Goes Piggyback



New LT-10, 3-watt transistor-amplifier, mounts piggyback on our SCA Multiplex TRANSISTOR Receiver, TR-66.

Here's new convenience for background music operators. For small installations with few speakers, use the LT-10 for amplification. It just plugs in — no wiring necessary. ■ Our transistor receivers have many special features and conveniences. Modular construction permits easy replacement of power supply, main channel or sub-channel circuitry. Servicemen always appreciate the plug-in transistors and straight-line design with convenient test points. No other manufacturer can guarantee sensitivity of 2 uv/50db or crosstalk of -55db or better. ■ McMartin is the leading producer of SCA Multiplex Receivers. The workmanship of McMartin Receivers is guaranteed *forever*. We can make this bold warranty because 20% of our production people are in final testing of your equipment.

McMARTIN INDUSTRIES, INC.
605 North 13th Street
Omaha, Nebraska 68102



Circle Item 60 on Tech Data Card



Promoted to assume the post of general manager of the marketing division is **Robert R. Owen**, (photo above) former national sales manager. The marketing division has responsibility for marketing all Ampex products, with the exception of consumer products and the products and services of Mandrel Industries, Inc., a subsidiary.

Also at Ampex, **Joseph C. Fiege** has been named Mid-Atlantic regional sales manager, with headquarters in Arlington, Va.

In his new position, Fiege is responsible for all Ampex industrial and professional products, including magnetic recorders, magnetic tape, and data-storage

equipment in the region, which includes Virginia, West Virginia, and Maryland. He was previously associated with C.E.C., Weston Instrument Corp., and the Naval Research Laboratory, Washington, D.C.


Samuel R. Harrell has joined **Raytheon Company** as assistant district sales manager for the firm's Communications and Data Processing Operation. He will represent Raytheon in the application, engineering, and sale of microwave communications systems and television relay equipment in Florida, Alabama, Georgia, Mississippi, Louisiana, North and South

Carolina, and Tennessee. His office will be in Atlanta, Ga.

Harrell was most recently equipment engineer for American Telephone and Telegraph Company Long Lines Department's southern area. He joined the Bell System in 1956, and served in various supervisory positions in Cincinnati, Miami, Jacksonville, Louisville, and Atlanta.

He is an electrical engineering graduate of North Carolina State College and is a member of the Institute of Electrical and Electronics Engineers. ▲

ALL BAND operation at the turn of a switch



THE CONTINENTAL.

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Visual/Allen Model V/A 100G
Master Color Video Tape Recorder



INTERNATIONAL

— First Choice of those
who demand the Best!



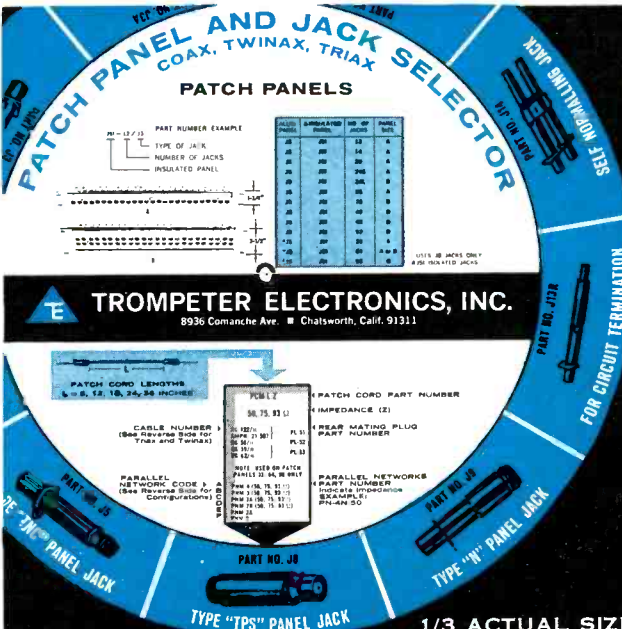
Model SS822 From
2 Track Stereo \$1440

Unsurpassed Performance

ips	db	cps	s/n
15	±2	50—20,000	57
7-1/2	±2	30—20,000	55
3-3/4	±2	30—10,000	51

Write to **Crown International**
Box 1000, Dept. BE-3
Elkhart, Indiana 46517

Put a Crown in Your Future!



TROMPETER ELECTRONICS, INC.
8936 Comanche Ave. ■ Chatsworth, Calif. 91311

FREE

**SELECT
PATCH PANELS,
PATCH CORDS
COAX, TWINAX
AND TRIAX
CONNECTORS
AND CABLE ON
THIS HANDY
CIRCULAR
PRODUCT GUIDE**

1/3 ACTUAL SIZE

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COMPANY _____

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CITY _____ STATE _____

PLEASE ADD ME TO YOUR MAILING LIST
 I NEED ASSISTANCE ON A SPECIAL APPLICATION

Circle Item 62 on Tech Data Card

The Commentator:

"I needed a headset that eliminates noise, provides a noise-canceling broadcast quality microphone, leaves both hands free, is comfortable over long stretches, and really takes punishment. My **Roanwell** does the whole job! Do you read me, Cameraman?"



11 Roanwell TV Specials to choose from — a model for every studio/field use. Users include ABC, CBS, NBC (all nationwide). Write for free brochure.



ROANWELL CORPORATION Roanwell Building
180 Varick Street, New York, N. Y. 10014 (212) YUkon 9-1090 • TWX: (212) 640-4791
Circle Item 63 on Tech Data Card

volt, 1-kc square waves for convenient calibration. A 5-ma current-probe loop is also provided.

Price of the Type R453 is \$2035; weight is approximately 32 lbs.

Circle Item 130 on Tech Data Card



CCTV Cameras

CCTV cameras Type TE-20-A and Type TE-22-A are designed for commercial, industrial, educational, medical, and defense applications. Both **General Electric Co.** cameras can be converted to 2:1 positive interlace by addition of an accessory sync generator module which fits inside the camera and attaches without modification. The TE-22-A also may be driven by pulses from an external sync generator.

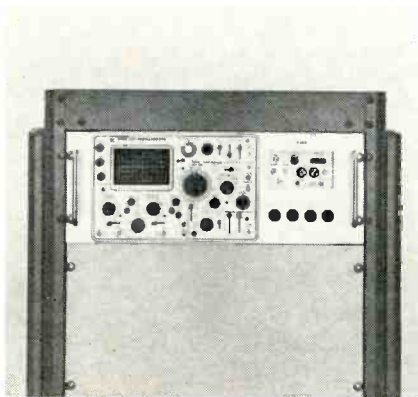
The cylindrical cameras are 11½" long, 5½" in diameter, and weigh 9 lbs. (less lenses). Video performance includes center horizontal resolution of 650 lines (minimum), electronic beam alignment, automatic light compensation with 4000:1 range, usable picture with scene brightness as low as 0.2 foot-lamberts with an f/1.4 lens. For the remote-control TE-22-A, the remote iris, focus, and lens-turret motors mount completely inside the camera frame. An externally mounted remote zoom lens and remote pan-and-tilt unit also are available. The TE-20-A bears a suggested list price of \$1295; the TE-22-A has a suggested list price of \$1350.

Circle Item 131 on Tech Data Card

NEW PRODUCTS

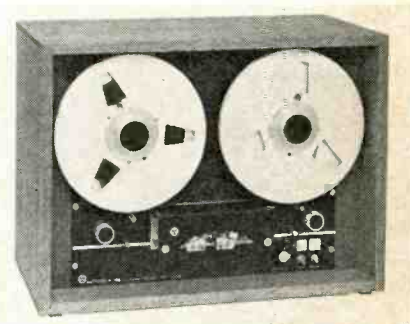
Tektronix, Inc., requires less than 7" of height in a standard 19" rack. The instrument can be withdrawn on slide-out tracks and tilted for servicing.

