

Broadcast Engineering

*the technical journal
of the broadcast-
communications industry*



COLOR
COLOR
COLOR
COLOR
COLOR
COLOR
COLOR
COLOR
COLOR
COLOR

WAIT

TILL YOU SEE

THE NEW

RIKER

SWITCHER

AT THE
SHOW NAB

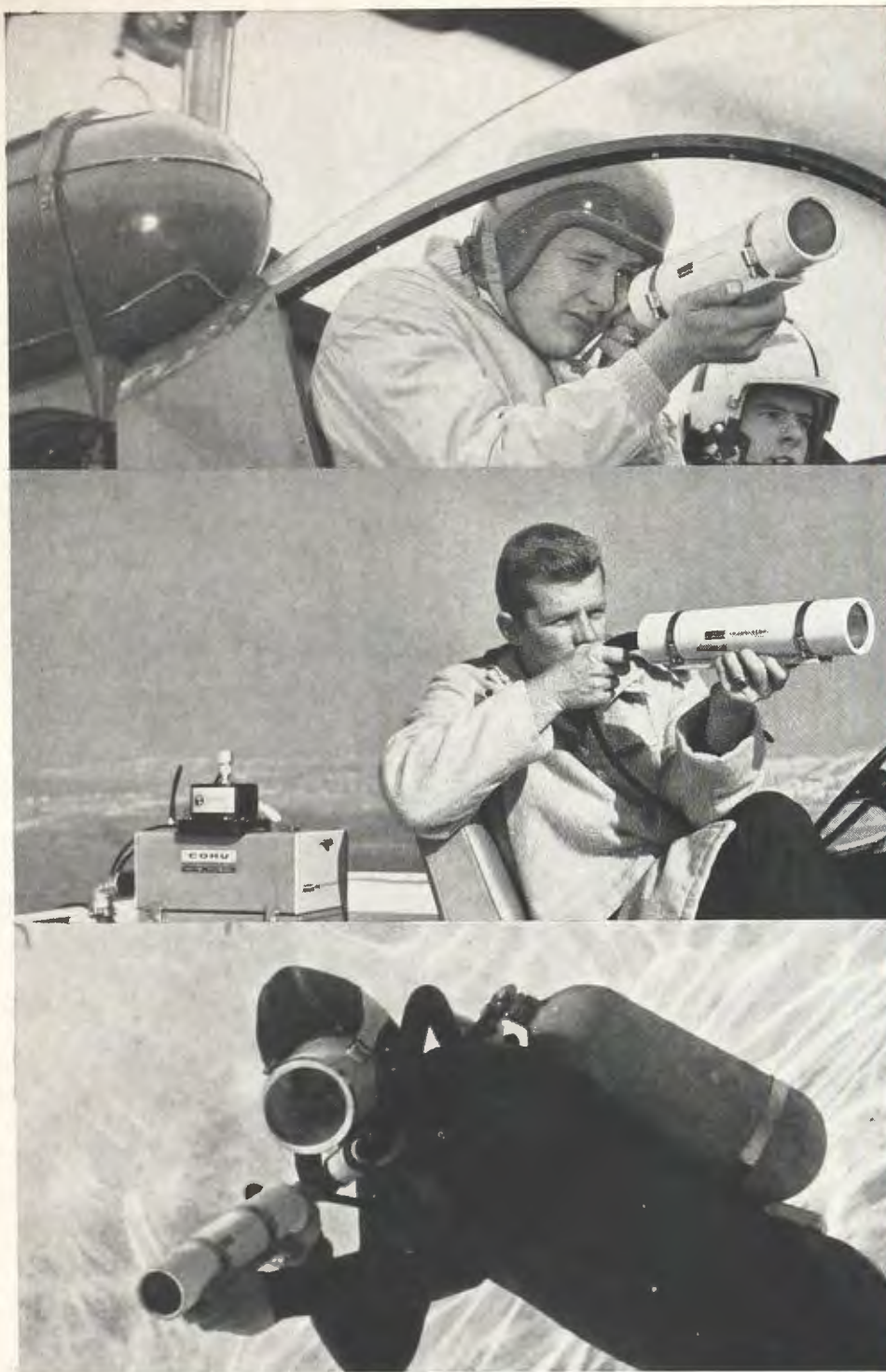
RIKER INDUSTRIES, INC.



...thinking always of tomorrow

Head Office: Huntington Station, New York Phone 516-444-1344. Branches: Los Angeles, Dallas, Washington, D.C.

Circle Item 1 on Tech Data Card



NEW
KIN TEL TV CAMERAS
LET YOU

**send
direct,
visual
reports
from
just about
anywhere!**

And under just about any kind of condition. In deep space. In explosive environments. In temperatures ranging from -17°C to $+70^{\circ}\text{C}$. In water. In pipelines, deep wells, boilers (its 3-inch diameter barrel permits operation in restricted areas).

In addition, KIN TEL's new 2000 series cameras are available with a built-in 4:1 or 10:1 zoom lens; provide the clearest pictures available anywhere—up to 700 lines of horizontal resolution; and—thanks to all solid-state circuits—are as trouble-free as you can buy.

Send us your RFQ. The 2000 series cameras are the newest addition to one of the industry's largest lines of television equipment. With KIN TEL's three basic TV systems and 207 separate in-stock components, KIN TEL can help you custom build a completely checked-out TV system to fit your exact needs. And do it faster and less expensively than you thought possible. Contact us or the KIN TEL representative near you.

Circle Item 2 on Tech Data Card

Box 623
San Diego, California 92112
Phone (714) 277-6700

COHU
ELECTRONICS, INC.
KINTEL DIVISION

publisher
Howard W. Sams
general manager
Donald W. Bradley
editor
William E. Burke
managing editor
James M. Moore
ass't to the editor
Norman D. Tanner
associate editor
David I. King

regional editors
George M. Frese, Northwest
Thomas R. Haskett, Central
Howard T. Head, Wash., D.C.
Robert A. Jones, Midwest
George C. Sitts, East
research librarian
Bonny Howland

production
Esther M. Rainey, Manager
Paul A. Cornelius, Jr., Photography

circulation
Pat Tidd, Manager
advertising sales offices
Hugh Wallace, Sales Manager

midwestern
Roy Henry
Howard W. Sams & Co., Inc.
4300 West 62nd St.
Indianapolis, Ind. 46206
291-3100

central
Paul Houston
Howard W. Sams & Co., Inc.
4300 West 62nd St.
Indianapolis, Ind. 46206
291-3100

eastern
Gregory C. Masefield
Howard W. Sams & Co., Inc.
3 West 57th St.
New York 19, New York
MU 8-6350

southwestern
C. H. (Jake) Stockwell
C. H. Stockwell Co., 4916 West 64th St.
Mission, Kansas, RA 2-4417

western
LOS ANGELES OFFICE
G. R. (Jerry) Holtz
The Maurice A. Kimball Co., Inc.
2008 West Carson St., Suites 203-204
Torrance, California, 90501
320-2204

SAN FRANCISCO OFFICE
The Maurice A. Kimball Co., Inc.
580 Market St., Room 400
San Francisco 4, California
EX 2-3365

foreign
PARIS 5, FRANCE
John Ashcraft, 9 Rue Lagrange
ODEON 20-87

LONDON W.C. 2, ENGLAND
John Ashcraft, Leicester Square
WHITEHALL 0525

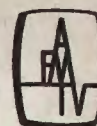
TOKYO, JAPAN
International Media Representatives,
Ltd., 1, Kotohiracho, Shiba,
Minato-Ku, Tokyo
(502) 0656

Copyright © 1966

by Howard W. Sams & Co., Inc.

BROADCAST ENGINEERING is published monthly by Technical Publications, Inc., an affiliate of Howard W. Sams & Co., Inc. Editorial, Circulation, and Advertising headquarters: 4300 West 62nd Street, Indianapolis, Indiana 46206. SUBSCRIPTION PRICES: U.S.A. \$6.00, one year; \$10.00, two years; \$13.00, three years. Outside the U.S.A., add \$1.00 per year for postage. Single copies are 75 cents, back issues are \$1.00.

the technical journal of the broadcast-communications industry



Broadcast Engineering

Volume 8, No. 1

January, 1966

CONTENTS

Features

Quartz-Iodine Lighting Patrick S. Finnegan 14

An examination of the advantages and disadvantages of this new kind of lighting.

Broadcasters Meet in Mexico Martin Taylor 17

A report on a convention held by our southern neighbors in broadcasting.

The Basics of Local Color George C. Sitts 18

What to expect when color comes to the local station.

Care and Testing of Broadcast Turntables Larry J. Gardner 20

How to care for this vital first link in the broadcast system.

Highlights of the NAEB Convention 23

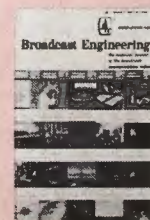
7-Year Subject-Reference Index 31

For the first time, a comprehensive index beginning with the first issue of BROADCAST ENGINEERING.

Departments

Letters	6	New Products	60
Washington Bulletin	25	Engineers' Tech Data	67
Engineers' Exchange	44	Advertisers' Index	69
Book Review	50	Classified Ads	70
News of the Industry	52		

For almost seven years, BROADCAST ENGINEERING has been the technical journal of the broadcast industry. An index covering all issues from the first through December 1965 begins on page 31 of this issue.



We'll do a month's work for you free!

Just send this page to CBS Laboratories. We will send Audimax and Volumax to your station. If you want to send them home after 30 days, we will pay the freight. But if you want to make your station their permanent home, all you do is pay \$665 each.

At the end of that period, chances are you will be so sold on Audimax and Volumax you will want to buy them.

And you should. After all, they can increase your program power 8 times.

Solid state Audimax is an automatic level control years ahead of the ordinary AGC. By automatically controlling audio levels, it frees engineers, cuts costs and boosts your signal.

Volumax, also solid state, out-modes conventional peak limiters by controlling peaks automatically with-

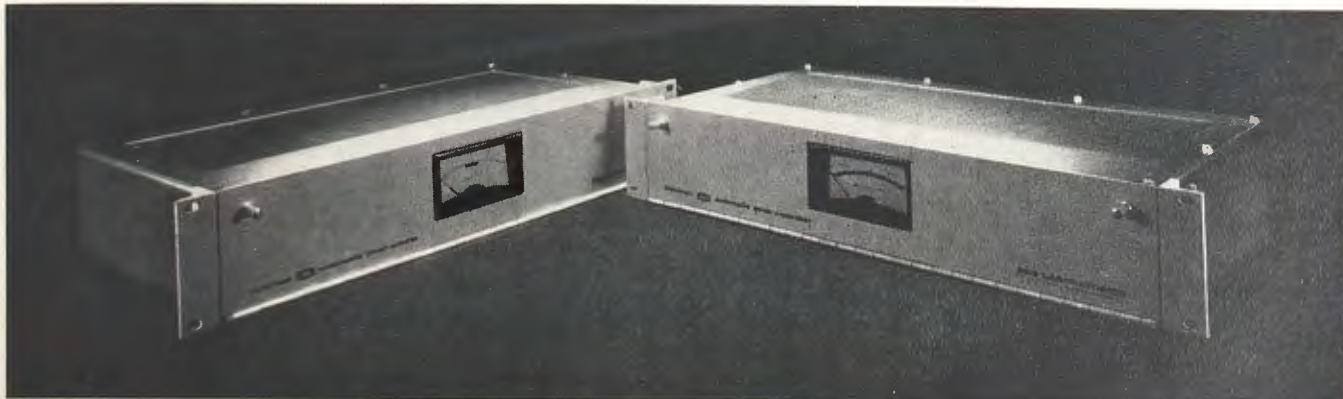
out side effects. By expanding effective range and improving reception, it brings in extra advertising revenue.

We can afford to give Audimax and Volumax away free. Because we know they're so good, most people can't afford to give them back.



CBS LABORATORIES

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



Circle Item 3 on Tech Data Card

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.

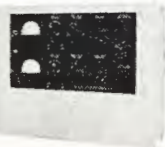


FAIRCHILD CONAX

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.

LETTERS to the editor

DEAR EDITOR:

Your article "Forty-Five Years of Broadcasting" (November 1965 BROADCAST ENGINEERING, page 20) was very interesting. I believe, however, that the chemical rectifiers were made of aluminum and lead in a borax (or it may have been ammonium sulphate) solution. WDAJ and my ham station, 9BZK, here in Parsons used this system in the early 1920's.

Four others and I operated WBAA, West Lafayette, Indiana, from 1925 to 1929. We used double-button carbon microphones energized by storage batteries. Storage batteries also supplied filament current for the two 204-A oscillators and two 204-A modulators. The transmitter employed Heising modulation. I had a second-class commercial ticket at WBAA. The only difference from a first-class license was the code-speed requirement, 13 or 15 words per minute instead of 20 words per minute.

PAUL V. TIERNEY

DEAR EDITOR:

It's probably just a typographical error, but in the article "TV Transmitter Proof of Performance" (November 1965 BE, page 12) the —35-db figure for FM noise in paragraph 1, page 13, should be —55db.

EUGENE E. KITSMILLER
Transmitter Supervisor,
KCTO, Denver

You're right, Gene, it was a typographical error. Other readers noticed it, too, including author Finnegan, who points out the following other errata in the article as it was printed:

Also in the paragraph on AM noise measurement, the word "peak" was omitted; the DC voltage recovered from the detector is proportional to the peak voltage of the FM carrier. Then the noise meter is calibrated with an AF voltage having this same peak voltage; a meter calibrated in rms values would indicate .707 of this voltage.

In Fig. 1, the level at the preamplifier output should have been —9db, not —90db.

One paragraph was omitted: For color stations it is important that the response 3.58 mc below carrier be down at least 42 db. The carrier should be modulated with a 3.58-mc sine wave at normal level, and a field-strength measurement should then be made. In the point-by-point method of measuring response, this measurement is obtained automatically, but the sweep method is not sufficiently accurate—a separate measurement must be made.

The author also adds this information: While envelope delay is not normally measured as such, there is a method for checking it at the station level. A square-wave signal can be fed through the

● Please turn to page 46

CONVERTING TO SEPARATE FM STEREO PROGRAMMING?



The remarkable new LANG Tape Playback Amplifier provides the low budget approach to converting your Ampex tape machines for unsurpassed performance. The new LANG LTP is a completely transistorized low noise, equalized tape head playback amplifier which raises the head signal to line level.

The LTP features separate high and low frequency equalization controls to permit the tape head output to be accurately adjusted to the NAB playback curve. The LANG LTP also contains a five-stage silicon transistor amplifier capable of delivering +24 dbm output with less than 1% total harmonic distortion. A built-in output transformer provides balanced output connections. Radio frequency and switching interference is eliminated by a shielded connector compartment and feed-thru capacitors.

Each LANG LTP is contained in a completely enclosed 5 x 12 x 1 1/4" heavy gauge aluminum chassis with adjustment controls located on the front panel. Standard input, output and power connectors are mounted on the rear apron.

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

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 5 on Tech Data Card

for your tower requirements check ROHN SYSTEMS



A complete tower erection service that has these special advantages:

- ✓ DEPENDABILITY
- ✓ RELIABILITY
- ✓ COMPLETE ENGINEERING
- ✓ COAST TO COAST SERVICE
- ✓ REPRESENTATIVES WORLD-WIDE

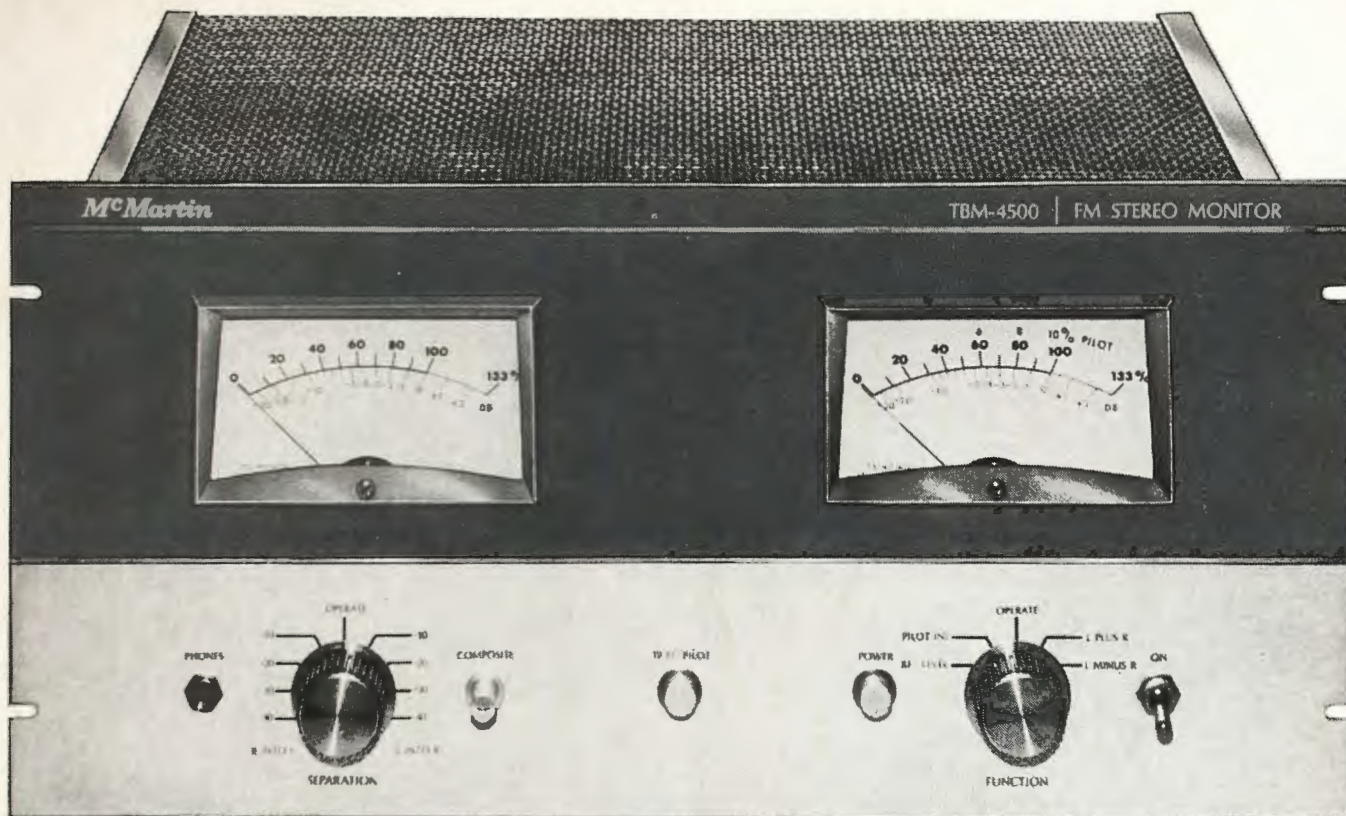
Be sure to obtain price quotations and engineering assistance for your complete tower needs from America's foremost tower erection service.

ROHN SYSTEMS, INC.

6718 W. Plank Road Peoria, Illinois
Phone 309-637-8416 • TWX 309-697-1488

Circle Item 6 on Tech Data Card

BROADCAST ENGINEERING



McMartin TBM-4500 FM|STEREO MONITOR

What's new?

An FM/Stereo transistorized Monitor that does three things no one else can do:

1. Simultaneously reads right and left channel modulation. This feature meets provisions of the new FCC proposal.
2. A 19 kc pilot indicator light shows that the station is transmitting stereo.
3. Measures pilot injection at any time without affecting modulation.

The TBM-4500 is a completely self-contained monitor with distortion of less than 0.375% on stereo from 50-15,000 cycles; has a signal-to-noise ratio better than -60db. Separation or crosstalk of either channel can be measured down to -50db directly on the meters. L plus R, and L minus R can also be measured directly on the meters. The amount of suppressed carrier at 38 kc can be measured.

Notice the new styling. It features "McMartin" blue on the upper panel and brushed aluminum below.

Write broadcast marketing manager for full details.

McMARTIN INDUSTRIES, INC.
605 North 13th Street
Omaha, Nebraska 68102



Circle Item 7 on Tech Data Card

The soundest sound in FM is the new sound of GATES



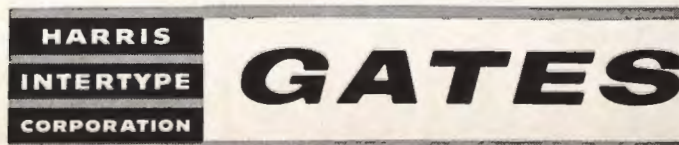
Two New FM Transmitters from Gates!

The Gates FM-1G and FM-3G are the newest additions to the most complete line of FM transmitters in the industry. From 10 watts through 20,000 watts, all models are quality all the way — featuring a high degree of stability, solid-state power supplies, new ceramic power tubes operating at a leisurely pace, plus a careful selection of quality components. Result: the ultimate in FM performance. And proof that the soundest sound in FM is the new sound of Gates.

Ask for complete description and specifications.

Gates FM Broadcast Transmitters—the most complete line in the industry

Model	Power Rating	Frequency Range
BFE-10C	10 watts	87.5-108 mc
BFE-50C	50 watts	87.5-108 mc
BFR-50C	50 watts	50-220 mc
FM-250C	250 watts	87.5-108 mc
FM-250CS	250 watts	50-220 mc
FM-1G	1,000 watts	87.5-108 mc
FM-3G	3,000 watts	87.5-108 mc
FM-5G	5,000 watts	87.5-108 mc
FM-7.5G	7,500 watts	87.5-108 mc
FM-10G	10,000 watts	87.5-108 mc
FM-20G	20,000 watts	87.5-108 mc



GATES RADIO COMPANY • QUINCY, ILLINOIS 62302 U.S.A.

A subsidiary of Harris-Intertype Corporation

Circle Item 8 on Tech Data Card



add 3 ■'s to your Log

and get automatic programming, logging and authenticating (only PROLOG can do it)

PROLOG uses your station log to give you any degree or combination of unattended, automatic, or manual-live operation you desire. PROLOG simply adds 3 squares (■) to the information you normally enter on the log. The entire log can be prepared on any standard typewriter, or you can use any of the auto-typing, Traffaccounting, IBM punch-card, and similar equipment in use today. PROLOG uses your established programming format; nothing changes unless you want to change it. That's PROLOG: simple and flexible!

For a 12-page brochure on PROLOG Systems, write to Commercial Sales Dept./Continental Electronics Mfg. Co./box 17040/Dallas, Texas 75217.

LTV *Continental Electronics*
A DIVISION OF LING-TEMCO-VOUGHT, INC.

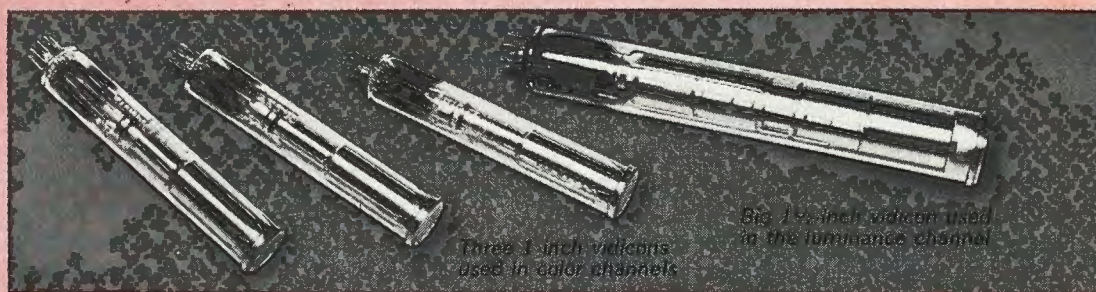
Circle Item 9 on Tech Data Card

RCA
NEW
LOOK

"BIG TUBE" COLOR TV FILM SYSTEM



Get “Big picture” performance from your color films



The 1½-inch vidicon in the luminance channel of RCA's color film camera provides a 50% larger image—50% larger than any used in other cameras. This gives improved signal-to-noise ratio, high resolution capability. Result: Unusually sharp reproduction of color films and slides.

All four of the vidicon pickup tubes are electrostatic-focus, magnetic deflection type. They require no focus coils — eliminating heat problems — and are independent of high voltage variations.

Completely transistorized, the TK-27 employs compact, plug-in circuit modules. They provide top performance and easier maintenance. Circuits are highly stabilized, assuring unvarying picture quality — over extended periods.

The entire “Big Tube” system is made by RCA, including camera, film projectors, slide projector and multiplexer. These are “matched” equipments—all designed to work together in an integrated system to best advantage. It's ideal for turning out top quality color film programs and commercials.

Your RCA Broadcast Representative has the complete story on this “Big Tube” color film system. Or write RCA Broadcast and Television Equipment, Building 15-5, Camden, N. J.



The Most Trusted Name in Television

New work horse of broadcasting from ATC

The all new Criterion tape cartridge system has become the new standard of the broadcasting industry. In broadcast installations all over this country and abroad, the Criterion system is supplying reliable tape information around the clock, day after day, year in year out. The all new solid state Criterion series has been designed to give the broadcaster the After Delivery Economies which mean more profits through superior performance.



- ☐ Completely transistorized. ☐ New direct capstan drive, quiet solenoid, plug-in connections and modules.
- ☐ Choice of one, two, three-tone and stereo operation ☐ Available in slide-out rack mount or slim-line, slide-out desk console. ☐ Conforms completely with recently adopted NAB standards.

For complete details phone Area Code 309-829-1228

AUTOMATIC  **TAPE CONTROL**
1107 E. Croxton Ave. Bloomington, Illinois
Circle Item 11 on Tech Data Card

Information on
an accident
n. El Camino
ve. Please call

C.-Young lady
eat 16F, please
Stanford, Calif.

or, pls. contact
once. Urgent.
e call Janice,

hana Simiona-
Hwy. 40. EVR.
ankin call 986-
Glenn.

Personals

- Nurse. Still
a brogue.
blarney. Just
the man.

PLANE

982-5380
835-4174
y 1-5
753
ys

TV, ETV, CATV Transmission Equipment

WANTED:

Rugged, reliable type to help with top-quality color and black & white TV transmission. Should have solid background. Must be able to operate at peak efficiency in sub-freezing and desert conditions. Should make few demands and must hate repairmen. Price must be reasonable.

**DRAFTSMEN
ELIMINATE FREEWAYS**
from your before and after work hours. Eliminate the high cost of commuting from your budget. Exceptional opportunity for 2 experienced detailing draftsmen, 2 to 3 years mechanical experience to accept permanent positions in a young growing manufacturing firm, headquartered in Belmont. Call for VACU-BLAST, 593-7658.

TECHNICAL DESIGNERS
Tech. Serv. 744
5563.

137-Help

DRAFTSMAN
Parr Blvd., RA

DRAFTSMAN, M
WESTERN GEA

ELECTRICIANS
Federal Elec. Pa

ELECTRONIC Bench
experienced. To s
sumer electronic pro
2nd class license nec
plan, vacation, perm.
Electronics, 935-7353.

ELECTRONIC Techs. M
Electronics, Palo Alto.

ELECTRONIC technicia
F B M experience. Cal
background desirable.
ate placement. Call
6620 or send resume
Corp. P.O. box 2096,
Cal.

ELECTRONIC Technicia
lenced in C.C.T.V. co
tions, sound and p
tems required. Write
Box 128, Stateline,

ELECTRONIC TE
MACH
Send
Kirk Engine
1038 W.

ELECTR
design
1185

ELECT
G
1601 C

ELECT
ters.

ENGINE
ing
D

So far, there's only one applicant

It's Lenkurt's 76 TV microwave transmission system. This is the system that's bringing top-quality color and black & white TV into areas where they used to think something was wrong with their picture if it didn't have snow most of the time.

For instance, take the 76 TV Studio Transmitter installation at station KOLO-TV in Reno, Nevada. Since the 76 is transistorized, the new system operates with practically no maintenance, quite a bonus to KOLO-TV because one of their microwave terminals is located on Freel Peak, where 10 foot snows and 100-200 mile winds are not uncommon. Another outstanding feature of the 76 system is its versatility. At the University of Kansas Medical Center, a 76 ETV system makes it possible for students to participate in classes presented at a sister campus, 45 miles away. This is one of the few two-way ETV systems in existence. This system is significant because of the high resolution it provides for note observation of medical techniques.

And the Columbia Basin Microwave Company is using our microwave to transmit two off-the-air pickups through an extensive 76 network to serve several CATV companies and school districts.

So, whether you're planning a community TV setup, an Educational TV program, or want to join a network, and you want rugged, reliable equipment to help with top-quality color and black & white TV transmission, you'd be doing a smart thing to write us for the resume on our money-saving, solid-state 76 TV microwave system.

Lenkurt Electric Co., Inc., San Carlos, Calif. Other offices in Atlanta, Chicago, Dallas, and New York City.

LENKURT ELECTRIC

SUBSIDIARY OF

GENERAL TELEVISION CORP.

www.americanradiohistory.com

QUARTZ-IODINE LIGHTING

by Patrick S. Finnegan, BE Consulting
Author, Chief Engineer, WLBC AM-TV,
WMUN FM, Muncie, Indiana — A new
type of incandescent lamp is now available
for studio lighting.

For many years, the majority of television-studio lighting has been supplied by incandescent lamps. Although these lamps generate more heat than other types, the size of fixtures required and the ease of dimming have led to their popularity. Such lamps do have their limitations, however. The filament deteriorates and causes blackening of the glass due to tungsten deposits. The high-wattage lamps require fixtures that contribute to reduced efficiency. Light output drops off as much as 25% over the life of the lamp, and the color temperature can fall as much as 300°K.

Quartz Lamps

The quartz-iodine lamp has undergone rapid development in the past few years, not only for television lighting, but also for general lighting. Basically, this lamp is an

incandescent lamp with a tungsten filament, quartz instead of glass for the envelope, and a very small amount of iodine enclosed in the envelope.

The problem of reduced light output and blackening of the envelope in regular incandescent lamps is due to the tungsten filament. While the filament is being operated at its normal temperature, small particles of the tungsten flake off, migrate to the glass envelope, and are deposited there. This process continues until the filament is worn away and fails.

The glass envelope limits the compactness of incandescent lamps, since glass cannot withstand the high temperatures close to the filament. Quartz, however, can withstand much higher temperatures than glass, and with the use of

quartz, a compact lamp is possible.

Lamp researchers discovered that iodine, if vaporized, could prevent the tungsten particles from blackening the glass. Its use is not possible in regular incandescent lamps because the temperature required to vaporize the iodine would also melt the glass. The envelope in a quartz lamp, however, operates above 500°F, and the iodine can be vaporized.

During operation of the quartz-iodine lamp (Fig. 1), the tungsten filament is heated to its normal temperature. Small particles of tungsten migrate to the envelope, as is the case in any incandescent lamp. The iodine vapor in the lamp combines with the tungsten particles, and when the lamp is turned off, the combined tungsten particles and iodine vapor return to the

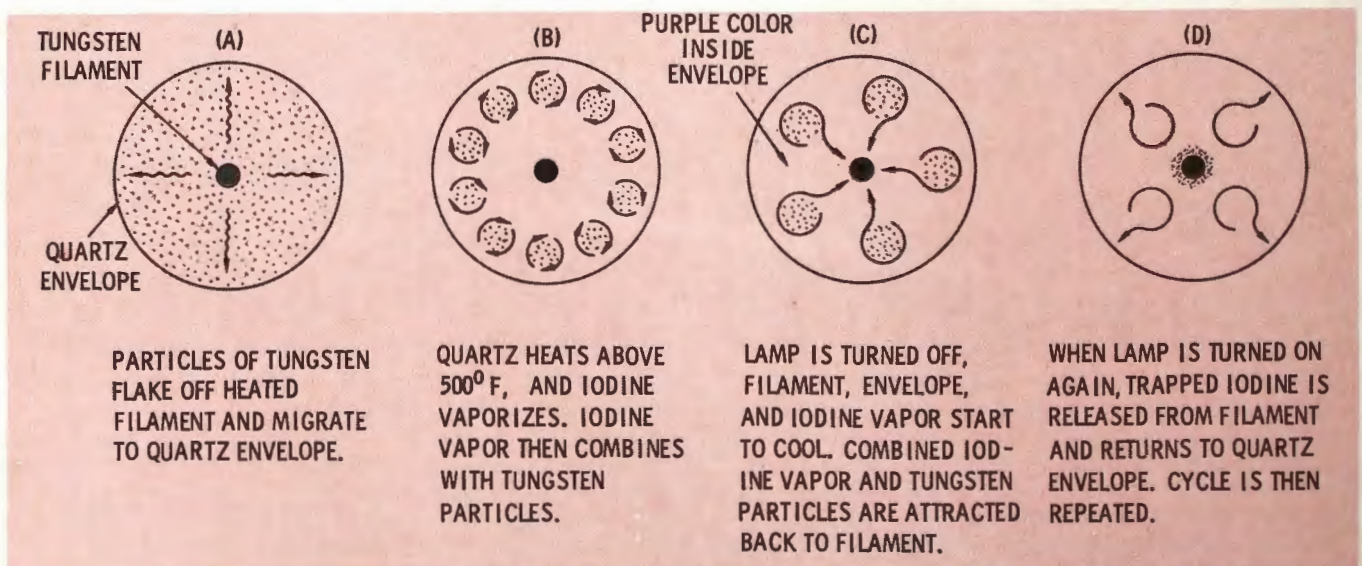


Fig. 1. This cleaning cycle in the quartz-iodine lamp contributes to its increased life and relative uniformity of light output.

filament. When the lamp is again turned on, the hot filament releases the trapped iodine, it returns to the quartz, and the cycle begins again. This "cleaning cycle" continues until the lamp burns out.

Since the iodine vapor returns the tungsten particles to the filament, blackening does not occur, and the transmission of light through the quartz is not diminished. Also, there is a relatively small reduction of color temperature and light output from the filament, and the lamp life is extended. The deterioration of light output is in the order of 3% over the life of the lamp, compared to about 25% for a regular incandescent lamp.