The Type R453 uses a CRT designed to provide the high writing rate and brightness required for use under high ambient light conditions. Dual-trace sensitivity is to 20 mv/div at 50mc, to 5 mv/div at 40mc, and the channels can be cascaded to obtain 1 mv/div sensitivity at 25mc, single trace. Signal delay allows viewing the leading edge of the triggering waveform. Four operating modes include each channel singly, alternate or chopped electronic switching between channels, or both channels added algebraically. In the added algebraically mode, channel 2 can be inverted for differential operation. Calibrated sweeps extend from 5 sec/div to 0.1 us/div, with a 10x magnifier extending the fastest sweep to 10 ns/div. Full-passband triggering facilities include automatic, single-sweep, and channel 1 only. A light indicates when the sweep is receiving triggers. A calibrator, accurate within 1% in amplitude and frequency, furnishes 1-volt and 0.1-



Rack-Mounted Oscilloscope

Developed primarily for service in high-speed applications, the Type R453 dual-trace oscilloscope, manufactured by

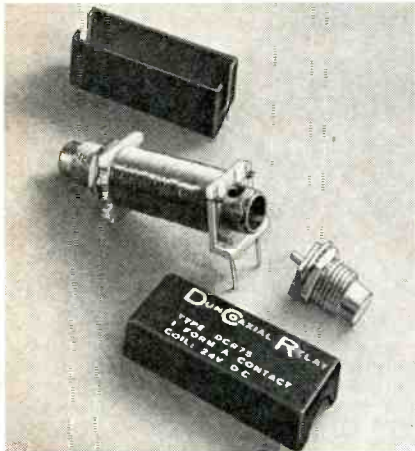


Automatic Logger

A two-direction tape recorder which provides up to 288 hours (12-16 operating

days) of continuous, unattended logging time for broadcast or communications requirements is built by **Metrotech**. The unit features sequenced logic for all record and playback functions, including end-of-play cutoff; it also incorporates solid-state switches and plug-in modular circuits. Overall frequency response is 3 db from 200-4000 cps at 15/32 ips, or 200-2700 cps at 15/16 ips, with adjustable equalization. Signal-to-noise ratio at logging speeds is 40 db minimum.

Circle Item 132 on Tech Data Card

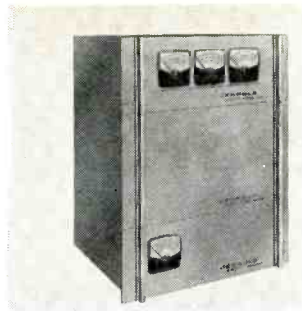


Coaxial Relay

A coaxial relay, using a special high-frequency miniature reed switch as the switching element, has been developed by **Struthers-Dunn Inc.** for use in low-level RF switching for communications and instrumentation applications. Manufacturer's specifications are: VSWR—1.05; insertion loss—less than 0.1db; line isolation—44 db at 100mc with switch open. The unit is housed in a steel enclosure measuring approximately 1 5/16" long by 17/32" square, less connectors. Coaxial connectors are mounted at each end; subminiature RF connectors of 50- and 75-ohm impedance are standard. Coil power requirement is approximately 0.4 watt, with nominal voltages of 6, 12, and 24 volts DC. Contacts are rated for continuous currents of 10 ma or less.

The "Duncoaxial" relay with Form "A" (normally open) contacts is priced in the \$20 to \$40 range, depending upon quantity.

Circle Item 133 on Tech Data Card



2500-mc ETV Systems

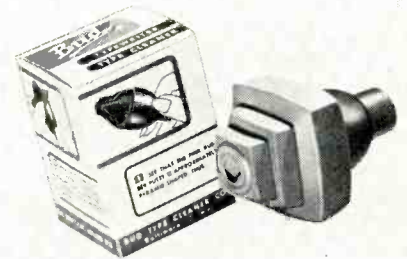
A line of 2500-mc school relay systems operating within the 2500-2686 mc frequency band is available from **Jerrold Electronics Corp.** The systems include transmitters, receiver-converters, antennas, and other accessory equipment.

The transmitter, Model SRT-1, is completely solid-state with the exception of the traveling-wave tube. It consists of three separate units, transmitter, power supply, and exciter-modulator, each of which may be individually mounted. A modular design approach has been used, and a single-channel transmitter with power supply and modulator occupies under 25" of height in a standard 19" rack. Output frequency is any 6-mc channel between 2500 and 2686 mc. The units are engineered for color transmission.

Relay receiver Models SRR-1 and SRR-2 are fully solid-state units, mounted

in cast-aluminum housings for outdoor mounting to the receiving-antenna mast. They convert any four or five alternately spaced channels in the 2500-mc band to alternately spaced VHF channels for viewing on standard VHF television receivers. Noise figures are given as less than 13 db for Model SRR-1 and less than 9 db for Model SRR-2.

Circle Item 134 on Tech Data Card



Teletypewriter Type Cleaner

A nonliquid cleaner for teletypewriter keys is produced by **Bud Type Cleaner Co.** This type cleaner employs a wad of pink plastic putty attached to a handle. The putty pulls the dirt out of the type and leaves no residue. After use, the putty is remolded by hand to provide a new clean surface. Keys of standard office typewriters and data print-out machines may also be cleaned with this product.

The cleaner is priced at \$0.50, lower in large quantities.

Circle Item 135 on Tech Data Card

The Cameraman:

"I've got the whole picture. I needed a headset that's just as comfortable and noise-eliminating as yours but also monitors both program and the director. The **Roanwell** I've got has a noise-canceling mike to boot."



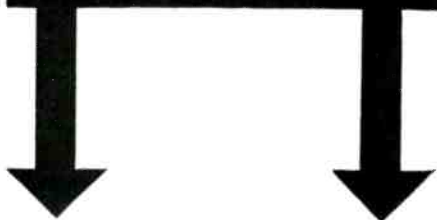
11 Roanwell TV Specials to choose from — a model for every studio/field use. Users include ABC, CBS, NBC (all nationwide). Write for free brochure.



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Circle Item 64 on Tech Data Card

**KEEP TOMORROW'S
NEEDS IN MIND
TODAY WITH BELAR**



**ADD-ON
MONITOR
SYSTEM**

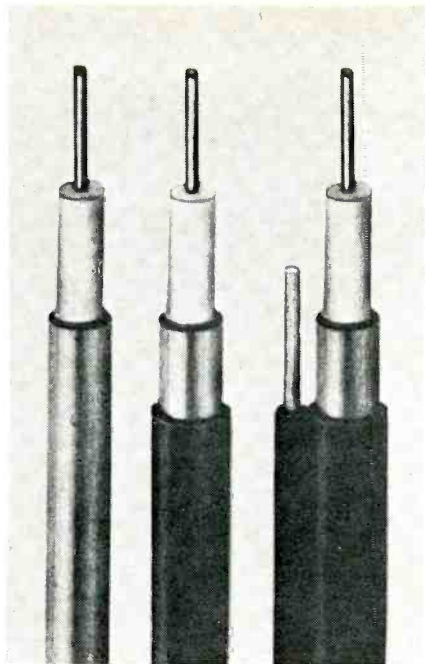


The Belar ADD-ON MONITORING SYSTEM allows the broadcaster to fulfill his monitoring requirements as the needs arise. The basic unit is the FMM-1 Frequency and Modulation Monitor for monaural use, and when requirements call for SCA, add the plug in SCAM-1 SCA unit. For stereo the FMS-1 Stereo unit completes the system.

Today's monitoring requirements make this system a must.

BELAR ELECTRONICS LAB.
1204 Childs Avenue • Drexel Hill, Pa.

Circle Item 65 on Tech Data Card



Cables for CATV

Continuous 1/2-mile lengths of "VIKAL" seamless aluminum sheathed coaxial cables are offered by Viking Industries. The long lengths of 75-ohm cable are available in 0.412", 0.500", and 0.750" O.D. and can be provided with additional protective polyethylene jacketing for direct burial or usage in areas that have corrosion problems. The 0.412 and 0.500 O.D. constructions are also made with optional integrated messenger strand. A "Super-Match Series" of 75-ohm connectors has been designed for use with these coaxial cables.