Whenever a quartz lamp is turned off and begins to cool, a light purple color can be seen within the envelope. This is the vaporized iodine; the color disappears after several minutes, and the inside of the lamp becomes clear as before.

A word of caution about the handling of quartz lamps should be mentioned: They should never be touched with the bare hand. Some of the oils from the skin deposit on the envelope and, when heated, hasten the deterioration of the quartz. All new quartz-iodine lamps are supplied wrapped in a soft paper, and this paper should be left on the lamp until it has been installed in the fixture. Also supplied with the lamp are instructions regarding how the lamp should be cleaned if one does accidentally handle the quartz. It goes without saying that one should never touch the lamp with bare hands while it is operating, since the quartz temperature is well over 500°F.

Advantages

One of the advantages of this type of lamp is its small physical size. A 1000-watt lamp is only 4¾" long, including the mounting ends, and ⅜" in diameter (Fig. 2). A 300-watt lamp is 3⅝" long and ⅜" in diameter. Besides the tubular lamp, one manufacturer has available a sealed-beam unit rated at 650 watts. This is similar in appearance to an automobile sealed-beam headlight, but is smaller in diameter.

The small size of the quartz

lamp makes possible smaller fixtures which can more effectively use and control the available output of the lamp. An economy in power is realized because fewer fixtures of lower wattage rating are needed to light a given set or studio than would be the case with standard incandescent fixtures. Small size also makes possible a high-intensity light source in a small, lightweight fixture.

The longer life span of quartz lamps contributes to economies in the cost of time and labor when making replacements. Also, a man can carry a dozen of these lamps at one time, but very few incandescent lamps. This can save many trips up and down a ladder. And, several dozen quartz lamps can be stored in the same space it takes for one large-wattage incandescent lamp (Fig. 3).

Limitations

As with anything that has many good features, there are also some limitations. The small "compact" lamps may be positioned in any manner, but the large lamps must be positioned not more than 4° from horizontal (Fig. 4) while they are burning. Fixtures designed for quartz lamps take this positioning into account.

Envelope temperatures are important; this could be a problem if dimmers are running the lamp under voltage. The envelope must be maintained at temperatures above 500°F, but the end seals should not exceed 650°F. Since the envelope operates at such a high temperature, cold drafts could cause the lamp to shatter.

When a very high-intensity beam

of light is required, such as in a very large auditorium or hall, the quartz light may not be bright enough. The largest lamps currently available are rated at about 2000 watts.

Ratings

Although limited as to the maximum wattage available, quartz lamps are available with color-temperature ratings from 2900°K to 3400°K, which permits their use in color studios. The higher Kelvin ratings permit dimming practices in which the lighting director "lamps up" so that he may dim down while still maintaining a suitable color temperature. Some fixtures are available which permit the use of gelatin filters. With such a filter, the light output from a 3000°K lamp gives the same color response as that from a 3200°K lamp. Because the fixtures are more efficient, the attendant loss of light intensity can sometimes be tolerated. At the same time, lamp life is improved considerably. For example, a 1000-watt lamp rated at 3000°K has a life expectancy of 2000 hours, whereas a 1000-watt lamp rated at 3200°K has a life expectancy of 500 hours.

Fixtures

Because quartz lamps are small, their fixtures are smaller than regular fixtures. The reflectors and lenses for spotlights receive anywhere from two to three times the light that could be obtained in the past from ordinary incandescent sources. The lenses require glass with high heat resistance because they are close to the lamp; the reflectors are usually of aluminum.

Portable lights with reduced size

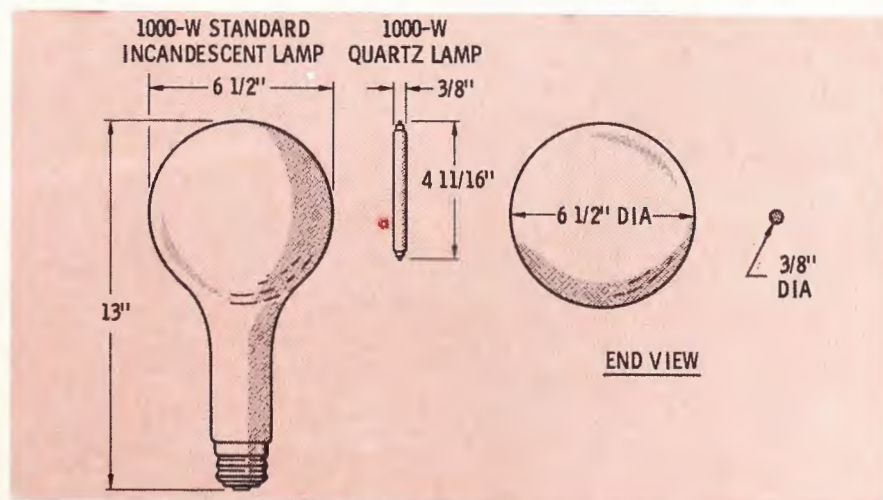


Fig. 2. Physical sizes of quartz-iodine and regular incandescent lamps compared.

and current requirements simplify remote pickups and news work. As an example, one such portable light uses a single 500-watt lamp that has a 2000-hour rating and draws only 4.2 amperes. This fixture is adjustable with a simple knob adjustment for either spot or flood. As a spot, it provides 100 footcandles at 10' from the lamp; as a flood it provides 60 footcandles. The light pattern in flood position is a rectangle approximately 11' high and 22' wide. The fixture has barn doors and can provide a sharp light cutoff to prevent spillage into another area. It can also be used in the studio when a small lamp is needed. It measures 4" x 4" x 9".

Ordinarily, studio floods provide a wide pattern of even lighting. (The edge of the defined area is the point where the light intensity is 50% of the maximum intensity.) A softer, more diffused light is possible with glass diffusers in front of the light. A still smoother field may be obtained with the use of frosted lamps.

As an example, the area covered by a 1000-watt rectangular flood, using a frosted lamp, is approximately 18' wide and 13' high at 16' from the lamp.

Spotlights using quartz lamps are also available. One such fixture, using a 1000-watt lamp, produces 160 footcandles at the beam center at a distance of 100'.

A variety of fixtures is available: pattern projectors, follow spots, strip lights, and others used for special lighting effects. One such light, using a 1000-watt lamp and barn doors on four sides, will light an area 24' wide 10' from the lamp. The light field can be cut to

a narrow, bright strip with well-defined edges.

Only a few types of fixtures have been mentioned here; many more are available.

Existing Fixtures

Most TV stations have a sizable investment in their present incandescent-lighting fixtures. Most will not want to scrap these units immediately to install quartz lighting. Some of these existing fixtures can be converted to quartz by the purchase of kits. Many of the conversion kits are of the small-wattage variety, but there are kits to convert some sizes of spotlights, also.

A few examples will help show the results to be expected from the modification of fresnel spotlights. A kit to modify a 500-watt fresnel spotlight includes a 400-watt quartz lamp and a complete socket assembly with reflector and 6" fresnel lens. It costs about \$27. The old base is removed from the fixture, and the new unit is installed in its place. This permits the original mechanism to be used in making the usual spot-to-flood adjustments. This 400-watt quartz-lamp arrangement gives about twice the light that was available from the 500-watt incandescent lamp. At the same time, the new lamp can be expected to last four times as long.

The same manufacturer has a conversion unit for the 750-watt incandescent lamp. The quartz fixture has a reflector and socket for the new lamp, and the whole arrangement is fitted with posts to plug directly into the old bipost socket. A new fresnel lens is provided. This conversion uses a 650-watt quartz lamp to increase the

light output 50% over the old incandescent lamp.

In a 2000-watt 12" fresnel spot conversion, there is a compromise in the hard-spot light intensity. The kit uses two 1000-watt quartz lamps of 150-hour life to replace the single 2000-watt 100-hour lamp. The light output of the converted unit shows a 56% increase in light over the original 2000-watt unit. In the hard-spot position, however, output of the new light is only 83% of the light available from the old lamp. The quartz light, however, maintains its light output with only a slight decrease over its life.

Favorable as these results may seem, remember that these are converted incandescent fixtures. When a fixture is designed specifically around the quartz lamp, it shows even better results. One such fixture, using two 1000-watt lamps, produces more light than a 5000-watt incandescent fresnel lamp, and still weighs only one lb. Still another new 12" fresnel, using a 2000-watt quartz lamp, has double the intensity of the standard fixture modified for quartz and approximately three times as much light as a standard incandescent fresnel of the same wattage.

Conclusion

The miniaturization of studio lighting fixtures is well on its way, due in large part to the introduction of the quartz-iodine lamp. Much progress has been made in overcoming some of the limitations in the use of quartz. Along with this advance in lighting, we can expect many new lighting and production techniques to evolve. ▲

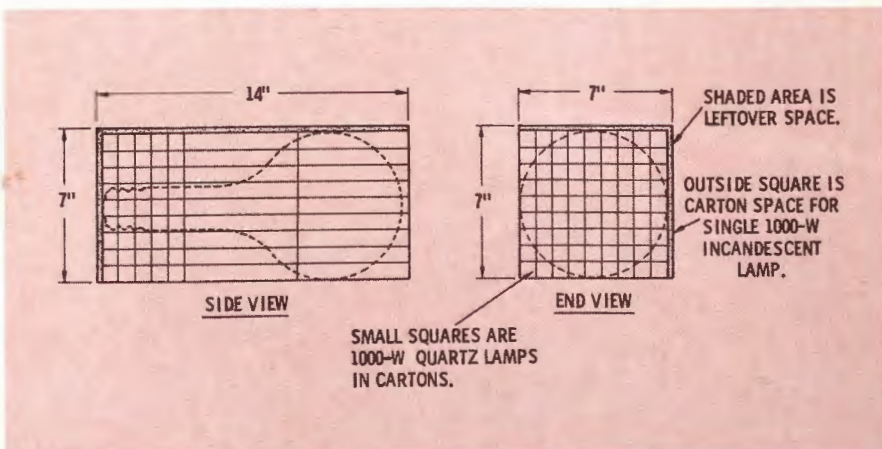


Fig. 3. As many as 207 quartz lamps can be stored in the space of one regular carton.

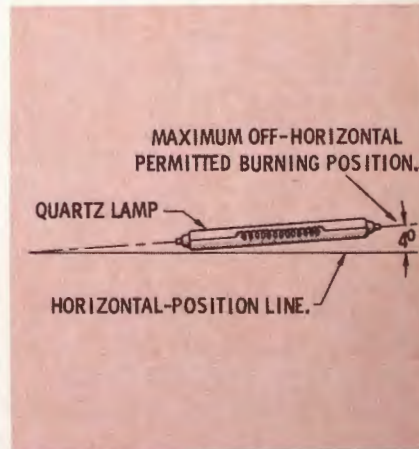


Fig. 4. The lamp must be kept horizontal.

BROADCASTERS MEET IN MEXICO

by **Martin Taylor**, Editor, Radio y Television

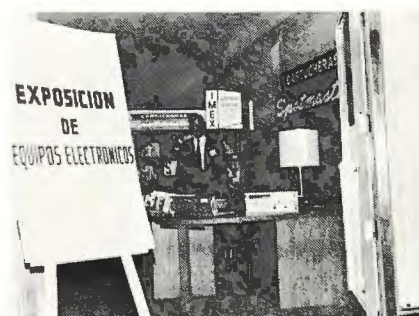
At the mere mention of Mexico, most of us conjure up thoughts of bygone vacations in a sunny land where genial people pass the major part of their workday in the shade of a cactus. Undoubtedly one would not have to search too extensively south of the border to find just such a situation. Juxtaposed to this rapidly disappearing aspect of Mexico, however, waxes a new and affluent economy which is clearly mirrored in the broadcasting industry. Currently, there are over 450 AM radio stations throughout the republic, and Mexico City alone has over 30. Television, likewise, is growing rapidly. There are 27 commercial TV stations in operation presently, and several of the largest cities boast two and three channels.

Since broadcasting is such a big business in Mexico, it is no wonder that the annual convention draws such a large attendance. During October of last year, broadcasters from all over the republic arrived in Mexico City to attend the event which is held annually in conjunction with the celebration of National Broadcasting Week. The four days of the convention were filled with feverish activity. The inaugural

ceremonies were carried live by every radio station in the country and were televised by one of Mexico City's leading stations. The thirty-minute inaugural broadcast was considered to be of sufficient import to pre-empt the transmission of Pope Paul's visit to the United Nations.

In the exhibit hall, both U.S. and Mexican firms showed their wares. Ampex, Gates, RCA, and Spotmaster all had prominent displays. The reader will probably be less familiar with the following Mexican firms which also purchased space on the floor of the hall: IMEX, Ingeniería Internacional de México, Compañía Central de Grabaciones, AMSI, Industrias Radiocomunicaciones, Compañía de Ingenieros en Comunicaciones Eléctricas, and DEKSA.

The final day of meetings was closed with a speech by Mexican President Gustavo Díaz Ordaz. Although designed to provoke Mexican broadcasters to introspection, his words might well be considered by broadcasters of all lands: "Let your words be always bondsman to your ideas and your ideas slaves to the truth." ▲



THE BASICS OF LOCAL COLOR

by George C. Sitts, Eastern Regional Editor—These are some of the things to consider when adding live color.

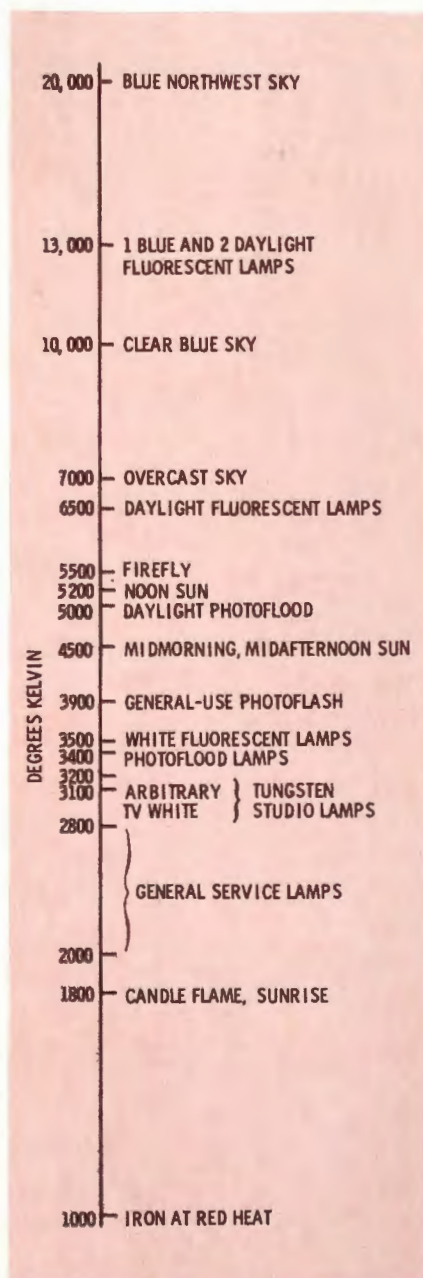


Fig. 1. Chart shows color temperatures in degrees Kelvin for several sources.

NBC has spent more than a dozen years developing its present color operating techniques. This past summer, CBS and ABC found themselves cramming for their fall color exam. Local studio colorcasts are now a way of life for quite a few medium-market stations. Here is a review of the basic considerations in adding studio color to any local outlet, based on the experiences of several of these small stations.

Basically, color is a phenomenon which is added to a monochrome base. Thus, color operation will follow many of the patterns of good b-w operation.

Generally, technical fears in anticipation of color have either failed to materialize or were satisfactorily solved before a major share of stations even considered local colorcasting. Most personnel with aptitude for monochrome become proficient in color with little difficulty.

It is true that more light is required; that lighting must be done with more care and will probably take twice as long as you are accustomed to; that camera setup and maintenance will take longer; and that rehearsals will take longer than with black-and-white. However, these things have a way of working into standard practice, and you will probably find after a few hundred hours that rehearsal time will settle back to normal.

People

An important factor in color productions is the staff. Color requires closer coordination of various seg-

ments of studio staff than is necessary in black-and-white. A color clash in black-and-white may be unsightly only to those in the studio; but, in a colorcast, a costume that clashes with colors in scenery or lighting can detract as much from a show as well coordinated color and light could add.

Because color is difficult to measure, it is important that people involved in color production are all seeing the same hue. One help is to have personnel who will be involved in color judgement take a Munsell 100 Hue Color Test. This will point out any color-blind designers or video operators, and will test remaining personnel for superior, average, or poor color discrimination.

The set of tests, which also measures zones of color confusion by simple graphic plots, is available from Munsell Color Co., Inc.; 2441 North Calvert Street; Baltimore, Maryland. Cost is about \$130.

Once you have a competent and cooperative staff, and of course the (presently scarce) color equipment, you can begin operation. Be sure technicians learn how to set up color cameras, and that they have proper equipment. There are stations that have operated in color without a vectorscope, and there are those who just toss their technicians into the mill and let them learn by experience. Such operations have been generally restricted to stations with a single color-film chain. Camera matching problems are so apparent and so difficult to adjust by eye that such ill-equipped stations

almost invariably have to add needed test equipment and training as they purchase additional color gear.