Circle Item 136 on Tech Data Card



Video Scanning Switch

A scanning switch to provide sequential switching of fourteen twinaxial input channels to a single twinaxial output has been developed by Trompeter Electronics. Switching is controlled by either a front-panel push-button or remote contact closure. A reset or homing function is also provided with both front-panel and remote-control capability. The channel in use is shown at the front panel by lighted indicators. The unit is self-contained and operates from a standard AC power source.

The switch is available in custom configurations and can provide for coaxial, twinaxial, and triaxial circuits. Isolation and crosstalk options are 45, 75, and

What's New IN THE Wide World of AUDIO???

Find out at the AES
Annual Spring
Convention!!!!

See the 13th Annual Spring Convention of the Audio Engineering Society and how it opens the door to the WIDE-WORLD-OF-AUDIO!

- Come see the latest audio equipment . . .
- Learn from the many valuable technical papers being presented.
- Update your professional knowledge on a wide range of subjects.
- Meet old industry friends!

Remember the dates—April 25th thru 28th at the Hollywood Roosevelt Hotel.

Don't miss the largest exhibit of professional audio equipment ever presented in Los Angeles.

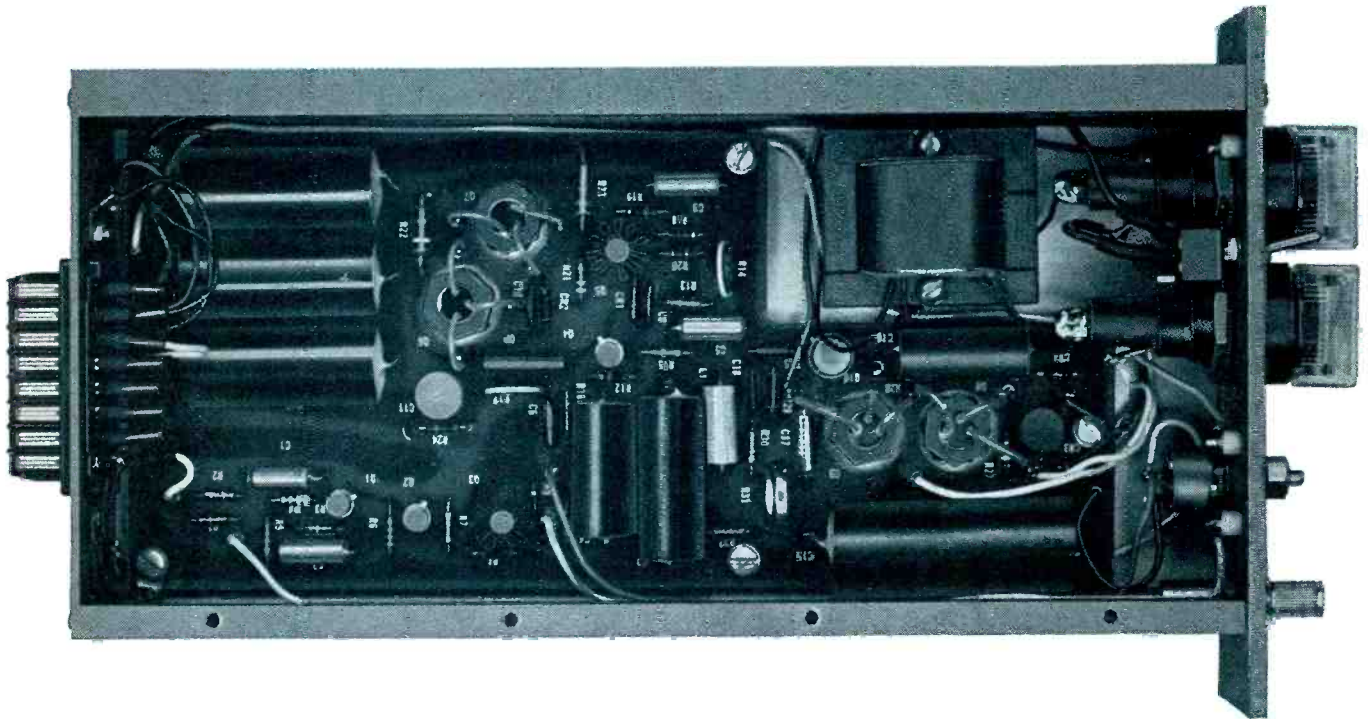
ATTENTION CHIEF ENGINEERS! . . . Write for professional complementary exhibit passes.



For convention details and registration forms . . . call or write convention chairman, Bud Morris, United Recording Corp., 6050 Sunset Blvd., Hollywood, California. (90028)

Phone (213) 469-3983

DYNAIR does it AGAIN!



...several revolutionary new products to be shown
for the **FIRST** time at the 1966 NAB convention!

Yes, DYNAIR — as usual — is setting the pace when it comes to TV accessory equipment. We look for a need and then fill it; it's the secret of our success! Our latest equipment, to be demonstrated at NAB, consists of:

Sideband Analyzer. A low-cost, solid-state TV sideband analyzer which is very compact and operates on all VHF channels. This device is ideal for both the broadcaster and the CATV operator.

AGC Amplifier. A solid-state modular TV AGC amplifier with self-contained power supply.

Sync Delay Unit. A solid-state modular device which allows sync to be delayed up to 91 μ SEC. Adjustable in .1 μ SEC increments with front panel controls!

Video and Pulse DA's. Solid-state modular DA's with built-in power supply. These are the amplifiers the broadcaster has been waiting for.

Along with these, we will also demonstrate our BU-1029A Balanced Universal Amplifier — the inexpensive hum-cancelling device you've been hearing so much about — and our TX-4A Solid-State Audio/Video Modulator, TX-1B Audio/Video Modulator and the RX-4A Solid-State TV Tuner.

Don't miss us. We'll be in booth 211 at the NAB convention, Chicago Hilton Hotel, March 27 thru 30.

If you won't be able to attend the NAB convention, write or call today for complete information on our new products.

Make DYNAIR your first stop at NAB

Remember... Booth 211

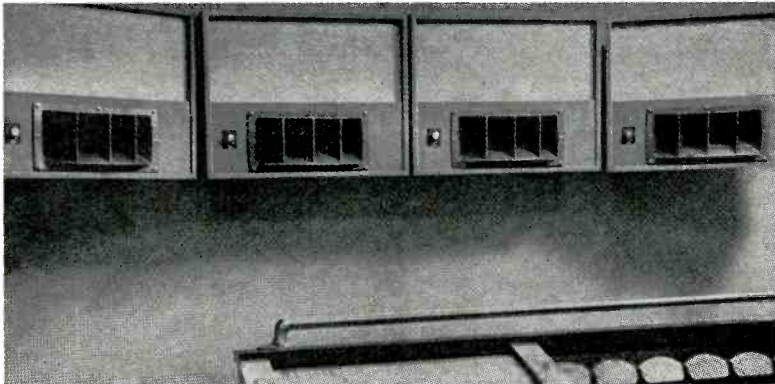
6360 Federal Boulevard
San Diego, California 92114
Telephone (714) 582-9211



Circle Item 53 on Tech Data Card



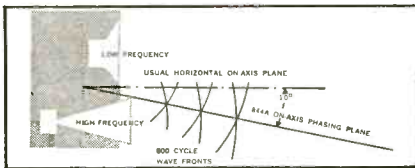
"For studio use, the Altec 844A is an ideal choice."*
**THANKS, AUDIO—THAT'S JUST WHAT OUR NEW
 MONITOR/PLAYBACK SPEAKER SYSTEM IS FOR!**



Four 844A monitors mounted above control console at Universal Recording Corp., Chicago.
 *AUDIO, December, 1965, pg. 50

Glad you found the new 844A to have "smooth, peakless and realistic bass, clean midrange, crisp high end, with excellent separation of instruments."*

We designed it that way. We wanted to give engineers a speaker to fill their need for a studio monitor/playback system of reasonable size and uncompromised performance.



The 844A uses a unique 10° downward, in-phase projection angle to permit hanging the unit flush with the wall above the observation window without bothersome tilting or "aiming" (For floor use, just stand the 844A upside down.)

Neat and compact, the complete two-way system is 24"H, 31"W, 16"D. The 90-pound unit achieves its exceptional sound with two 12" high-compliance woofers, high-frequency driver, and 800-Hz sectoral horn. Coverage is a wide, 90° horizontal and 40° vertical.

SO WE'RE CONSERVATIVE! An easily accessible control on the front of the panel permits high-frequency shelving with the dual full-section network. Driver upper limit is 22,000 Hz.

AUDIO says: "... 22,000 Hz... claimed as the upper limit of the 844A. Actually, it is not, since we could hear (with the microphone), signals up to over 24,000 Hz."*

SEND FOR REPRINT OF COMPLETE AUDIO REVIEW PLUS TECHNICAL DATA

The 844A is a no-compromise 30-22,000 Hz. professional system that easily meets the most demanding studio criteria. At \$327, it is within the budget of any recording or broadcast studio. It is available through those Altec distributors authorized to handle Altec recording and broadcast products. Send for his name and a catalog of Altec's complete line of audio controls, including attenuators, mixers, VU expanders, stereo pan potentiometers, equalizers, filters, and precision networks. Write Dept. B-2.



ALTEC LANSING
 A Division of *ESF* Ling Altec, Inc.
 ANAHEIM, CALIFORNIA
 © 1965 AL

Circle Item 68 on Tech Data Card

110 db. Frequency ranges offered are DC to 20 mc for twinaxial and DC to 60 mc for coaxial and triaxial configurations. Special configurations are available for higher frequencies. Switching speed is 250 milliseconds per step.

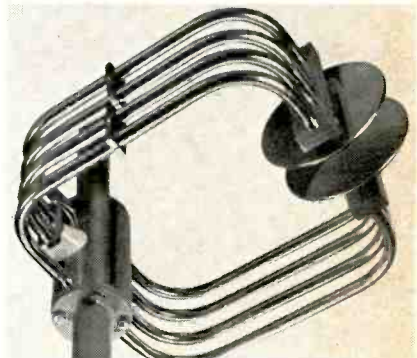
Circle Item 137 on Tech Data Card



50-kw Line Termination

The Model 8762 line termination is designed for connection to the line wherever needed. This Bird unit weighs 13 lbs and resembles in appearance an 18" length of 3" line. It is rated for 50,000 watts continuous power and a VSWR of 1.1 to 500 mc. Water requirement is ten gallons per minute with a permissible water input temperature of 60°C. The unit is available for 50-ohm 3 1/8" flanged or 51.5-ohm 3 1/8" unflanged line. Adapters are available for 1 1/8" or 6 5/8" line. The price for single units is \$3000.

Circle Item 138 on Tech Data card



FM Broadcast Antenna

A broadband FM antenna designed for use in applications including multiplex is manufactured by **Teletronix Engineering Co.** The antennas have vertical and horizontal elements and may be stacked for

Unsurpassed!!!



NEW... LANG SOLID STATE PROGRAM EQUALIZER

Unsurpassed in design, performance and versatility, the new LANG SOLID STATE PROGRAM EQUALIZER PEQ-2 incorporates the finest features found in quality equalizers,

PLUS THESE EXCLUSIVE FEATURES...

- Eight low boost shelf frequencies • Four low droop shelf frequencies • Eight high boost peak frequencies • Six high droop shelf frequencies • Frequency select switches and equalization controls for all boost and droop functions • All controls and switches may be used simultaneously • Low frequency peak boost by use of boost and droop controls • Equalization "on" lamp indicates when equalization is taking place • Engraved stainless steel panel blends harmoniously with other equipment • Plug-in transistor amplifier and power supply cards • Compact size: 3½"x19".

For complete details and new Lang Catalog write:

LANG ELECTRONICS INC.
507 FIFTH AVE., N.Y. 17
For all your audio needs — Look to Lang!

Circle Item 70 on Tech Data Card

COLOR VTR SALES ENGINEER

The television industry's swing to color has created the need for alert, aggressive Sales Engineers. VTR experience essential. If you are the kind of person we're looking for, you're assured an outstanding future with the leading manufacturer of Color Television and related broadcast equipment.

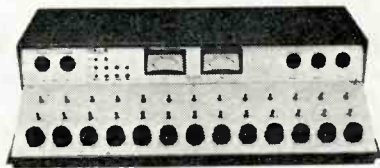
Salary is commensurate with experience and ability. Interviews will be conducted in major cities, or interview travel expenses paid.



Send complete resume or call
Mr. Charles Spicer
VISUAL ELECTRONICS CORPORATION,
356 W. 40th Street,
New York, N.Y. 10018
Telephone (212)
736-5840

higher gain. They are constructed of aluminum with multiplated finishes. Specifications include SWR of less than 1:1.1 when field tuned, and horizontal circularity within +1 db.

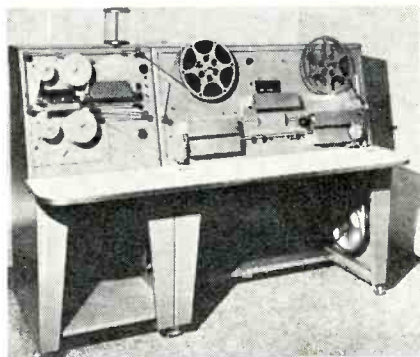
Circle Item 139 on Tech Data Card



Audio Package

An audio package designed primarily for the small television station is available from Alma Engineering. The Model 990 series package includes a 13-channel (26-source) control console with channel amplifiers, a distribution amplifier, and two monitors. Available models provide local control, remote control, or remote control with audio-follow-video. Prices range between \$5,000 and \$10,000, depending on model and auxiliary equipment.

Circle Item 140 on Tech Data Card



Film Inspection and Editing Machine

The Mark IX Model Q film inspector has been designed by the Harwald Company to give professional quality to the film operations of a television station, film library, or film distribution office. It replaces the Model Q unit.

With this machine, films are electronically inspected for breaks or tears; footage is measured or can be timed; splices are counted; the film is cleaned, rewound, and viewed; and the sound is read and can be synchronized. Solid-state electronic circuitry is utilized.

The machine allows commercials to be inserted and removed, and permits film to be viewed at up to 400 feet per minute. Film may be viewed at 50% faster than sound speed and checked for continuity. Optional electronic cleaning and scratch-detector accessories are available.

**MODERNIZE
and
ECONOMIZE**

with

WILKINSON

LIFETIME DIRECT REPLACEMENT SILICON RECTIFIERS

LOW COST!
NO REWIRING!
IMPROVED
OPERATION!



REDUCED HEAT!

REPLACE NOW!

5R4, 5T4 and European Types

Price \$3.95

SAVE and KILL HEAT...
SAVE and STOP FAILURES
...SAVE and IMPROVE
OPERATION...

with

WILKINSON

DIRECT REPLACEMENT SILICON RECTIFIERS

REPLACE WITHOUT
REWIRING THESE TUBES

5U4, 5V4, 5W4, 5Z4, 5V3, 5Z3,
5Y3, 5AZ4, 5AR4, 5AW4, 5AU4

Price \$2.95

For complete details write:

WILKINSON ELECTRONICS, INC.

1937 MACDADE BLVD. WOODLYN, PA. 19094
TELEPHONE (215) 874-5236 874-5237

Circle Item 71 on Tech Data Card

Prices for these units are \$5950 for the Mark IX Model Q, \$1500 for the electronic cleaning machine, and \$2900 for the scratch detector.

Circle Item 141 on Tech Data Card



Transportation Cases

A line of standard glass fiber transportation cases is being manufactured to military specifications by Skydyne, Inc. Over 30 standard case configurations with a variety of shock and vibration absorbing interiors are available and being used by a major network. Interiors are fabri-

cated to various equipment requirements from polyurethane or polyethylene foam.