Electronic Equipment

Starting point for fine color is fine monochrome. After you have the black-and-white up to snuff, with all differential-phase and differential-gain problems ironed out, you can proceed to tune up color gear. Chances are, if you are adding live color, you already have some color-film experience. Technically, the setup procedure for live color parallels that of film color. Minor differences are associated with setting up image orthicons or Plumbicons® as opposed to simple film vidicons. More attention should be lavished on intercamera phasing and gamma matching. Camera mismatch that would be ignored in a two-camera film operation (because of infrequent switching of cameras) becomes painfully apparent on live cameras that are switched several times a minute.

Lights

Out in the studio, good color requires more light, of better quality, than is necessary for monochrome. Color television has brought into technical vogue the term "color temperature," which is simply a measure of the color of a lamp's output (Fig. 1).

So far as the local studio is concerned, actual color temperature is not as important as maintaining an even color temperature after cameras have been set up. A decrease in color temperature will deliver a picture shaded toward red, while a color-temperature increase will cause a bluer picture (referred to a camera setup for white at your studio's reference color temperature). Shifts in color temperature are caused by excess dimming of lamps and by the lamp changing color as it darkens with age.

Lamp dimming—that is, the reduction of filament voltage to reduce light output—can be used with moderation. A dimming of four stops, or about 250° K (Kelvin), can be used before a color change will be apparent to viewers. The simplest means of not exceeding this range is by marking the dimmers or by using series resistors to limit dimmer range. Care must be taken



Fig. 2. Color sets require more base and fill light than do black-and-white scenes.

to insure that lamps darkened by age have not put their dimmers beyond the color range. A regular plan of lamp inspection, with removal of any that have begun to darken, should keep you within the 250° K range.

Light levels of 300 to 400 foot-candles are necessary to obtain good color pictures for present image-orthicon cameras. This does not necessarily mean that a large number of new fixtures are necessary. First, color generally requires more base and fill light (Fig. 2), and a couple of extra scoops can bring the light levels up considerably. Second, as you begin to accustom crews to limited dimming, you will find the average light per fixture has increased noticeably.

It is best to begin by using your present fixtures efficiently, concentrating them over a smaller area un-

til your color lighting techniques develop enough to indicate which additional lights are needed. Such action could have a side benefit. The fixture and lamp industry is currently struggling internally to standardize fixtures and bulb design for the new quartz lamps. Network studios currently buzz with stories of developmental problems in quartz equipment. The stories are based principally on difficulty in getting a good shadowless scoop light because of the point-source nature of quartz lamps, and on recent moves to develop single-ended quartz lamps that will fit present fixtures.

However, present quartz equipment does have the advantage of even color temperature throughout the life of the lamp. Also, the out-

● Please turn to page 44



This view of a network color studio shows the high level of illumination required.

CARE AND TESTING OF BROADCAST TURNTABLES

by **Larry J. Gardner**, BE Consulting
Author, Chief Engineer, WKIX, Raleigh,
N. C.—Your station's reputation is
affected by how well you maintain
these machines.

At least half the programming of most present-day radio stations originates from records, which of course are played with broadcast turntables. It is on the quality of these units that the overall quality standards of the station are judged by the listener, who is becoming a very critical judge indeed. So, it is in the best interest of a station to keep its turntables in the best possible condition.

Mechanical Considerations

Before any pickup system can reproduce a disc recording properly, the disc must be rotated at a definite and constant speed, and its ro-

tation must be free from as much other mechanical movement as possible. Speed variations cause "wow" when they occur at rates of less than about 10 cps and "flutter" when they occur at higher rates. Mechanical motion other than the rotation of the turntable causes an extraneous signal known as "rumble" to be introduced into the pickup. Rumble is made up predominantly of noise below 100 cps.

Wow and flutter are measured best with flutter meters. However, these generally are not available to the broadcast engineer, so he must depend on a qualitative analysis using his ears. For all tests on turn-

table systems, a good test record (such as the 1965 NAB Test Record) is absolutely necessary. Using a 3,000-cps tone on the test record, listen for changes in the pitch of the tone. On a turntable with low wow and flutter, speed variations will be so slight that the pitch is almost perfectly constant.

To check the rumble level, play back the standard-level tone (usually 1,000 cps) from the test record, set the console fader to the 12 o'clock position, and adjust the master gain control on the console for a VU meter reading of zero VU, or 100%. Then, without changing the master gain setting, play the silent groove on the test record, turn the turntable fader up all the way, and note the VU-meter reading. Since the 12 o'clock position on practically all faders is 20 db below maximum gain, adding -20 to the VU meter reading will give you the rumble level of the turntable. For example, if the VU meter reads -15db, the rumble level is 35 db below NAB standard level. Any reading greater than 30 is considered acceptable.

What if you have wow and flutter? And rumble? Here's what to do about it. Since practically all turntables in use today are of the rim-drive, or idler-drive, type, the discussion will be confined to this type. First, check the drive idler wheel or wheels. With the motor

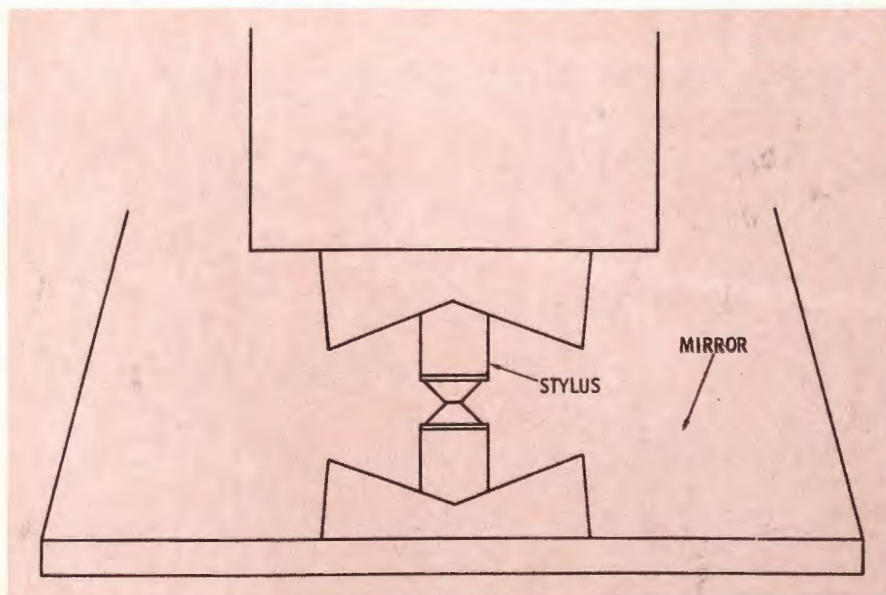


Fig. 1. Stylus and image should form straight line when viewed from any position.

running and the turntable removed from its socket bearing, press the drive idler against the motor shaft, holding your finger on the idler shaft. You should feel only a very slight vibration. If you feel a strong vibration, the idler probably has a flat spot on it and should be replaced. Flat spots on the idlers are the most common cause of flutter and a frequent source of rumble. Also, any grease or oil should be removed from the idler, the motor shaft, and the turntable drive surface with denatured alcohol.

The main turntable bearing should be well lubricated according to the manufacturer's instructions. Many turntables use a single large ball bearing in the turntable shaft well, and very frequently this can become lost while the unit is disassembled. Most tables will run without the bearing, but will develop wow, flutter, rumble, or any combination of the three. Be sure the bearing is in place and the shaft well is oiled enough that some pressure is required to reseal the turntable on its bearing.

In adjusting the drive-idler pressure, the best setting is usually that point which provides the fastest starting. This not only provides more positive mechanical action, but also is the best compromise between too little pressure, which causes poor drive, and too much pressure, which causes slow motor speed. Check the speed with a stroboscope disc under a fluorescent or neon light. With most professional turntables, there are two common causes of speed variations: poor adjustment of pressure and a defective motor bearing. A bad motor bearing can also cause flutter and rumble, and the best test of the motor is to listen to the sound it makes when it is running. If there is any hint of a rattle, trouble is on the way. A good lubrication job will often keep a marginal motor running well for quite a while. Also, keep the felt or rubber mat on the top of the turntable in good shape, since it is the final link in the drive chain from the motor to the record.

The Arm and Cartridge

Probably the most neglected part of the turntable is the arm, but it is a major factor in determining the

Table 1. Frequency Responses of Typical Pickup Cartridge

Frequency	5K load	10K load	50K load
30 cps	+4.0 db	+0.1 db	-4.6 db
50 cps	+2.8 db	0.0 db	-4.2 db
100 cps	+1.9 db	-0.3 db	-3.5 db
400 cps	+0.8 db	-0.5 db	-1.9 db
1 kc	0.0 db	0.0 db	0.0 db
2.5 kc	-0.6 db	+0.2 db	+1.0 db
5 kc	-1.3 db	+0.2 db	+1.8 db
10 kc	-4.4 db	-0.5 db	+3.5 db
15 kc	-6.5 db	-0.5 db	+4.8 db

overall operation of the system. It should be properly mounted, according to the manufacturer's instructions, so that there is a small overhang as the stylus is brought as near as possible to the turntable spindle. The arm should be adjusted for correct tracking force for the cartridge in use and should have its pivots adjusted for minimal drag on the stylus. Improper stylus tracking force can cause poor frequency response, poor stereo separation, increased distortion, increased stylus wear, incorrect stereo phasing, and increased record wear. Arm pivots which cause excessive drag can cause all of these effects and unbalance between stereo channels. Follow the instructions, and be sure the arm adjustments are right—they are important. Frequent checks with a stylus-pressure gauge are well worth the time.

Almost all cartridges used by broadcasters are in the general "magnetic" category, which includes the variable-reluctance, moving-magnet, and moving-coil types. All three are available in both stereo and monophonic designs. There are

only two basic troubles usually experienced with cartridges: stylus trouble and mounting trouble. About the only cure for a worn, broken, bent, chipped, or mutilated stylus is replacement. For mounting, there are several things to keep in mind. First, the cartridge must be mounted correctly in the arm. Second, it must meet the surface of the record at the correct angle.

The stylus angle is very important, especially for stereo work. It may best be checked by placing a small pocket mirror on the turntable, resting the stylus on the mirror, and adjusting the stylus position until the reflection is perpendicular to the stylus in all directions (Fig. 1). (Note: Some of the newer stereo cartridges operate with the stylus at a 15° angle from the vertical in the direction of groove motion. Fig. 2 shows how the angle should look on this type of cartridge. The angle is not extremely critical, but should not be more than 15°.)

The Electronics

There are two common ways of connecting a pickup cartridge into a broadcast console. Most popular

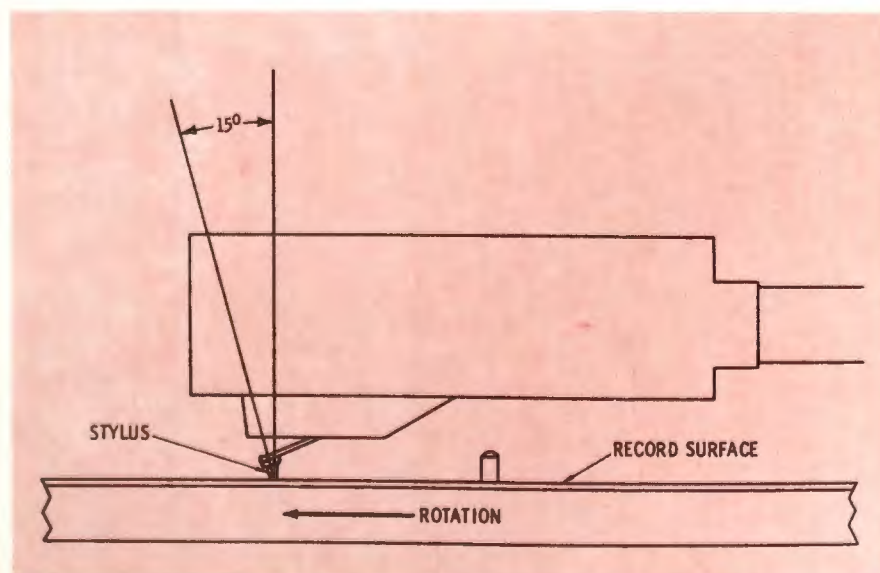


Fig. 2. Side view shows proper mounting position for a cartridge with 15° stylus.

1. OPEN DECOUPLING CAPACITOR
2. NOISY PLATE-LOAD RESISTOR
3. NOISY GRID RESISTOR
4. NOISY TUBE
5. NOISY TUBE SOCKET
6. NOISY CATHODE RESISTOR
7. LEAKY COUPLING CAPACITOR
8. NOISY 2ND-STAGE GRID RESISTOR

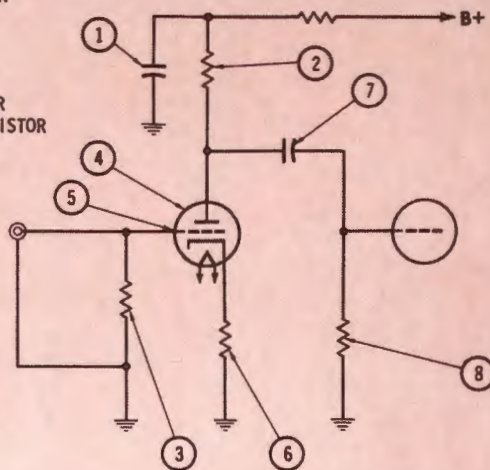


Fig. 3. Potential sources of noise in a vacuum-tube preamplifier input stage.

is the use of an equalized turntable preamplifier which delivers sufficient output to drive a high-level console input. Another method is to use a passive equalizer feeding a flat-response microphone preamp. Either method is satisfactory, although the equalized preamp offers the advantage of somewhat lower noise level. In either system, the most common problem is failure to achieve flat frequency response. Equalized preamps and passive equalizers are designed to operate with particular cartridges, which may or may not be electrically the same as the ones with which they are used. Also, cartridges of the same make and type often show individual variations in frequency re-

sponse. In most cases, the response may be made correct by varying the load resistance into which the cartridge works. As a general rule, increasing the load resistance increases the response at the high end (5,000 to 15,000 cps) and decreases the response at the low end (below about 200 cps). Decreasing the load resistance has the opposite effect. Table 1 shows the response of a typical cartridge with different values of load resistance. Since the magnetic cartridge is essentially a low-impedance device, changing the load resistance over a rather wide range has little effect on the output level. To determine the correct load, connect a 50K carbon potentiometer across the cartridge, and

adjust for response that is the same at 1000, 100, and 10,000 cps; then measure the resistance of the control as set for the best possible response, and substitute a fixed resistor for it. With some cartridge-preamp or cartridge-equalizer combinations, it may be necessary to change the value of the load resistor within the preamp or equalizer.

Another common problem with turntable electronics is hum and noise. To track down a hum problem, first disconnect the pickup from the preamp. If the hum disappears or drops greatly, chances are the problem is a ground loop. Ground loops are caused by the presence of more than one return path from the cartridge to the main chassis ground in the preamp. This problem is more critical with stereo than with mono, but it can be avoided simply by avoiding multiple ground paths. With a monophonic system, the cartridge cable shield should be grounded only at the input of the preamp or equalizer. For stereo, the two channels should be kept completely separate from the cartridge to the preamp or equalizer input. Also, it is important that the turntable motor and base be grounded directly with a single wire to the preamp chassis, or, if an equalizer is used, to the main station ground. Of course, the preamp chassis should also be connected to the station ground.

Noise occurring in the preamp may be either hum or "white" noise. Hum may generally be cured by shielding, selecting tubes for lowest hum level, carefully adjusting "hum-balance" controls, and checking for low-value filter capacitors. White noise, or "hiss," may be due to any of the parts indicated in Fig. 3 and Fig. 4. If the noise originates ahead of the equalizer circuits, it will take on a characteristic "roaring" sound due to the high-frequency rolloff of the equalizer. In this case, the noise is generally due to a defective tube, transistor, resistor, or capacitor in the input stage, although a noisy socket or poor connection can produce the same symptoms.

The ideas outlined here should be of help in getting and keeping turntables in shape to deliver a consistently high-quality signal. ▲

1. OPEN DECOUPLING CAPACITOR
2. NOISY COLLECTOR-LOAD RESISTOR
3. NOISY BASE RESISTOR
4. NOISY TRANSISTOR
5. LEAKY BLOCKING CAPACITOR
6. NOISY EMITTER RESISTOR
7. NOISY BIAS RESISTOR

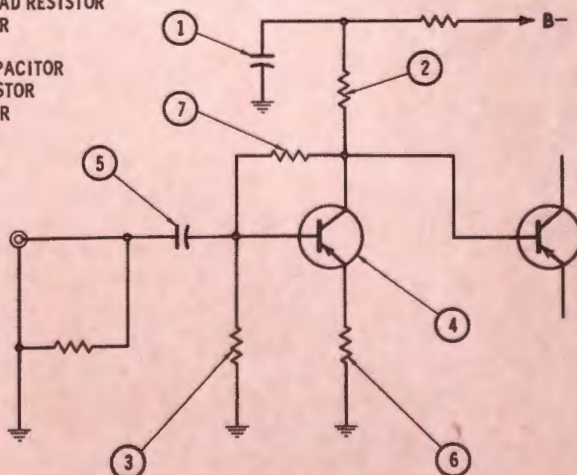


Fig. 4. Possible noise sources in input stage of a transistor turntable preamplifier.