Circle Item 147 on Tech Data Card



Hydraulic Crab Dolly

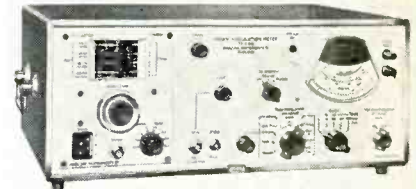
The crab dolly shown in the illustration is 26 $\frac{3}{4}$ " wide and 39" long. In addition to crabbing and rear-wheel tracking, it also offers front-wheel steering. The telescopic camera lift of this Color-Tran equipment is operated by bottled carbon dioxide. The CO₂ bottles are equipped with a quick-change fitting, requiring no tools. Maximum height (from floor) of the lift, including head mount is 56"; minimum height is 25". (When using

low-boy only, in "low-low" position, a 9 $\frac{1}{2}$ " height from the floor is achieved.) The height is continuously adjustable.

A shifting mechanism permits pre-selection of two steering modes, with automatic shifting of wheel drive within the same shot.

The dolly can be dismantled, without use of tools, and packed into two fitted carrying cases. The unit is constructed of cast aluminum and weighs 185 lbs without the camera lift, which weighs 45 lbs.

Circle Item 148 on Tech Data Card



Modulation Monitor

This transistorized FM/AM modulation meter, Model 2300, covers a frequency range from 4 to 1000mc. measures deviation in five ranges— ± 5 , ± 15 , ± 50 , ± 150 , and ± 500 kc—at modulating frequencies up to 150 kc, and is relatively unaffected by the presence of spurious AM up to 80%. The local oscillator of

NOW...THE IDEAL COAXIAL PATCH FIELD for TV STATIONS consists of:

COTERM



QUICK DISCONNECT CONNECTOR



- Normal thru coaxial circuits without use of patchcords.
- Source automatically terminated in proper impedance when load side is patched.
- Permits testing of active circuit without interruption of signal.
- Extremely high density (22 jacks on 19" x 1 $\frac{3}{4}$ " panel).
- **COJAX** has all features of COTERM except self-termination of source when load side is patched. Accepts same patchcord as COTERM.

- Unique snap locking feature permits easy insertion and removal even in extremely high density patch fields.
- Easy to install using standard tools and available for wide range of coaxial cables.

We stock a complete line of panels and related accessories.

COOKE Engineering Company

735 N. Saint Asaph Street, Alexandria, Va.
TWX 703-931-4200 Telephone: 703-548-3889

Circle Item 73 on Tech Data Card

COMMUNICATIONS SYSTEMS

Exceptional growth opportunities with
expanding national multi-plant corporation.

TECHNICAL SALES SPECIALIST

Responsible for territorial sales carrier and microwave systems, CATV and ETV, components and turn key systems. Prefer E.E. degree or 5 years technical sales experience with telephone or CATV industry.

FIELD ENGINEER

Supervise sub-contract installations, carrier, CATV, ETV and outside telephone plant installations; act as liaison with public utilities, contractors and turn key supplier. Requires 5 years outside plant engineering or construction for utilities.

SYSTEMS ENGINEER

To design telephone transmission, CATV, ETV, and CCTV systems; ability to interpret signal survey data and evaluate industrial electronic equipment. EE degree preferred and 2 years experience microwave, carrier, ETV or CATV system design.

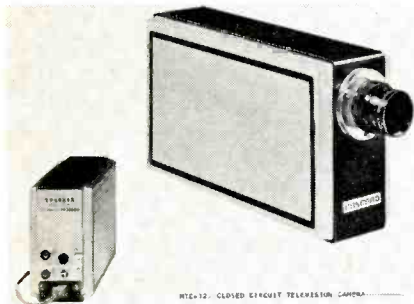
Please send resume including
salary requirements to:

Dept. 148, Broadcast Engineering

An Equal Opportunity Employer

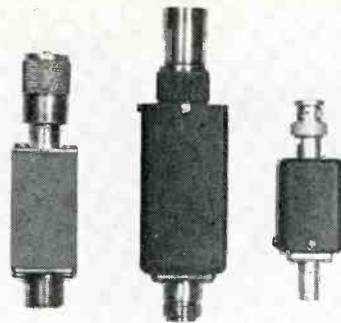
this **Marconi Instruments** monitor may be locked to harmonics of internal crystals in the range from 20mc to 1000mc, and provision is made for driving with an external local oscillator. De-emphasis circuits are provided, and a 15-kc low-pass filter may be switched in to limit the demodulated signal bandwidth. AM measurement is provided in ranges of 30% and 95%; positive and negative peaks are selected by a switch. The price is \$1735.

Circle Item 142 on Tech Data Card



Automatic CCTV Camera

The solid-state MTC-12 closed-circuit camera is intended to retail for less than \$300. This **Concord** camera contains such design features as automatic adjustment to different light conditions, a sensitive vidicon tube, RF or video output, and high signal output for long-distance transmission. Output of the camera appears on channel 5 or channel 6. The unit measures 3" x 5¼" x 9¾".

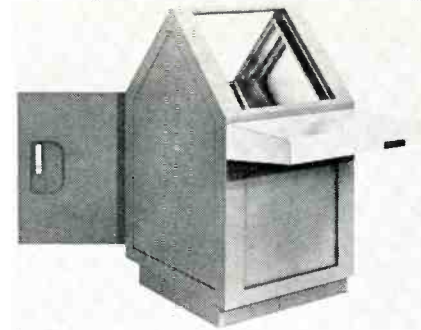


Fixed Pad Attenuators

This line of **Holland Electronics**, fixed-pad attenuators is available for pulse, video, and RF applications. Enclosed metal construction provides shielding and protects the low-noise, 1% tolerance resistors used in the attenuation networks.

Attenuators are available in any desired db value from 1 through 60db in 1db steps. Standard impedances are 50, 75, and 93 ohms. Standard connectors are UHF, N, and BNC. Type UHF and BNC attenuators are rated at ½ watt; type N, at 1 watt. Special units can be supplied with any impedance or attenuation, multiple outputs, different input and output connectors, type TNC and C connectors, test terminals, etc. Impedance matching attenuators are also available.

Circle Item 143 on Tech Data Card



Low-Silhouette Enclosures

Welded aluminum enclosures of a type used at Cape Kennedy and Marshall Space Flight Center are commercially available from **Zero Manufacturing Co.** These consoles are made in the standard 19" and 24" panel widths, but are so designed that their overall width is less than the usual unit, permitting more cabinets to be installed in a given area. Depth is 30½"; overall height is 45¾". An open top is provided on both sides for easier installation and servicing of electronic gear. A writing surface (shown) is optional. RFI shielding is integral, but may be optionally deleted where not required. Both NASA and MIL specifications are met in the design, components, and test compliances. Finish is gray enamel. Other cabinet designs are also available.

Circle Item 144 on Tech Data Card

REMOTE CONTROL with a DIFFERENCE

For your **UNIQUE STATION** we can provide Unique custom modifications to our 615 series Remote Control quickly, cheaply, and efficiently.

Basic Complete Model 615-C for 16 functions including 4 meters.
still \$895

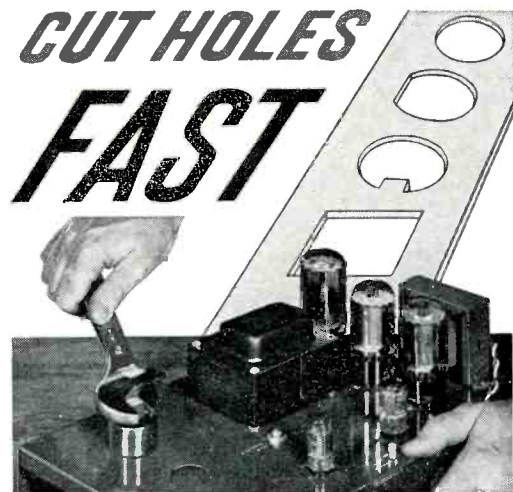
NO

Dials
Steppers
Transistors
Tubes

For more information circle
Bingo number or call us collect
at 215/839-3250.