HIGHLIGHTS OF THE NAEB CONVENTION

by George C. Sitts, Eastern Regional Editor

The National Association of Educational Broadcasters Convention (held last November 1-3) resembled in many ways the NAB Convention held seven months earlier at the same location—the Sheraton Park Hotel, Washington, D. C. Station managers and engineers engaged in discussions with equipment-sales representatives and strolled through a hall full of equipment displays. Sessions, seminars, and panels were conducted on every subject from curriculum planning to color conversion—with the notable exception of a previous favorite, “Is ETV effective?” Appar-

ently, educators had accepted the effectiveness of ETV as a foregone conclusion and thus used their convention time for learning new ways to improve the use of the medium.

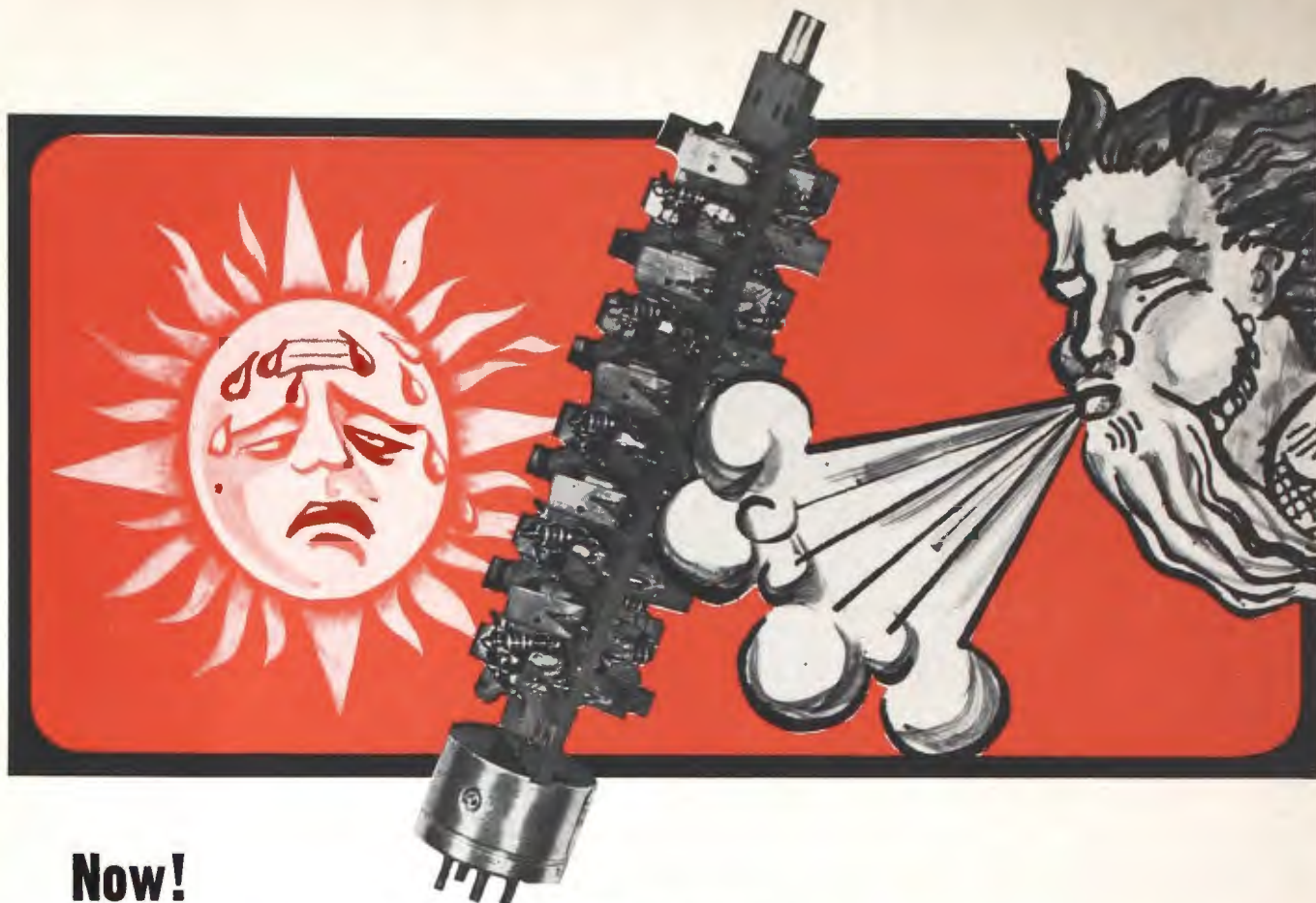
The day the educational broadcaster borrowed equipment from a local commercial station, operated a shoestring station, and divided his time between pleading for funds and keeping ancient equipment on the air appears over. This year, the talk was of replacing old equipment, finding capable engineers and production people, and improving

curriculum, teaching methods, and effectiveness.

Equipment manufacturers were among the first to recognize this trend to increased professionalism. The educational broadcasters were treated to large equipment exhibits, working displays, and round-the-clock hospitality suites. Equipment representatives were generally well acquainted with dispersion of new NDEA and Poverty Program funds, whereas many educators appeared uncertain of which moneys were available to them. Sessions pertaining to financial aid were SRO.

● Please turn to page 28





Now! End "Off-Air" Panic and Eliminate Temperature Worries Forever, with... **WILKINSON SILICON RECTIFIERS**

No more finicky temperature sensitive mercury vapor rectifiers... Go on cold mornings! Forget heating and air conditioning!... Wilkinson Silicon Replacement Rectifiers produce no filament heat and function below -60°C .

No longer high priced! Wilkinson Silicon Rectifiers cost less than others and can be repaired in seconds with low-cost replacement diodes. No encapsulation used! No more guesswork or costly test time! You know at a glance the exact status of your complete power supply because a "GO, NO GO" indicator warns when the reverse leakage of any diode is in excess of 50 microamps. Wilkinson Rectifiers virtually last forever!

Now it's easy and economical to solid state the power supplies in high power equipment. With Wilkinson Rectifiers no rewiring is necessary. Just plug them into your present mercury vapor tube socket. Filament transformers as well as other components are left in place.

Modernize your equipment today! Consult the Tube Replacement Chart shown here and order now!

FEATURES: Light Indicator on each diode warns of any difficulty or high voltage ON. • Easily replaceable low-cost diodes. • Reduces heat — power cost — hash. • Operates from -65°C to $+70^{\circ}\text{C}$ Free Convection. • Eliminates warm-up time.

TUBE REPLACEMENT CHART

WE TYPE	REPLACES TUBE TYPE		P.R.V. AMPS		UNIT PRICE
SR-3-1	866A	816	3KV	1	10.95
SR-10-6	872	8008	10KV	6	50.00
SR-10-12	872	8008 575	10KV	12	60.00
SR-14-6	872	8008 575	14KV	6	72.00
SR-14-12	872	8008 575	14KV	12	84.00
SR-20-6	6894	6895 673	20KV	6	100.00
SR-20-12	6894	6895 673	20KV	12	120.00
SR-24-15	869B		24KV	15	225.00
SR-32-25	857B		32KV	25	475.00

FOR COMPLETE DETAILS WRITE:

WILKINSON ELECTRONICS, INC.

1937 MACDADE BLVD. • WOODLYN, PA. 19094
TELEPHONE (AREA CODE 215) 874-5236 874-5237

Circle Item 13 on Tech Data Card

January 1966

We interrupt this magazine to bring you...

Late Bulletin from Washington

by Howard T. Head

AM Licensees Have Resiting Problems

Standard broadcast licensees are finding it increasingly difficult to provide coverage of the nation's growing towns and cities. Not only does this growth create problems of covering areas largely vacant when the transmitting facilities were constructed, but populous subdivisions are often built in areas where directional antennas are required to produce deep nulls. This results in poor coverage of the affected areas, as well as distortion of directional radiation patterns beyond acceptable limits.

Transmitter relocation is sometimes resorted to, but these plans may be complicated by increases in real-estate values. Sites low in price a few years ago may now be highly valued, while increases in real-estate values and the additional difficulty of providing adequate signal to the city make selection of new locations difficult.

The Commission is aware of the problem, but existing Technical Standards governing coverage of the city, blanketing, and maintenance of directional antenna patterns are still rigidly enforced. Recognition has recently been given, however, to problems created in some instances by minor interference changes when transmitters must be relocated over short distances. Generally, however, the problem is becoming more acute, and little relief is in sight.

Land-Mobile Base Transmissions by FM Multiplex

A Working Group of the Commission's Advisory Committee on the Land-Mobile Radio Services has proposed a novel means for accommodating a substantial number of transmissions for base stations in the land-mobile radio service. These services, which include police, business, industrial, and many other services, have complained of an increasing shortage of spectrum space for both base and mobile operation. Under the new proposal, land-mobile base transmissions would be provided by multiplexing subcarriers on FM broadcast stations. In successful tests at WRYT (FM), Pittsburgh, Pennsylvania, as many as eight narrow-band subcarriers were multiplexed on the WRYT carrier without experiencing mutual interference, or without causing interference to the main transmissions of WRYT.

Under typical circumstances, these land-mobile base transmissions can be received out to distances on the order of 15 miles. Transmissions from

the mobile unit to the base-station receiver would be accomplished over the regular land-mobile channels. One drawback of the proposal is that stereo FM transmissions must be curtailed; also, regular SCA operations would conflict with the land-mobile transmissions.

Transmitters Must Be Visible From Operating Position

The Commission has called attention to the fact that transmitters not operated under a remote-control authorization must be visible from the operator's position at all times. The visibility may be provided by means of a suitable mirror, or in some instances closed-circuit television systems have been accepted as providing the required visibility. In these instances, however, the Commission has required that the transmitter be reasonably accessible to the operator.

In those instances where the visibility requirement cannot be met, the Commission requires a formal application for remote-control operation (FCC Form 301-A) with all control and metering circuits specified by the remote-control Rules.

More Action on Clear Channels Due Soon

The Commission has once again turned its attention to the problem of the most effective use of the 24 clear channels heretofore reserved for the exclusive use of one 50-kw Class I-A station during nighttime hours. On twelve of these channels, provision has already been made for a single Class II-A full-time station in one of the Western states; in most instances, these Class II-A stations have either been granted, or conflicting applications have been designated for hearing.

The Commission is now preparing to establish guide lines for the further use of the clear channels. These include: (1) conditions under which clear-channel operation may be permitted with powers up to 750 kw, (2) conditions under which additional unlimited-time Class II stations may be permitted on the clear channels, and (3) the assignment of daytime-only Class II stations to the clear channels.

Short Circuits

New filing fees required for broadcast applications have been established (May 1965 Bulletin), effective January 3, 1966 . . . ZIP-code your return address in writing Federal Agencies; they are required to ZIP-code their replies . . . A Citizens band licensee in the Boston area has been sentenced to a year in prison for transmitting "obscene, indecent, and profane" language over his CB station . . . New Rules governing sunrise operation of daytime-only AM stations are expected soon . . . Most broadcast interests have opposed the Commission's proposal to establish "antenna-farm areas" for tall FM and television towers, largely on the grounds that the proposals give the FAA far too much authority over the height and location of tall broadcast towers . . . NASA has issued invitations to contractors for feasibility studies of direct satellite-to-home broadcasting in the short-wave and FM bands; television wasn't mentioned, but is known to be under study -- the enormous amounts of power required and channel availability appear to present the most serious problems in television space broadcasting.

Howard T. Head...in Washington

EIMAC

new power amplifier pentode provides excellent linearity

Now you can have reliable power in a new 1500 watt pentode. Eimac's 5CX1500A power amplifier tube is designed for use at the popular 1000-2000 watt peak envelope power range. And it's compact: height, 4 $\frac{7}{8}$ ", diameter 3 $\frac{1}{2}$ ". Physical configuration is similar to Eimac's well-known 4CX1000A tetrode. The tube carries control and screen grid dissipation ratings of 25 and 75 watts, respectively. The 5CX1500A is ideally suited for Class C operation. In linear service the tube can provide a two-tone signal with third-order products of -39 db at 1000 watts PEP or -35 db at 1700 watts PEP. Write Power Grid Product Manager for information or contact your local EIMAC distributor.

5CX1500A

CLASS C MAXIMUM RATINGS

DC PLATE VOLTAGE	5000 V
DC PLATE CURRENT	1.0 Amp.
DC SCREEN VOLTAGE	750 V
PLATE DISSIPATION	1500 W
SCREEN DISSIPATION	75 W
GRID DISSIPATION	25 W
SUPPRESSOR DISSIPATION	25 W

TYPICAL CLASS AB₁

LINEAR AMPLIFIER MEASURED VALUES IN TWO TONE TEST

DC PLATE VOLTAGE	4000 V
DC PLATE CURRENT (No Signal)	250 mA
DC PLATE CURRENT (Two Tone)	485 mA
DC SCREEN VOLTAGE	500 V
PEAK ENVELOPE POWER OUT	1785 W
THIRD ORDER IN MAXIMUM	-35 db

EIMAC

San Carlos, California 94070

A Division of Varian Associates



Circle Item 14 on Tech Data Card

FOR THE ONE SOUND ENGINEER IN THREE WHO IS VERY PARTICULAR

AUDIO MIXER



Unique plug-in preamp modules gives you 6-channel mixing with choice of input levels or impedances in any combination at no extra cost. Additional low-cost plug-in units can be supplied for maximum flexibility in use. One input can be used as a 1000 cycle tone for system balancing. Separate and master gain controls, separate bass and treble controls, large illuminated VU meter with range switch. Main output 600 Ω , transformer coupled, balanced or unbalanced. Additional output from emitter follower for feeding tape recorder or amplifier. Solid state throughout.

DIODE SWITCH



For simplified operation of remote video monitor, without cumbersome trunk lines. Gives remote selection of 3 high impedance inputs, couples to low impedance output through transistor isolating circuit. Solid state throughout. Self-contained power supply, AC isolated.

Write for complete specifications. See how well-designed quality equipment doesn't have to cost more.

Specialists in versatile equipment for broadcast, closed circuit TV and recording studios. For the engineer who insists on quality.

**BRADFORD
INFORMATION
SYSTEMS, INC.**

7312 N. Ridgeway Ave., Skokie, Ill. 60076

NAEB Convention

(Continued from page 23)



For engineers fortunate enough to attend this convention, there was in addition to the exhibit hall a full-day engineering program, hosted by Jansky & Bailey, on Tuesday. The day began at 8 AM with a continental breakfast where engineers had a chance to get acquainted with each other. A few equipment reps and some federal personnel also attended. Thus the group conversations ranged from quality of various pickup tubes to FCC computer errors in channel allocations to an NDEA man's attempt to explain who gets money for equipment, why, and how much.

After Oscar Reed, Jr., chairman, started the program promptly at nine, William J. Kessler, consulting engineer and professor of engineering at the University of Florida, discussed engineering problems and developments resulting from establishing ETV in American Samoa. The talk was especially informative to those interested in engineering theory.

For engineers concerned with the nuts-and-bolts, day-to-day operation of ETV facilities, there were several effective speakers, among them William C. Lewis. The technical services director of the Delaware statewide ETV system presented an informative and well illustrated talk on the role hard-nosed business practices, ingenuity, and manual labor played in meeting a tough deadline for completion of that state's system.

Roger Penn, assistant professor



at American University, reported on his research to determine viewer rating of relative picture quality of four common live-camera pickup tubes. Pictures from an average 3" I.O., 4½" I.O., Plumbicon®, and vidicon were evaluated by a group of viewers for such qualities as smear, resolution, and gamma.

Allen B. MacIntyre, director of engineering at the University of North Carolina, probed the planning and actual field problems of building the 500-mile North Carolina ETV microwave system.

In a paper presented by his engineering staff, Charles A. Prohaska, assistant general manager of WETA, Washington, D. C., discussed the design, building, and operating success of the station's one-vehicle remote van.

Later, an Engineers' Professional Interest Section of the NAEB was formally organized, with Ronald Stewart, consulting engineer for the Kentucky Educational Television Authority, elected chairman of the group. The Interest Section will represent member engineers within the NAEB and will aid in organizing regional meetings of its members.

With all the discussion today about commercial color television, the subject was inevitable for the educational broadcaster. E. C. Tracy, division vice-president of RCA, spoke Monday on the various costs of color conversion.

As with the NAB, some exhibits were crowded, others not. Among the items that drew the crowds were:

Ampex's VR-7000, a new VTR in the \$3000 range.

RCA's PK-330, an \$8500 vidicon studio camera chain with a zoom lens, yoke, and vidicon assembly that tilts while the viewfinder remains level.



you lost your turn by missing our ad in the September issue. Go back and look at page 26 for NEW REMOTE CONTROL from BIONIC INSTRUMENTS, INC.