BIONIC INSTRUMENTS, INC.
221 Rock Hill Road
Bala Cynwyd, Pa. 19004

Circle Item 75 on Tech Data Card



GREENLEE CHASSIS PUNCHES

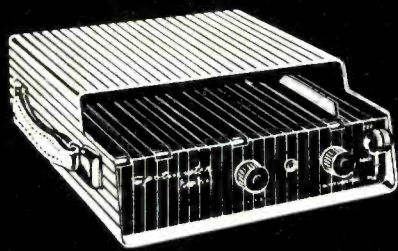
Make accurate, finished holes in 1½ minutes or less in metal, hard rubber, and plastics. All standard sizes . . . round, square, key, or "D" shapes for sockets, switches, meters, etc. At your electronic parts dealers. Write for literature.

GREENLEE TOOL CO

Division of Greenlee Bros. & Co.
1854 Columbia Avenue, Rockford, Illinois 61101

Circle Item 74 on Tech Data Card

SPOTMASTER



PortaPak I Cartridge Playback Unit



Your time salesmen will wonder how they ever got along without it! Completely self-contained and self-powered, PortaPak I offers wide-range response, low distortion, plays all sized cartridges anywhere and anytime. It's solid state for rugged dependability and low battery drain, and recharges overnight from standard 115v ac line. Packaged in handsome stainless steel with a hinged lid for easy maintenance, PortaPak I weighs just 11½ lbs. Vinyl carrying case optional.

Write or wire for full information.

Spotmaster

BROADCAST ELECTRONICS, INC.

8800 Brookville Road
Silver Spring, Maryland

Circle Item 76 on Tech Data Card



Studio Turntable System

The EMT 930st stereo/mono broadcast turntable system furnishes line-level outputs from an equalizer/amplifier. Specifications include a wow and flutter figure of 0.03% rms, rumble figure better than NAB standard, and starting time of 0.4 sec with output cut off for close cueing. The turntable is equipped with remote start/stop control, strobe turntable, back-up markings for 33⅓, 45, and 78 rpm, synchronous motor, EMT-Ortofon stereo cartridge and arm with lowering device, and groove-illumination light. Price, less console, is \$1295 from **Got-ham Audio Corp.**

Circle Item 145 on Tech Data Card



Dynamic Microphones

Dynamic units for use in such applications as PA systems, tape recorders, learning labs, and professional equipment have been added to the **Sonotone** microphone line. A choice of impedances provides usages with solid-state and tube equipment. The impedances are 200, 600, 10,000, and 50,000 ohms.

The diaphragms are made of polyester film to resist the effect of high temperature and humidity, and the cartridge cups are encased in rubber sleeves to reduce handling and clothing noises and to resist shock. The units are equipped with shielded cable and phone plugs. List prices are \$32.50 for the Model DM-70 (illustrated) and \$37.50 for the Model DM-10. ▲

Circle Item 146 on Tech Data Card

Delta News

Vol. V

1966

DELTA'S OPERATING IMPEDANCE BRIDGE

MODEL OIB-1

We quote our designer: "Operating Impedance is the complex ratio of the voltage applied to a load as compared to the current flowing in the load when it is operating under normal power in normal environment. In many cases, this impedance differs substantially from the 'self impedance' or 'cold impedance' of the load . . . many loads have operating impedances which vary with applied power levels. Meaningful impedance measurements must therefore be made at normal power level.

"Bridges of classical design are ordinarily incapable of handling large

amounts of power, and measure only the 'cold impedance' of the load."



Delta's OIB-1 will handle 5 kw through power at VSWR ≤ 3, from 500 kc to 5 mc, or 10 kw intermittently below 1.7 mc.

For more information, write

DELTA ELECTRONICS, INC. 4206 Wheeler Ave., Alexandria, Va. 22304

Circle Item 77 on Tech Data Card

POSITIONS IN COLOR TV ENGINEERING

The sudden industry wide acceptance of PLUMBICON Color Cameras has created many entirely new engineering positions in the areas of systems planning, field engineering, equipment packaging, circuit design. Engineers with live camera TV station experience and who are looking for personal advancement will receive training in this new equipment which is already playing a major role in the present shift to color.

Salary is commensurate with experience and ability. Locale: New York and Los Angeles. Relocation assistance provided. Interviews possible in major cities or interview travel expenses paid.

Send complete resume or call Mr. C. E. Spicer or Mr. G. H. Wagner, Visual Electronics Corporation, 356 West 40th Street, New York, N. Y. 10018, telephone (212) 736-5840.



VISUAL ELECTRONICS CORPORATION
NEW CONCEPTS
IN BROADCAST EQUIPMENT

BROADCAST ENGINEERING

ENGINEERS' TECH DATA

AUDIO & RECORDING EQUIPMENT

90. ATLAS SOUND — Catalog 565 illustrates and describes public-address loudspeakers, microphone stands, and accessories for commercial sound applications.
91. AUDIO DEVICES — Technical data sheet features tape products including lubricated tape for continuous-loop cartridges; dealer list is also provided.
92. BAUER — Literature details solid-state eight-channel stereo console; unit has 30 inputs.
93. CROWN — Technical-specifications sheet supplies data on two-channel solid-state monitor amplifier with 20 watts per channel sine-wave power rating.
94. MAGNE-TRONICS — Folder titled "The Big Idea . . . Motivation" describes background-music service.
95. QUAM — General catalog No. 65 lists speakers for color-TV replacement, PA systems, high-fidelity, and general replacement.
95. VIKING OF MINNEAPOLIS — Pictorial folder shows plug-in components, mechanism, outside views, and specification chart for Model 230 tape transport and Models RP110 and RP120 amplifiers.

COMPONENTS & MATERIALS

97. AMPEREX — Condensed catalog lists line of semiconductors.
98. DENSON — Catalogs 965S-1 and 965S-1 SPECIAL feature new, used, and surplus radio and TV broadcasting equipment. The SPECIAL edition includes schematics and construction features.
99. HILL ELECTRONICS — Four-page manual covers the specifications for, selection and ordering of oven and non-oven oscillators with frequencies from 1 cps to 100 mc.
100. MULLARD — Flier sheets provide cross-reference data and price list on tubes for special-purpose, industrial, and broadcast applications.
101. OAK — Forms SP-214, SP-216, and SP-187 provide specifications, prices, and cross-reference for pushbutton, lever, rotary, and slide switches.
102. SWITCHCRAFT — New-product bulletin No. 157 describes seven-way stereo-speaker-selector switch mounted on brushed brass or brushed stainless steel wall plate.

MICROWAVE DEVICES

103. MICRO-LINK — Planning guide covers 2500-mc ITV systems. Brochures and specification sheets provide data on Model 420A portable link and Model 600 fixed link.
104. MICROWAVE ASSOCIATES — Bulletin 9021 gives specifications and photos detailing solid-state TV-relay equipment.

MOBILE RADIO & COMMUNICATIONS

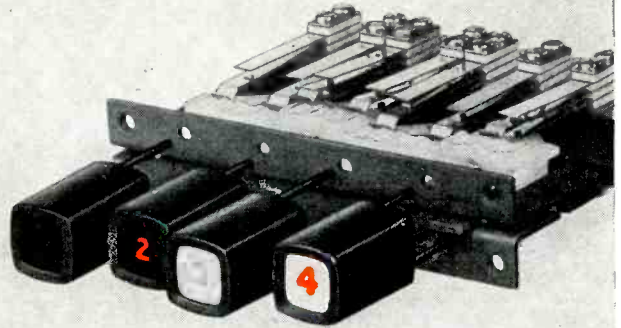
105. MOSLEY ELECTRONICS—Catalog lists complete line of 1966 Citizens-band equipment.

POWER DEVICES

106. HEVI-DUTY — Bulletin 7-22 supplies data on line-voltage regulator using saturable-core reactor.
107. SOLA — Twelve-page two-color technical bulletin provides photos, charts, and schematics covering line-voltage regulators.

March, 1966

NOW! "ILLUMINATE" YOUR NON-ILLUMINATED SWITCHES!