Circle Item 16 on Tech Data Card

← Circle Item 15 on Tech Data Card

BROADCAST ENGINEERING



Sony targets the sound you want



Telemike Exclusive: Built-in Monitor Facility*

Now, with *three* readily interchangeable sound tele probes, similar in principle to changeable telephoto lenses, you can 'zoom' in from varying distances for the precise sound you're after. The 18-inch probe may be used for 'close ups,' as far back as 75 feet from the sound source; the 34-inch probe from 150 feet. A 7-foot probe is optional for distances beyond 150 feet.

*The most unique feature, a Sony exclusive, is the built in, battery powered, solid state monitoring amplifier in the pistol grip handle, which assures the operator that he is transmitting the source with pin-point accuracy.

OTHER FEATURES, OTHER USES: The new Sony F-75 Dynamic Tele-Microphone is highly directional at the point of probe, with exceptional rejection of side and back noises (35 to 40 db sensitivity differential). Recessed switching allows quick selection of impedances (150, 250 and 10K). The uniform frequency response, controlled polar pattern, and unprecedented rejection of background noise eliminates feedback interference in P. A. systems.

The complete Sony F 75 Tele Microphone includes two sound probes, 18 and 34 inch lengths, monitoring pistol grip handle and the Sony dynamic headset, all in a velvet lined compartmentalized carrying case, for less than \$395. For specifications and a catalog of the complete line of Sony microphones, visit your nearest Sony/Superscope franchised dealer, or write: Superscope, Inc. Dept. 52, Sun Valley, Calif. *The best sound is Sony.*



Circle Item 17 on Tech Data Card

Advanced, Solid State

Spotmaster

Super B Series

MEETS OR EXCEEDS ALL NAB SPECIFICATIONS AND REQUIREMENTS

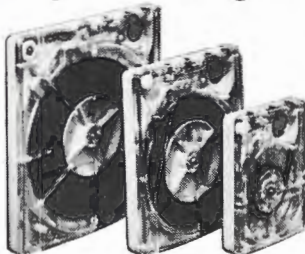


And Here's the New Economy King **COMPACT 400-A**



Don't let their low price fool you. New, solid state SPOTMASTER Compact 400's are second only to the Super B series in performance and features. Available in both playback and record-playback versions, these Compact models share the traditional SPOTMASTER emphasis on rugged dependability.

Top Quality **Tape Cartridges**



Superior SPOTMASTER tape cartridges are available in standard timings from 20 seconds to 31 minutes, with special lengths loaded on request. In addition, Broadcast Electronics offers a complete selection of blank cartridges, cartridges for delayed programming and heavy duty lubricated bulk tape. Prices are modest, with no minimum order required.

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.

Super B specs and performance equal or exceed NAB standards. Our ironclad one-year guarantee shows you how much we think of these great new machines.

Write, wire or call for complete details on these and other cartridge tape units (stereo, too) and accessories . . . from industry's largest, most comprehensive line, already serving more than 1,500 stations on six continents.



**BROADCAST
ELECTRONICS, INC.**

8800 Brookville Rd., Silver Spring, Md.
Area Code 301 • JU 8-4983

Circle Item 19 on Tech Data Card

Color-Tran's 1000-watt focusable quartz flood—a 9" x 9" package priced at about \$80.

Sarkes Tarzian's 2700L Plumbicon® studio camera chain—about \$13,000.

Sylvania's mobile TV production unit—a self-contained van including two vidicon camera chains, assorted monitors, switchers, audio mixer, input-voltage regulator, gasoline-powered generator, steel-plated roof with camera turret—\$42,500.

GE's PF-11-C pneumatic multiplexer utilizing, as the name implies, compressed air to operate the mirrors—about \$4000.

Visual Electronics' PM-50 Plumbicon® studio camera featuring a built-in ten-to-one zoom lens—price near \$20,000.

Throughout the show, a number of station managers attempted to fill new, high-paying engineering positions. We asked about the positions and got these replies:

"Our present engineer (in the \$5000-6000 bracket) is good on old-equipment repair, but we're to the point where we need someone who can select new equipment and who can take command of our growing technical staff."

"There is too much responsibility on the engineer's shoulders for us to trust our new equipment to an inexperienced engineer."

"We have low-paying engineering jobs too, but the man that's hard to get is the responsible engineering administrator."

"Because our reputation for quality and continuity rests on one engineer, we'll pay extra for a good man."

Thus, the 1965 NAEB Convention pointed up the need for professional, well-informed ETV engineers. By 1966 show time, many of these positions will be filled, and these people will be concentrating on bringing the ETV industry technical professionalism. It should be a very interesting year. ▲

Symbol of Excellence



in Electronics

Circle Item 18 on Tech Data Card

BROADCAST ENGINEERING

Broadcast Engineering

7 YEAR SUBJECT REFERENCE INDEX

Index to Subjects

Acoustics	32	Facilities	36	Outside Broadcast	39
Aircraft Applications	32	FCC	36	Ownership	39
AM	32	FCC Rules and Regulations, Amend- ments and Proposed Changes.....	36	Pads and Attenuators.....	39
Antennas, AM	32	Films, TV	36	Power Supplies	39
Antennas, Directional	32	FM	36	Proof of Performance.....	39
Antennas, FM	32	Indexes	37	Radiation and Propagation.....	39
Antennas, Receiving	32	Industry Features	37	Recording, Video	39
Antennas, TV	32	Interference	37	Remote Control	39
Associations and Conferences.....	32	International Broadcasting	37	Remote Pickup	39
Audio Equipment	32	Level Devices, Audio.....	37	Safety	39
Automation	33	Lighting	37	SCA	39
Book Reviews	33	Lines, Remote	37	Semiconductors	39
Building Design and Construction.....	33	Line Voltage	37	Specifications and Standards.....	40
Cartridge Tape Equipment and Operation	33	Licenses	37	Stereo	40
CATV	33	Logs and Logging.....	37	STL	40
CCTV	33	Maintenance	37	Studio	40
Chief Engineer	33	Matching Networks	38	Switching Equipment	40
Color TV	33	Measurements	38	Tape Recording	40
Components and Materials.....	33	Meters	38	Telephone Lines	40
Consoles	34	Microphones	38	Television	40
Control Room	34	Microwave	38	Television Cameras	41
Disc Recording and Playback.....	34	Miscellaneous	38	Test Equipment and Instruments.....	41
Emergency Operations and Equipment	34	Mixers	38	Towers	41
Engineering Theory	34	Mobile	38	Translators	41
Engineers' Exchange	34	Modulation	38	Transmitters	41
Equipment Construction and Modification	35	Monitors	38	Transmission Lines	41
Equipment Design	35	Multiplex	38	UHF-TV	41
ETV	36	Newsfilm	38	Video Equipment	41
		Off-Air Pickups	38	Washington Bulletin	42
		Operations	39		

LE indicates "Letters to the Editor"; NI indicates "News of the Industry."

ACOUSTICS

- Broadcasting, in28, Jul 63
- Music-pickup techniques14, Feb 64
- Precedence effect6, May 60
- Recording studios26, May 59
-12, Feb 64
- Reverberation, synthetic8, Jan 60
- Studio, introduction to.....14, Sep 65

AIRCRAFT APPLICATIONS

- Broadcast system, heliportable
.....18, Jan 64
- Field-intensity measurements.16, Mar 65
- Helicopter use34, Aug 64
- field measurements20, Aug 61
- international TV, in.....24, Jan 65
- TV station in helicopter20, Dec 61

AM

- Allocation freeze, FCC.....36, Feb 64
- Antennas, directional,
planning32, Aug 60
- Audio equipment, choice of.22, Nov 59
- Audio transmission set,
use for12, Feb 65
- Automation system10, Jun 64
- Clear channels, FCC and...22, Nov 61
- Cross-modulation24, Jul 64
- Daytime stations, proposed
change in hours.....29, Aug 59
- Diplexing transmitters14, Jul 60
- Field-intensity measurements..6, Jan 61
- Grid-modulation theory28, Jun 63
- Harmonic suppression12, Apr 63
- Modulation
—methods18, Mar 64
- monitors, calibration12, Nov 64
- correctionLE 6, Jan 65
- power, increasing10, Jul 65
- Network, off-air pickup.....12, Aug 63
- Power measurements for....20, Apr 65
- Proof of performance.....20, May 63
-20, Jun 63
-16, Oct 63
-12, Dec 63
-28, Feb 64
- Remote control, CBS
experience4, Nov 61
- Single-sideband, compatible..4, Aug 59
- Spare-parts inventory14, Jul 63
- Stereo
—method16, May 63
- stations40, Feb 60
- STL, 900-mc22, Oct 64
- Studio design14, Jun 63
- Test-equipment checklist10, Jul 63
- Transmitter kit2, Jun 60
- Transmitters
—1-kw24, Jul 61
- list37, Jul 59
- 4-400A use in18, Mar 65

ANTENNAS, AM

- De-icing control34, Sep 64
- Directional, planning32, Aug 60
- Impedance, effects of lighting and
isolation circuits on.....4, Sep 60
- Maintenance17, Nov 62
- safety note on.....LE 6, Jan 63
- Matching networks for.....12, Jan 64
- Measurements, RF bridge for.23, Jun 65
- Meters for, remote-
indicating14, Aug 65
- Remote pickup, installation..12, Jan 63
- Series feed30, Jan 63
- Shunt feed32, Jan 63
- Site test for16, Nov 65
- Unipole
—folded4, Dec 60
- use26, Feb 63

ANTENNAS, DIRECTIONAL

- Adjustments, AM stations..16, Nov 64
- Design10, May 64
- Field-intensity
—contour calculations16, Dec 62
- measurements6, Jan 61
- airplane, from16, Mar 65
- helicopter, from.....20, Aug 61
- interference22, Feb 63
- Form 30114, Feb 63
- correction toLE 6, May 63
- Installation14, Nov 62
- azimuth, bearing14, Dec 62
- correction factors24, Jan 63
- Polaris, use of.....15, Dec 62
-22, Jan 63
- surveying15, Dec 62
- time24, Jan 63
- Measurements
—checking pattern, for.....20, Jul 65
- field-intensity meter
use for10, Nov 65
-23, Dec 65
- running radials for.....21, Jun 65
- Operation10, Jan 64
- correction20, Mar 64
-LE 6, Jun 64
- Pattern distorted by
water tank19, Jan 63
- Phase monitors, improving
sensitivity of24, May 65
- Phasing26, Oct 63
- system specifications26, Jun 61
- Power dividers4, Sep 61
- Primer on18, Dec 65
- Proof-of-performance plans.22, Apr 63
- Soil conductivity, effects of..12, Jun 64
- chartLE 6, Nov 64
- Stability of48, Apr 65
- Systems planning32, Aug 60
- Theory24, May 63
- Tuning unit, composite22, Sep 62

ANTENNAS, FM

- De-icing control34, Sep 64
- Field-intensity, dbu and dbk.20, Nov 62
- Mounting4, Oct 61
- Multiplex, for26, May 60
- Stereo
—station, planning12, Nov 62
- correctionLE 6, Dec 63
- transmitting16, Dec 63
- Vertical polarization for....14, Aug 64
- VSWR, effects on stereo
separation16, Jan 63

ANTENNAS, RECEIVING

- Off-air pickup, TV.....28, Aug 63
- Translator, location of.....12, Dec 64

ANTENNAS, TV

- Candelabra24, Dec 60
- De-icing control34, Sep 64
- Helical, theory of.....20, Oct 65
- Measurements for24, Jul 65
- STL, alignment of44, May 64
- Translator, location of.....12, Dec 64
- UHF
—Empire State Building42, Jun 61
- transmitting14, Jan 64

ASSOCIATIONS AND CONFERENCES

- AES Convention
—196234, Sep 62
- 196552, Sep 65

IEEE, 1963 International

- Convention48, Mar 63
- IRE Symposium10, Nov 60
-4, Dec 61
- ITU Conference, 1963.....22, Jan 64
- NAB
—Convention
—1959, report5, May 59
- 1960, report10, Apr 60
- 1961, preview24, Apr 61
- report4, May 61
- 1962, report4, May 62
- 1963, preview35, Mar 63
- report18, Apr 63
- 1964, preview33, Mar 64
- report16, May 64
- 1965, preview39, Mar 65
- report18, May 65
- Engineering Conference,
19598, May 59
- 19628, May 62
- Engineering Department..32, Mar 63
- NCTA Convention, 1965....10, Sep 65
- NEC, 20th20, Oct 64
- review of24, Dec 64
- SMPTE Technical Conference
—95th55, Mar 64
- 96th20, Oct 64

AUDIO EQUIPMENT

- AGC action4, Jun 62
- Amplifiers
—design
—resistance-coupled16, Jun 63
- transistor6, Sep 62
- miniature31, Jun 59
- monitor12, Aug 65
- noise-suppression14, Apr 62
- Broadcasting, for.....22, Nov 59
- Chime generator, electronic..4, Jan 61
- Compressors12, Jul 63
-16, Aug 63
- addenda, manufacturers'
addressesLE 6, Oct 63
- Console
—custom-built14, Mar 61
- production28, Jul 64
- Contamination, signal18, Mar 62
- Control-room10, May 61
- Distortion, study of.....18, Dec 59
- Distribution system,
solid-state28, Aug 63
- Echo effect with tape13, Aug 59
- Fader, automatic8, Sep 59
- FM station, stereo, planning.22, Dec 62
- Level control, automatic8, Nov 60
- Level devices, use of.....40, May 64
- correctionsLE 6, Jul 64
- Levels, balanced12, Aug 60
- Limiters, peak10, Jun 63
-16, Aug 63
- addenda, manufacturers'
addressesLE 6, Oct 63
- correction (to Jun)LE 6, Aug 63
- Limiting action4, Jun 62
- Maintenance, studio14, Aug 62
- Microphone
—filter, special-effects.....24, Jun 63
- mixer40, Oct 64
- polar response6, Feb 60
- unidirectional6, Apr 60
- wireless16, Apr 65
- Monitor, paging system
addition10, Nov 62
- Music system, automatic17, Feb 63
- correction toLE 6, Apr 63
- Oscillator, solid-state63, Oct 64
- Plug, multicontact, uses for..30, Jul 59
- Remote amplifier,
transistorized10, Oct 59
- Reverberation, synthetic8, Jan 60
- Shielding8, Jun 62
- Stereo, phase checks for....18, Dec 63

- additionsLE 6, Feb 64
- Studio maintenance12, Jul 62
- Switcher
 - crossbar type18, Aug 64
 - reed16, Sep 64
- Switching, push-button16, Dec 60
- system16, Dec 64
- Tape
 - cuer, automatic22, Mar 62
 - equipment34, Dec 64
 -14, Jan 65
 -18, Feb 65
- mastering66, Mar 65
- standards, reel-to-reel, NAB16, Sep 65
- transports, reel-to-reel, maintenance23, Oct 65
- Tape-cartridge
 - cuing22, Jul 65
 - maintenance, system36, Nov 64
 - standards, NAB8, Jan 65
- Transistor amplifier design18, Aug 62
- Transmission sets
 - construction14, Sep 64
 - use12, Feb 65

AUTOMATION

- Alarm, for faults14, Dec 64
- Design considerations16, Oct 59
- Logging
 - program20, Mar 63
 - transmitter6, Mar 61
- Money, make, not save16, May 65
- Music system17, Feb 63
- correctionLE 6, Apr 63
- Programmer, simple30, Mar 61
- Program system, automatic32, Sep 59
- Radio use10, Jun 64
- Systems, planning for16, Sep 63
- Tape-cartridge use30, Apr 63
- Tape equipment, audio, for18, Feb 65
- Television, system for16, May 59
- Time injector12, Oct 62
- correctionsLE 6, Jan 63
- Tone generator for, 20-cps22, Aug 65
- Transmitter-site10, Jun 65
- WKRC-TV installation4, Jul 60

BOOK REVIEWS

- ABC's of Mobile Radio35, Aug 62
- ABC's of Ultrasonics26, Apr 62
- Acoustical Tests and Measurements50, Aug 65
- Analysis, Transmission, and Filtering of Signals37, Dec 63
- Antenna Engineering Handbook38, Jun 64
- Audio and Acoustics65, Feb 65
- Auto Radio Manual27, Apr 62
- Basic Electronics92, Mar 65
- Basic Electronics for Engineers51, Aug 64
- Basic Theory and Application of Transistors50, May 65
- Collected Papers on Acoustics50, Sep 65
- Communication Satellites56, Oct 64
- Design and Operation of Regulated Power Supplies26, Jun 62
- Electronic Games and Toys20, Feb 62
- Electronic Musical Instruments Handbook35, Aug 62
- Electronics Math Simplified36, Jan 62
- FM Multiplexing for Stereo26, Jul 62
- Handbook for Electronic Engineers30, Dec 65
- Handbook of Electronic Charts and Nomographs36, Jan 62
- Handbook of Electronic Tables and Formulas56, Oct 64
- Magnetic Tape Recording47, Nov 64

- Mathematics for Electronics and Electricity50, Dec 64
- Microphones50, Jul 64
- Microwave Test and Measurement Techniques49, Nov 65
- NAB Engineering Handbook34, Jan 63
- Oscilloscope, The30, Sep 64
- Planning the Local UHF-TV Station36, Jun 65
- RCA Power Tubes30, May 62
- RCA Receiving Tube Manual26, Apr 62
- Radio Electronic Transmission Fundamentals26, Jul 62
- Radio Handbook34, Jan 63
- Radio Operators License Handbook64, Oct 65
- Sideband Communications Handbook38, Sep 62
- Silicon Controlled Rectifier Manual30, May 62
- Single-Sideband Principles and Circuits22, Nov 64
- Sound in the Theatre20, Feb 62
- Transistorized Voltage Regulators20, Jun 62
- Transistor Substitution Handbook26, Jul 62
- Transistor Substitution Handbook, Revised20, Feb 62
- Troubleshooting With the Oscilloscope30, May 62
- Tube Substitution Handbook35, Aug 62
- Tube Substitution Handbook Volume 336, Jan 62
- Two-Way Mobile Radio Handbook46, Jan 65
- Understanding Lasers and Masers58, Apr 65
- What You Should Know About Two-Way Radio26, Jun 62

BUILDING DESIGN AND CONSTRUCTION

- Acoustics30, Jul 63
- Control room32, Jul 64
- Interference, internal, prevention16, Oct 62
- Studio
 - radio, planning12, Feb 61
 - WFAA34, Sep 60
- Transmitter5, Nov 61
- TV
 - WJXT4, Nov 60
 - WTWO17, Oct 65
- TV/Radio center20, Oct 63

CARTRIDGE TAPE EQUIPMENT AND OPERATION

- Adjustments, test cartridges for31, Nov 65
- Automatic
 - audio system26, Sep 59
 - cuing for playback22, Jul 65
 - machine18, Jun 63
- Conelrad, automatic test procedure6, Jun 61
- Control, automatic, for machine6, Apr 62
- Cue-tone generator, 20-cps22, Aug 65
- Heads, care of21, Dec 65
- Maintenance for19, Jun 65
- systems36, Nov 64
- Operation, techniques24, Apr 64
- Portable systems14, Jan 65
- Rack, construction20, Aug 63
- additionsLE 6, Feb 64
- Standards, NAB8, Jan 65
- Systems, automatic30, Apr 63
- correctionLE 6, Jul 63

CATV

- Amplifiers, cascaded
 - wideband14, Oct 63
- Cable for, choosing18, Jul 65
- FM, adding to systems10, Aug 65
- Maintenance of28, Feb 65
- NCTA Convention, 196510, Sep 65
- Pay and, a viewpoint34, Jan 65
- System
 - description12, Jan 65
 - full-spectrum12, Feb 63
- Systems, basic10, Feb 64

CCTV

- ETV, transmission standards18, Oct 63
- System for school14, Nov 65

CHIEF ENGINEER

- Antennas
 - auxiliary, FCC permission for48, Jan 65
 - base-current meter, constant-impedance switch for58, Jun 65
- Blanket contour52, Aug 64
- Dipole, horizontal55, Nov 64
- Directional antenna
 - base-current readings64, Mar 65
 - logging, automatic, for52, Aug 64
 - phase variation, tolerances for88, Apr 65
- Emergency operation55, Nov 64
- FCC 10% Rule48, Sep 64
- changes inLE 6, Nov 64
- Field-strength change71, Oct 64
- Interference, in CATV system64, Mar 65
- Lightning and RF-arcing damage to tower55, Nov 64
- Monitor point, change of36, Feb 65
- NARBA71, Oct 64
- Power-line-voltage regulation58, Jun 65
- Radials, laying88, Apr 65
- Stereo proof of performance36, Feb 65
- STL operations, license requirements88, Apr 65
- White areas71, Oct 64

COLOR TV

- Stereo4, Jul 62
- Studio, mobile14, Oct 60
- Tape-recording techniques18, Apr 64

COMPONENTS AND MATERIALS

- Cable, choosing for CATV18, Jul 65
- Coax transmission line, uses10, Jan 65
- Image orthicon
 - color TV, for8, Jul 62
 - sensitive4, Feb 60
- Mercury rectifiers, care and testing8, Jun 60
- Microelectronic modules, 196526, Mar 65
- Negative-resistance devices16, Jul 65
- Plug, multicontact, uses for30, Jul 59
- Rectifiers
 - high-voltage solid-state16, Apr 64
 - silicon replacements28, Aug 61
- SCR, dimmer use for22, Jul 59
- Spares, inventory for14, Jun 63
- Tape, magnetic4, Jun 60
- storage, effects of38, Apr 61
- storage tips28, Jul 61
- Tubes, manufacture of22, Oct 60

UHF, high-power devices...28, Mar 63
4-400A, AM-transmitter use...18, Mar 65

CONSOLES

Audio
—custom-built...14, Mar 61
—production...28, Jul 64
Semiautomatic control table...20, Apr 64
Stereo, portable...20, Sep 65

CONTROL ROOM

Audio switching, push-button...16, Dec 60
Design, new approach...32, Jul 64
Desk, circular...42, Nov 63
Emergency booth...22, May 64
Improving...10, May 61
Maintenance, preventive...12, Dec 62
Radio, design...14, Jun 63
Semiautomatic control table...20, Apr 64

DISC RECORDING AND PLAYBACK

Facilities, updating for...14, May 65
Lathe, standard, modification
to microgroove...24, Sep 64
Logging system, automatic...20, Mar 63
Logs, program, dictation-
equipment use for...48, Nov 63
Playback systems, updating...36, Nov 63
Stereo phase relations...24, Aug 62

EMERGENCY OPERATIONS AND EQUIPMENT

Conelrad
—alarm, teletype...10, Aug 62
—attention signal...28, Feb 61
—correction...4, Apr 61
EBS system...15, Dec 65
Emergency booth...22, May 64
Generator...10, Jul 62
Part 73...23, Apr 65
Power system...20, May 64
Safety practices in station...14, Nov 64
Tower collapse, CKAC...28, Apr 65
—corrections...LE 6, Jun 65
Tower collapse or defects...13, Apr 65
—correction...LE 6, Sep 65

ENGINEERING THEORY

Acoustics
—music pickup...14, Feb 64
—studios...14, Sep 65
—recording...12, Feb 64
Amplifiers, cascaded
wideband...14, Oct 63
AM-transmitter modulation
power, increasing...10, Jul 65
Antenna
—directional...32, Aug 60
—feed, series, shunt...30, Jan 63
—helical...20, Oct 65
—impedance, effects of lighting and
isolating circuits on AM...4, Sep 60
—unipole...26, Feb 63
—folded...4, Dec 60
Audio
—amplifiers
—resistance-coupled...16, Jun 63
—transistor...6, Sep 62
—compressors...12, Jul 63
—peak limiters...10, Jun 63
—correction...LE 6, Aug 63

Cathode follower...14, Jun 65
CATV systems...10, Feb 64
Clamp circuits...16, May 60
Class-C amplifiers...18, Aug 65
—correction...LE 6, Nov 65
Coax, characteristics of...40, Feb 65
Cross-talk, multiplex, effects
of SWR on...4, Aug 61
Directional antennas...24, May 63
—design...18, Dec 65
—operation...10, Apr 64
—phasing...20, Mar 64
—correction (to Jan)...LE 6, Jun 64
—soil-conductivity effects...26, Oct 63
—chart...12, Jun 64
—stability...LE 6, Nov 64
—stability...48, Apr 65
Emitter follower...14, Jun 65
Field-intensity
—contour calculations...16, Dec 62
—dbu and dbk...20, Nov 62
FM
—multiplex and SCA...12, Sep 64
—practical...6, Feb 62
—pre-emphasis and distortion...12, Feb 62
in...18, Apr 62
—serrasoid modulator...10, Nov 59
—station, planning...4, Jul 59
—station, planning...20, Jul 60
Frequency vs wavelength
calculations...24, Aug 63
IRE, 10th annual symposium...10, Nov 60
Microphone technique and
development...14, Nov 59
Microwave systems, video,
specifications for...30, Oct 64
—correction (to Oct)...20, Nov 64
Modulation
—audio...LE 6, Mar 65
—grid...18, Mar 64
Negative resistance...28, Jun 63
Pads, isolating and matching...16, Jul 65
Parametric amplifier...20, Aug 65
Precedence effect...12, May 64
Radar, weather, system...14, Jun 64
Recording, video, time-base
error...10, Jun 61
Remote-control systems...8, Nov 61
Stereo broadcasting, new
method...36, Oct 65
Switching devices, solid-state...16, May 63
Tower construction, vibration
problems in...16, Jun 65
Tower-emergency operation...34, Jul 59
—correction...13, Apr 65
Transistor audio-circuit
design...LE 6, Sep 65
Transmission lines...18, Aug 62
Vectors, review of...26, May 63
Video-tape recording...22, Feb 65
—techniques...18, Apr 64
—techniques...20, Nov 63

ENGINEERS' EXCHANGE

Air-conditioning, records for...50, Apr 61
Antenna, shielded loop...30, Jun 62
Audio gear use...38, Sep 64
"Beeper," eliminating
pulse noise in...39, Jun 60
Blowers, saving on
replacement...39, Jun 60
Burnishing tool for
phone jacks...68, Oct 65
Capstan motor
—binding...42, Aug 64
—switch...32, Jun 62
Carrier-current repeaters...46, Aug 65
Carrier-failure alarm...42, Jul 65
—correction to...LE 6, Oct 65
Cartridge-tape head alignment
jig...48, Nov 64
Case, equipment...23, Apr 62

Conelrad bell counter...30, Jul 61
Console
—accessory panel...36, Apr 63
—monitor, auxiliary...34, May 63
—remote lines, modified to
monitor...43, Jun 59
—Yard, dual-channel
modification for...40, Jul 65
Cue
—earphone...22, Jul 62
—line, carrier-current...30, Dec 62
—tone, auxiliary...38, Sep 64
Cut button, foolproof...60, Feb 65
Distortion
—amplifier, lowering...30, Sep 60
—diode...34, May 63
Equalizer indicator for
turntable...40, Jan 60
Exhibits, engineering,
report...32, Nov 60
Field-strength-meter
calibration...32, Mar 61
FM monitoring, remote, relay
switching for...24, Nov 62
—parts for...LE 6, Jan 63
Focus-current meter...56, Oct 64
Frequency monitors, care of...29, Jan 64
—comments on...LE 6, Apr 64
Gated compressor, dual
recovery time...40, Jul 65
Ghosts, method for
diminishing...40, May 65
Guy-wire pattern distortion,
eliminating...31, Sep 62
Headsets, level control for
low-impedance...42, Jul 65
Heaters, space, transmitter...40, Dec 59
Impedance and inductance,
quick measurement...48, Nov 64
Insulators, bowl, rain shields
for...44, Mar 63
Interlock, curing trouble...30, Sep 60
Labels for jacks...22, Dec 63
Licenses, displaying...56, Oct 64
Light blinker, solid-state...58, Mar 64
Limiter
—amplifier, RCA BA-6A,
zero-set control for...60, Mar 64
—preamp...36, Apr 63
Line
—checks
—portable radio, with...70, Oct 65
—speeding...77, Apr 65
—remote-control, indication...23, Jul 62
—voltage, excessive...42, Apr 64
Log, maintenance...22, Dec 63
Matching unit, 600-ohm...34, Aug 63
Mercury-vapor-tube tester...30, Jun 61
Meter maintenance...52, Oct 64
Microphone filter...52, Oct 64
Microwave intercom facilities...48, Jul 59
Modulation
—monitor, check calibration
with scope...30, Oct 63
—peaks...39, Jun 60
—transformer, temporary
operation with defective...26, Jul 63
Monitor
—on-air...30, Sep 60
—speaker added to
level-meter panel...36, Apr 63
Multiplex specifications...34, Jun 62
Nemo alarm...32, Nov 60
Neon lamps, dark...22, Sep 61
NIAC receiver...28, Jan 63
One of those days...22, Dec 63
Oscillator, reference,
crystal-controlled...52, Oct 64
Party line plus, the...51, Sep 65
Pattern switching,
carrier interruption for...24, Nov 62
Phase change without
pattern change...29, Jan 64
Pickup heads, rotate to
prolong life...48, Jun 65
prolong life...43, Jun 59

Power
—change, automatic system 36, Feb 63
—cut-back modification 32, Dec 64
—failure indicator 60, Feb 63
—supply, GE BT-1B, improving 42, May 65
Reclosure, automatic 32, Jun 63
Record cleaners 38, Sep 64
Recorder
—control, automatic 51, Sep 65
—echo, correcting 28, Jan 63
—servicing 30, Sep 60
Recording clock 38, Sep 64
—preset 22, Dec 63
Regulation, voltage, for GE Unilevel amplifier 28, Sep 63
Relay
—quieting 20, Jul 62
—stepper 34, May 63
—correction LE 6, Aug 63
—supply, low-cost, low-current 48, Jun 65
Remote
—amplifier 32, Jun 63
—basic 33, Jun 63
—correction LE 6, Nov 63
—kit, weekend case makes 35, Sep 63
—lines, monitoring 32, Nov 60
—pickup, CB transceiver for 43, Aug 64
—turntable inputs for amplifier 78, Apr 65
—TV-pickup system, a 30, Dec 62
—unit, with portable recorder 30, Dec 64
Remote-control
—line fuse protector 42, Aug 64
—warning lights for 38, Feb 64
SCA muting amplifier 26, Aug 62
Shortwave-transmitter maintenance 36, Jul 64
Socket adapters for amplifier-input modifications 39, Feb 64
Speaker
—monitor, control 33, Nov 60
—muter, automatic 26, Jul 63
—correction LE 6, Sep 63
—portable test 41, Nov 63
Station ID's on film, make your own 31, Dec 62
Stereo
—cartridge, mono playback from 68, Oct 65
—FM off-air relay 70, Oct 65
Switch
—contacts, adding 46, Jun 65
—meter, with lightning protection 24, Dec 61
Tape
—automatic timing for 34, Jun 64
—delay using one transport 44, Jun 65
—inputs via spare mixer 34, Jun 64
—rack system 26, Oct 62
—recorder modifications
—Ampex 300 35, Aug 63
—input control 30, Sep 60
—Magnecord P60 4P75 42, Apr 64
—speed, checking 22, Jul 62
—transport, automatic remote control 26, Oct 62
Tape cartridge
—boost, high-frequency 40, Nov 63
—handling 26, Nov 62
—head-alignment jig 48, Nov 64
—hold-in, transport 57, Oct 64
—speed accuracy 40, Nov 63
—starting switch for deck 44, Jan 65
—winding 44, Mar 63
—on turntables 36, Jul 64
Teletype alerting device 44, Aug 65
Temperature
—gauge, electronic 58, May 64
—indicator for Rust remote-control equipment 26, Oct 62
—sensitive components, locating 43, Jun 59

Thermal relays, reducing delay time in 44, Mar 63
Time-delay substitute 76, Apr 63
Tower
—broadcast, detuning idle 28, Jan 63
—light indicator 70, Oct 65
—lighting wiring, economizing on 44, Jul 65
—correction LE 6, Oct 65
Transformer
—matching 32, Mar 61
—replacement, emergency 30, Dec 62
Transmitter
—control, automatic 78, Mar 65
—final, unstable 48, Nov 64
—filaments, time switch for 39, Nov 59
—life, prolonging 48, Jul 59
—Gates BC-1J, modification for 39, Nov 59
Troubleshooting, by odor 24, Apr 62
Tube
—identification 50, Apr 61
—replacement 26, Aug 62
—tester, Hickok 6000, modification to 29, Sep 62
Tuning capacitor, emergency 36, Jul 64
Tuning units (outside), stabilization of 48, Jul 59
Turntable, servicing 43, Jun 59
TV, two-channel, from single control position 27, Oct 62
Vidicon automatic-sensitivity-control improvement 45, Aug 65
VTR
—cue amplifier for 77, Apr 65
—guide-height adjuster 34, Sep 63
—tip-projection control, automatic 30, Oct 63
VU meters, cuing protection for 46, Mar 63
Waveform camera 40, May 65

EQUIPMENT CONSTRUCTION AND MODIFICATION

Alarm
—fault, for automation 14, Dec 64
—plate-power failure 24, Aug 64
Antennas, remote-pickup for broadcast 13, Jan 63
Audio
—console, production 28, Jul 64
—distribution system 28, Sep 63
—oscillator, solid state 63, Oct 64
—playback equipment, updating 36, Nov 63
—switcher
—crossbar 18, Aug 64
—push-button 16, Dec 64
—solid-state 34, Mar 65
—transmission sets 14, Sep 64
Camera-tube alignment
—generator 26, Dec 62
—correction LE 6, Mar 63
Chassis-construction hints 25, Jun 65
Chime generator, electronic 4, Jan 61
Chopper, video-modulation, solid-state 26, Jun 64
—alternate parts LE 6, Dec 64
—modification to LE 6, Aug 65
—LE 6, Sep 65
Conelrad
—alarm, teletype 10, Aug 62
—attention signal 28, Feb 61
—correction 4, Apr 61
—automatic test procedure 6, Jun 61
Console
—audio 14, Mar 61
—video-distribution 14, Sep 61
Console, portable stereo 20, Sep 65
Cuer, tape, automatic 22, Mar 62
Desk, control-room 42, Nov 63
Disc lathe, from standard to microgroove 24, Sep 64