ECONOMICALLY . . . WITHOUT
LAMPS, WIRING OR HEAT

SWITCHCRAFT'S REVOLUTIONARY NEW GLO-BUTTON*

THE NEW THIRD DIMENSION IN SWITCH BUTTONS

Get this: no lamps, no wiring, no heat, no separate power supply—yet, when you push these ingenious buttons they "glow" brightly giving a clear, visual indication of the circuit's condition! They add a brilliant, problem-solving third choice to the engineer who's looking for the instant visibility of illuminated buttons (especially on crowded control panels) with the multiple economies and simplicity of non-illuminated buttons.

SIMPLE, FOOL-PROOF, POSITIVE OPERATION . . .



Pusher "legs" on back of button are connected to internal fluorescent illuminator which actuates the "glow." When you push the button "in" the internal fluorescent illuminator is put in contact with the front screen and legend glows brightly . . . even in very high or very low ambient light situations. Release, it's out. Won't lose its brilliance. 2 types: white-face button has visible legend whether button is "in" or "out," black-face button has visible legend only when button is "in."

VIRTUALLY UNLIMITED APPLICATIONS . . .

Use the "Glo-Button" Series X on all pushbutton switches with standard .050" x .187" plungers, such as Switchcraft Series 7000, 8000 and 35000 "Multi-Switches," or other switches with maintained plunger action and maximum fallback of 1/16". Ideal for computers, control panels, instrumentation, commercial and industrial equipment, or any place that pushbutton switches must be combined with economical, reliable visual signaling.

Try one in your own station's control panel: Write for a free sample and Bulletin 155 on your letterhead, or see your local switchcraft authorized industrial distributor for immediate delivery at factory prices.

* PATENT APPLIED FOR

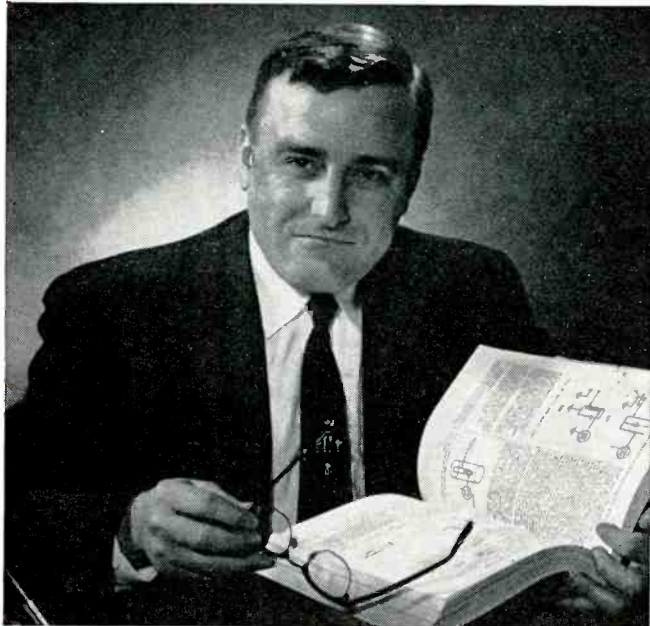
SWITCHCRAFT
INC.

5535 North Elston Ave., Chicago, Illinois 60630
CANADA: Atlas Radio Corp., Ltd., 50 Wingold Ave., Toronto, Ontario

Circle Item 79 on Tech Data Card

123

How to get... and hold a top job in AM-FM-TV...



*a message from Carl E. Smith, E. E.,
Consulting Broadcast Engineer*

In over 30 years in broadcasting, I've met hundreds of really top flight technical men and 98% of them were at or near the top because they "knew their stuff". There is no substitute for knowledge.

Even if a friend or relative can get you a good job, you'll fail mighty fast if you can't produce results. The first good emergency will separate the men from the boys. I've seen it happen again and again . . . when things start to go sour and the signal isn't what it should be, skill is the only acceptable solution.

To get and *hold* a top engineering job, you need advanced technical education. And you can get it through a program of college-level study used by broadcasting engineers for 30 years. Cleveland Institute's Advanced Communications Engineering Course has helped thousands of men prepare themselves for key positions in radio and television engineering. It can do the same for you.

So don't let that next promotion pass you by. Send the coupon below for full details. There is no obligation. I want you to know what you can accomplish . . . if you want to get ahead. If the coupon is gone, write: Cleveland Institute of Electronics, 1776 E. 17th St., Dept. BE-24, Cleveland, Ohio 44114.

SEND COUPON TODAY

Cleveland Institute of Electronics

1776 E. 17th Street, Dept. BE-24
Cleveland, Ohio 44114

Please send me *free* information on your Advanced Communications Engineering Course . . . without obligation.

Name _____
(please print)

Address _____ County _____

City _____ State _____ Zip _____

A leader in communications training . . . since 1934

REFERENCE MATERIAL & SCHOOLS

108. CLEVELAND INSTITUTE OF ELECTRONICS — New pocket-sized, plastic "Electronics Data Guide" includes formulas and tables for: frequency vs. wavelength, db, length of antennas, and color code.
109. HOWARD W. SAMS — Literature describing popular and informative technical publications; includes latest catalog of technical books.
110. PRD ELECTRONICS—Application note No. 18 contains tables of db return loss vs. reflection coefficient, universal ratio function "U," and graphs of return loss (db) vs. VSWR.

STUDIO & CAMERA EQUIPMENT

111. CLEVELAND ELECTRONICS — Data concerns modifications using new yoke assembly to update 3" image-orthicon camera.
112. COLORTAN INDUSTRIES — 1966 general catalog lists technical data on quartz-iodine lighting equipment and accessories; portable and studio-type dimmer-control systems are also covered.
113. TEXWIPE — Folder includes sample and technical data on cleaning cloth for optical lenses.
114. TV ZOOMAR — Product sheets supply specifications on remote-controlled lenses for vidicon and IO use; pocket guide gives field-coverage data for vidicon-camera lenses. Literature features remote-control pan and tilt equipment.

TELEVISION EQUIPMENT

115. AMPEX — Brochure V022 and data sheet V023 contain descriptions, specifications, and applications for portable video tape recorder and complete TV recording system.
116. COHU — Four-page bulletin 6-382 includes broadcast-studio and closed-circuit switching systems providing specifications for switching matrix and switcher controls.
117. COLORADO VIDEO — Data sheet covers Model 401 video x-y plotter.
118. VITAL — Data sheets give specifications of Model VI-500 stabilizing amplifier, Model VI-10A video distribution amplifier, and Model VI-20 pulse-distribution amplifier.

TEST EQUIPMENT & INSTRUMENTS

119. ANALAB — Data sheets list specifications and applications for automatic photo-recording equipment for transients and spectrum-analyzer plug-ins for oscilloscopes.
120. COLUMBIA ELECTRIC — Eight-page catalog Form TT-166 describes applications and operating principles for AC/DC clamp-on ammeters.
121. HICKOK — Brochures feature Model DMS-3200 digital measuring system and Model 580 tube tester.
122. WORKMAN — Catalog sheet No. 92C covers a transistor/diode tester which uses a tone signal to indicate the condition of the component under test.

TRANSMITTER & ANTENNA DEVICES

123. AIR SPACE DEVICES — Eight-page brochure STC5-65-10M provides photos featuring use of safety device for climbing towers; specifications and installation data are also included.
124. BARNSTEAD — Photos and descriptive data feature cooling-water repurification loop for UHF transmitting tubes.
125. GATES — Four-page brochure includes photos, operational data, and specifications for 20-kw FM transmitter. New 48-page catalog No. GS-4, in Spanish, details full company line of transmitters and audio equipment.
126. MOSELEY ASSOCIATES — Six-page brochure describes solid-state 10- and 21-channel remote-control systems.

Advertisers' Index

Albion Optical Co., Inc.	110
Altec Lansing Corp.	118
American Electronic Lab.	48
Andrew Corp.	101
Automatic Tape Control, Inc.	87, 107
Audio Engineering Society	116
Ball Bros. Research Corp.	37
Belar Electronics Lab.	116
Belden Mfg. Co.	9
Broadcast Electronics	102, 111, 122
Bionic Labs.	119
Boyton Studios	86
Bradford Information Systems	44
CBS Labs., Inc.	5
CCA Electronic Corp.	98
Cohu Electronics	3
Cleveland Institute of Electronics	123
Collins Radio	6
ColorTran	92
Cook Engineering Co.	120
Crown International	113
Dage TV Co.	cover 3
Delta Electronics Corp.	121
Dynair Electronics	117
Eastman Kodak Co.	35
Eitel-McCullough, Inc.	47
Fairchild Recording Co.	6, 111, 125
Gates Radio Co.	95
Gardner, C. L. Construction Co.	103
General Electric Co.	12
Greenlee Tool Co.	121
International Nuclear Corp.	108
Jampro Antenna Co.	10
Jerrold Electronics Corp.	13
Lang Electronics, Inc.	103, 119
Lenkurt Electric Co.	11
Magnecord, Midwestern Instruments	33
McMartin Industries, Inc.	112
Memorex Corp.	91
Miratel Electronics	109
Moseley Assoc.	96
Northern Electric Co., Ltd.	39, 40, 41, 42
Nortronics Co., Inc.	109
Norelco	29, 30
QRK Electronics	103
Raytheon Co.	106
RCA Broadcast and Comm. Prod. Div.	19, 20
RCA Components and Devices	cover 4, 104, 105
Revere Mincon	27
Riker Industries	cover 2
Roanwell Corp.	114, 115
Rohn Mfg. Co.	100
Sarkes Tarzian, Inc.	88, 89
Sennheiser Electronic Corp.	99
Shure Brothers, Inc.	8
Sparta Electronics Corp.	46
Syncron	107
Standard Electronics	83
Switchcraft, Inc.	123
Tape caster	45
Telemet Co.	85
Telepro Industries, Inc.	49
Trompeter Electronics	113
Viking of Minneapolis	82
Visual Electronics	44, 100, 107, 109, 111, 113, 122
Vital Industries	97
Ward Electronic Industries, Inc.	7
Wilkinson Electronics	119
Zoomar	90

NOW! GIVE YOUR FM STATION 100% MODULATION CAPABILITY



WITH THE FAIRCHILD CONAX!

Now! The FAIRCHILD CONAX enables FM radio stations to increase the signal strength and apparent loudness potential by the effective control of high frequencies which cause trouble when pre-emphasized. High frequencies add sparkle and "bite" to program material and pre-emphasis improves signal-to-noise ratios. When the two are combined, however, it often becomes necessary to decrease the station's power to eliminate over-modulation possibilities.

How can high frequencies, which normally contain less energy than mid or low frequencies, cause trouble when pre-emphasis is applied? Simple! High frequency information, such as the jingling of keys, the sharp "s", the muted trumpet, cymbals, or other high frequency sounds, often become high frequency "spikes" when pre-emphasized thereby exceeding the FCC 100% modulation limitation. By making high frequency information "spike-free" (through the use of inaudible super fast attack and release times) the FAIRCHILD CONAX now allows the use of the full high frequency pre-emphasis curve.

HERE'S A STEP-BY-STEP GRAPHIC ANALYSIS OF THE FAIRCHILD CONAX IN ACTION...

FIG A - Normal program material with program information distributed in mid range - 500 to 5000 cycles.

FIG B - Same program material pre-emphasized. Still trouble-free.

FIG C - Program material with a high percentage of high frequency material in its content - such as found on today's records.

FIG D - Same high frequency program material (hot) after pre-emphasis. Note high frequency "spikes" now exceed 100% of modulation.

FIG E - Same program material now controlled by the FAIRCHILD CONAX action.

* Note even with pre-emphasis the lack of troublesome high frequency "spikes" that normally would cause over-modulation.

The FAIRCHILD CONAX has an exclusive patented preview circuit which applies a standard pre-emphasis curve to any entering signal. The patented FAIRCHILD CONAX frequency dividing and controlling network allows accurate and inaudible control only of the troublesome high frequency "spikes". This means you can transmit a signal with high average modulation level up to 3 db higher, utilizing the full apparent loudness possibilities of your rated power. In FM stereo and SCA transmission, the FAIRCHILD CONAX prevents splatter between the SCA channel and the stereo channel, allowing you to use both of these dollar producing signals to their fullest. Now full modulation capabilities can be realized without the danger of FCC citation or any change in the transmitted sound of your signal. Now FAIRCHILD CONAX gives your station that brighter and louder sound... the sound that sells. **AVAILABLE IN MONO OR STEREO COMPACT SIZE!**

Write to FAIRCHILD - the pacemaker in professional audio products - for complete details.

FAIRCHILD

RECORDING EQUIPMENT CORPORATION
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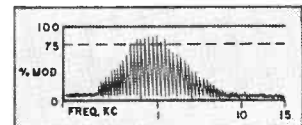


FIG A

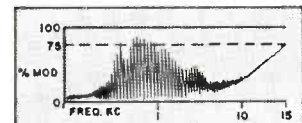


FIG B

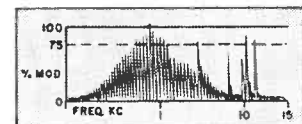


FIG C

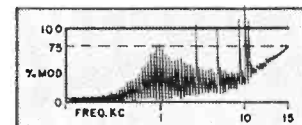


FIG D

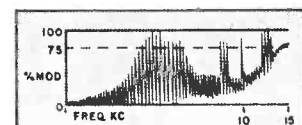


FIG E

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Advertising rates in the Classified Section are ten cents per word. Minimum charge is \$2.00. Blind box number is 50 cents extra. Check or money order must be enclosed with ad.

The classified columns are not open to the advertising of any broadcast equipment or supplies regularly produced by manufacturers unless the equipment is used and no longer owned by the manufacturer. Display advertising must be purchased in such cases.

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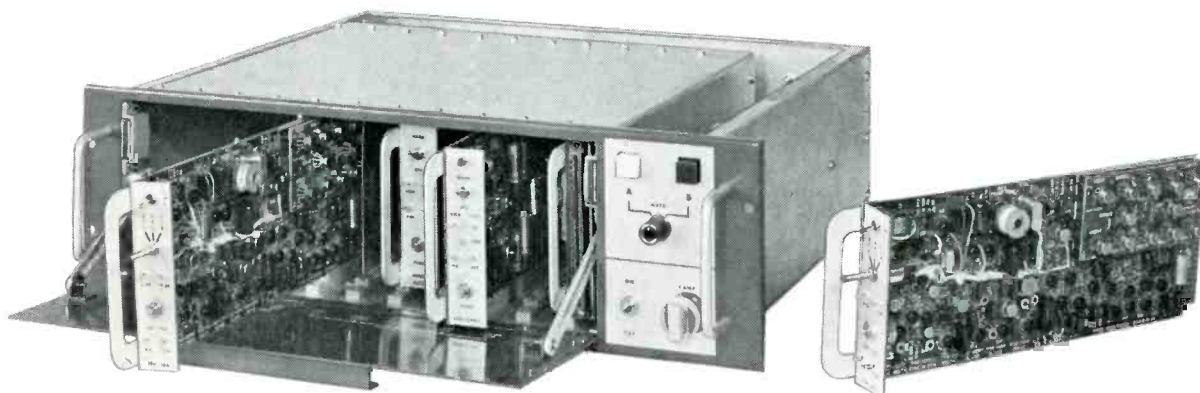
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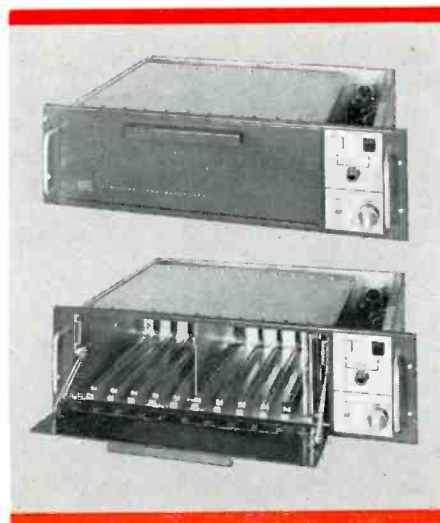


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