Distribution amplifier, video, transistorized 26, Dec 61
Echo effect with tape 13, Aug 59
Film projector, rear view 14, Oct 64
Microphone
—filter, special effects 24, Jun 63
—mixer, solid state 40, Oct 64
Monitor
—amplifier 12, Aug 65
—RT, oscilloscope as 15, Oct 65
Multimeter, built-in 18, Jun 65
Music system, automatic 17, Feb 63
—correction LE 6, Apr 63
Paging system for audio monitor 10, Nov 62
Phase monitors, improving sensitivity of 24, May 65
Picture monitor switcher 32, Apr 65
Power supply, solid state 36, Sep 63
Program logger, automatic 12, Oct 64
Programmer, automatic 30, Mar 61
Projector, front 32, Jul 61
Pulse generator, 20 millimicrosecond 28, Dec 61
Recording facilities, updating 14, May 65
Remote
—control multiple function line pair 18, Apr 65
—pickup transmitter 14, May 64
—van 8, Oct 62
—correction LE 6, Dec 62
—parts for LE 6, Jan 63
—LE 6, Sep 64
SCA muting, silence sensor for 19, Oct 65
Switcher, preset for TV 6, Feb 61
TV
—camera preamp, bias supply 20, Jun 64
—patching system, RF, for 60, Apr 65
—sync generator, solid-state 36, Apr 65
—10, May 65
Tape
—cue-tone generator, 20-cps 22, Aug 65
—recorder
—delay system for 34, Nov 63
—variable-speed addition to RCA TRT-1 26, Nov 63
Tape-cartridge
—machine
—automatic 18, Jun 63
—automatic cuing for 22, Jul 65
—rack 20, Aug 63
—additions LE 6, Feb 64
Time injector, automatic 12, Oct 62
—corrections LE 6, Jan 63
Transmission line, counter-weighted system for 74, Mar 65
Transmitter kit, AM 2, Jun 60
Tuning unit, antenna 22, Sep 62
Video
—processor switch panel 42, May 64
—switcher 28, May 63
—correction LE 6, Aug 63
VTR
—cue device 16, Feb 64
—frame-lock device 22, Nov 62

EQUIPMENT DESIGN

Amplifier
—audio, transistor 6, Sep 62
—noise-suppression 14, Apr 62
Clamp circuits 16, May 60
Duplexer for AM transmitters 14, Jul 60
Directional-antenna 32, Aug 60
Fader, automatic 8, Sep 59
FM
—stereo, at WEFM 4, Jul 61
—transmitter 18, Aug 60
Generator, power, emergency 10, Jul 62
Level control, automatic audio 8, Nov 60
Multiplex subcarrier generator 8, Sep 60

Power dividers, directional- antenna	4, Sep 61
Recorder, video, time-base compensation	8, Nov 61
Remote control by radio link	10, Mar 61
Switcher, vertical-interval	24, Oct 61
Transmitters	
—AM, 1-kw	24, Jul 61
—FM, 20-kw	4, Aug 62

ETV

American Samoa, system in	42, Apr 65
CCTV system	14, Nov 65
Low-cost system	32, Feb 63
Milwaukee stations	32, Aug 65
Translators for	12, Dec 59
Transmission systems, standards	18, Oct 63

FACILITIES

AM transmitter plant, WIBC	52, Jul 65
FM	
—engineering	6, Feb 62
—station, planning	12, Mar 62
—station, planning	20, Jul 60
Studio planning, radio	12, Feb 61
TV	
—translators	22, Feb 62
—WJXT	4, Nov 60
—WTWO	17, Oct 65

FCC

(See also SPECIFICATIONS AND STANDARDS)

Allocation	
—freeze, AM and FM	36, Feb 64
—problems	24, May 59
Antennas, AM, site test for	16, Nov 65
Chairman, statement by	26, Mar 62
.....	36, Mar 63
Clear channels	22, Nov 61
EBS	15, Dec 65
ETV, transmission standards	18, Oct 63
FM	
—allocation plan	18, Sep 61
—Rules	28, Nov 62
—stereo	
—approved	28, May 61
—proof of performance	10, Aug 63
—correction	LE 6, Nov 63
—Technical Standards	36, Jun 59
FM/TV mobile monitor unit	13, Apr 64
Form 301	14, Feb 63
.....	13, Mar 63
—correction (to Feb)	LE 6, May 63
Harmonic suppression, AM	12, Apr 63
Inspections, renewal	14, Oct 61
Inspector, dealing with	23, May 63
Interference	24, Mar 63
License, Third-Class	30, Mar 64
Logging, transmitter, automatic	20, Sep 63
Maintenance-Log Rules	13, Jul 65
Remote control, transmitters	10, Sep 63
—experience with	18, Sep 59
Rules (see also next category)	
—compliance	18, Feb 62
—operator, amended	NI 30, Dec 63
Translator rules, VHF	18, Nov 60

FCC RULES AND REGULATIONS, AMENDMENTS AND PROPOSED CHANGES

Allocations, FM	26, Sep 61
AM	
—presunrise operation	14, Feb 62
—SSB	24, Nov 60
—transmitters	43, Aug 60
Antenna ammeters	32, Dec 59
Applications	37, Sep 60
—AM	31, Dec 59
—FM	14, Feb 62
—processing	39, Oct 61
Assignments	39, Jan 61
—translator, Alaska and Hawaii	26, Jan 61
—TV	28, Jun 60
.....	34, Jul 61
—VHF	29, Feb 60
.....	35, Apr 60
.....	37, Jul 60
.....	42, Aug 60
.....	27, Oct 60
.....	34, Jul 61
Boosters	
—UHF, cochannel	27, Jul 60
—VHF	35, Oct 59
Broadcast services	32, Apr 60
Call signs	37, Jul 60
Class IV stations	41, Jun 59
.....	36, Sep 60
.....	38, Jan 61
Clear channels	26, Nov 59
.....	28, Dec 59
.....	34, Jan 60
.....	36, Mar 60
.....	34, May 60
.....	32, Nov 61
Conelrad	35, Feb 60
.....	32, Mar 60
.....	34, Apr 60
.....	30, 34, May 60
.....	34, Feb 61
.....	40, Jun 61
Daytime	
—skywave	30, Jul 59
.....	28, Dec 59
—stations	29, Aug 59
FM	
—educational	26, Sep 60
—multiplex	39, Jul 59
—stations	24, Nov 60
—stereo	42, Aug 60
.....	39, Jul 59
Interference standard	36, Jan 60
License periods	33, Apr 60
Logs, station	29, Feb 60
Monitors	
—frequency	26, Jan 61
.....	34, Feb 61
—TV frequency and modu- lation	39, Jul 59
.....	37, Jul 60
Multiplex, FM	28, Jun 60
Notice, local	34, Jul 61
Ownership, multiple	39, Jan 61
Part 4	35, Mar 60
Practice and procedure	36, Mar 61
Program forms	40, Apr 61
Reallocation of fixed, land mobile, maritime frequencies	34, Jan 60
Remote control	31, Aug 59
.....	30, May 60
Remote-pickup stations	24, Nov 60
Repeaters, TV	
—low-power	24, Jan 60
—VHF	41, Jun 59
SSB, standard broadcast	37, Jul 60
Schedule, minimum	33, May 60
.....	44, Aug 60
Standards of Good Engineering Practice	35, Oct 59
Stereo	39, May 61
TV	
—interim operation	14, Feb 62
—stations	24, Nov 60

Tower marking	32, Mar 60
.....	30, Apr 60
.....	42, Aug 60
Translators	27, Oct 60
.....	30, Nov 60
—booster, UHF	36, Aug 61
—TV	33, Jan 60
Tubes, spare	28, Dec 59
UHF-TV test, New York	42, Aug 60
Multiplexing regulation, FCC	22, Jun 60
Phasing system, quantitative	26, Jun 61
Tape, reel-to-reel, NAB	16, Sep 65
Tape systems, video, international	16, Jun 61
Vertical-interval-test Rules, FCC	24, Oct 59

FILMS, TV

Chains, maintenance of	12, Oct 65
Cleaning ultrasonically	34, Nov 64
Documentaries, filming	34, May 59
Equipment, 8-mm	14, Dec 61
News slides, copying system	24, Oct 63
Projector, rear-view system	14, Oct 64
Seminar	6, Jun 59
Tape-recorder use with	14, Jan 65
Tape systems, synchronized for audio	64, Apr 65

FM

Allocations	18, Sep 61
—freeze, FCC	36, Feb 64
Antennas	
—mounting	4, Oct 61
—multiplexing, for	26, May 60
—vertical polarization	14, Aug 64
—VSWR, effects	16, Jan 63
Automation system	10, Jun 64
CATV, adding to	10, Aug 65
Crosstalk	18, Sep 60
Engineering, practical	6, Feb 62
.....	12, Mar 62
.....	18, Apr 62
FCC Rules	28, Nov 62
Filter, variable high- frequency	16, Nov 63
Interference, multiplex, in FM receivers	14, Sep 59
Line-voltage regulation for	10, Jul 64
Monitor, modulation —calibration of	12, Nov 64
—correction	LE 6, Jan 65
—multiplex, for	14, Aug 59
Multipath vagaries	7, Jun 60
Multiplex	
—monitor design	22, Feb 60
.....	12, Mar 60
—muting, selective	12, Nov 60
—reception methods	18, Mar 60
—regulations, FCC	22, Jun 60
—subcarrier	
—generator	8, Sep 60
—recovery	19, Jan 61
—two-channel, KCMK	8, Oct 59
—VSWR effects	4, Aug 61
Network, off-air pickup	12, Aug 63
Noise measurement	27, Apr 60
Off-air	
—pickups, relay use	6, Nov 59
—relay, heterodyne type	34, May 65
Part 73	23, Apr 65
Pre-emphasis and distortion in	10, Nov 59
Power measurements for	21, Apr 65
Proof of performance, stereo	10, Aug 63
—correction to	LE 6, Nov 63
Receiver installation, multiplex	14, Dec 60
Remote control, STL	10, Feb 63
SCA	
—minimizing problems in	16, Mar 64
—muting, silence sensor for	19, Oct 65

Serrasoid modulator.....4, Jul 59
 Spare-parts inventory.....14, Jul 63
 Station
 —planning20, Jul 60
 —stereo, planning.....12, Nov 62
22, Dec 62
 —correction (to Nov).....LE 6, Jan 63
 —ten-watt, installation.....14, Mar 65
 Stereo
 —amplifiers, phase checks.....18, Dec 63
 —additionsLE 6, Feb 64
 —antennas for.....16, Dec 63
 —converting to.....8, Dec 61
 —do's and don'ts.....18, Sep 62
 —era, new.....32, Jun 61
 —experiments, KISW-FM.....18, Jan 60
 —FCC approves.....28, May 61
 —method, new.....16, May 63
 —monitoring methods.....10, Dec 63
 —monitors, developments.....10, Aug 64
 —PAM/FM system.....4, Dec 59
 —phase-shift measurement.....10, Oct 62
 —principles, basic.....12, Sep 64
 —station installation.....8, Dec 63
 —summary.....20, Dec 63
 —system, compatible.....27, Aug 59
 —tests2, Feb 61
 —WEFM, equipment.....4, Jul 61
 STL, 900-mc.....22, Oct 64
 Subcarrier
 —deviation28, Apr 60
 —frequencies, selection of.....10, Aug 59
 —generation9, Dec 59
6, Jan 60
 Test-equipment checklist.....10, Jul 63
 Transmitter
 —design18, Aug 60
 —measurements26, Apr 60
 —20-kw4, Aug 62

INDEXES

Article titles, May 1959
 through April 1961.....14, May 61
 Multiplex articles, 1960.....18, Jan 61
 Subject-reference
 —196232, Dec 62
 —196325, Dec 63
 —196459, Dec 64
 —196526, Dec 65

INDUSTRY FEATURES

AES 16th Convention,
 preview28, Sep 64
 Authors, BROADCAST ENGINEER-
 ING'S Consulting.....38, Jan 65
 Broadcast
 —center, AM/FM/TV.....42, Oct 64
 —station, world's most
 powerful10, Jan 63
 Broadcasting
 —forty-five years of.....20, Nov 65
 —future34, Apr 64
 CA and pay TV, a viewpoint.....34, Jan 65
 CATV, a look at.....12, Jan 65
 Central-American radio-TV.....13, Aug 65
 Editorial comments.....34, Feb 64
 ITU Conference, 1964.....22, Jan 64
 Microelectronic modules,
 196526, Mar 65
 NAB conventions
 (See ASSOCIATIONS AND CON-
 FERENCES)
 NCTA
 —chairman's speech.....22, May 65
 —Convention, 1965.....10, Sep 65
 NEC, 20th, review of.....24, Dec 64
 President, assassination of,
 network coverage.....20, Feb 64
 Radio pierces great
 blackout20A, Dec 65
 Remote-control section.....35, Oct 65
 TV

—evolution of, early.....14, Jul 64
 —station, WTWO.....17, Oct 65
 —studio trends13, Dec 65
 —symposium, Montreux.....23, Sep 65
 —correctionsLE 6, Dec 65
 Thermoelectric generators,
 remote power from.....10, Aug 64
 World's Fair, electronics at.....12, Jul 64

INTERFERENCE

Broadcast
 —spurious emission, checks
 for74, Apr 65
 —station, internal,
 prevention16, Oct 62
 Cross-modulation, cause
 and cure of.....24, Jul 64
 FCC Rules.....24, Mar 63
 Field-intensity measurements.....22, Feb 63
 TV, tracing14, Aug 63
 —correctionLE 6, Oct 63

INTERNATIONAL BROADCASTING

Broadcasting
 —Central America, in.....13, Aug 65
 —Norway, in.....42, Dec 64
 —worldwide42, Mar 65
 ETV system in American
 Samoa42, Apr 65
 IEEE, 1963 International
 Convention48, Mar 63
 ITU Conference, 1963.....22, Jan 64
 Radio
 —East German.....56, Feb 65
 —European32, Aug 61
 Satellite relays.....8, Oct 61
 Stereo AM stations.....40, Feb 60
 TV
 —evolution of, early.....14, Jul 64
 —helicopter use in.....24, Jan 65
 —symposium at Montreux.....23, Sep 65
 —corrections to.....LE 6, Dec 65
 —transmitters, parallel
 operation24, Mar 64
 Tape standards, video.....16, Jun 61
 Tower, concrete, in South
 Africa50, Feb 65
 Video tape, mobile, England.....10, Dec 62
 Voice of America.....24, Jan 62

LEVEL DEVICES, AUDIO

AGC devices.....4, Jun 62
 Automatic8, Nov 60
 Background-noise suppressors.....14, Oct 63
 Compressors12, Jul 63
 —addenda, manufacturer's
 addresses16, Aug 63
 —correctionLE 6, Oct 63
 Expanders14, Oct 63
 High-frequency variable
 filter14, Oct 63
 Limiters, peak.....10, Jun 63
 —addenda, manufacturer's
 addresses16, Aug 63
 —correctionLE 6, Aug 63
 Limiting devices.....4, Jun 62
 TV loudness, and.....14, Aug 60
 Use of.....40, May 64
 —correctionsLE 6, Jul 64

LICENSES

Third-class, FCC.....30, Mar 64

LIGHTING

Dimmers, SCR use.....22, Jul 59
 Guide for.....18, Dec 64
 TV studio.....14, Apr 63
 —layouts20, Oct 59

LINES, REMOTE

Impedance matching for.....26, Aug 64
 —correctionLE 6, Oct 64
 Multiple-function pair.....18, Apr 65

LINE VOLTAGE

Regulation for broadcast
 stations10, Jul 64

LOGS AND LOGGING

Automatic, transmitter.....6, Mar 61
 Maintenance, considerations
 for13, Jul 65
 Part 7323, Apr 65
 Program
 —automatic20, Mar 63
 —automatic system for.....12, Oct 64
 —dictation-equipment use
 for48, Nov 63
 Programs recorded by CBS.....36, Mar 62
 Transmitter
 —automatic20, Sep 63
 —automation for.....10, Jun 65

MAINTENANCE

Air cleaning, for transmitters.....26, Nov 64
 Amplifiers, solid-state.....18, Nov 63
 Audio studio12, Jul 62
14, Aug 62
 CATV systems.....28, Feb 65
 Cartridge-tape units.....36, Nov 64
 Coax transmission line,
 pressurized10, Jan 65
 Directional antennas.....16, Nov 64
 Film
 —chains12, Oct 65
 —cleaning, ultrasonic, for.....34, Nov 64
 —projector sound systems.....23, Mar 60
 Information, communicating.....24, Sep 61
 Log, considerations for.....13, Jul 65
 Microwave16, Jun 64
 —addition to.....LE 6, Nov 64
 Monitors, broadcast.....22, Oct 62
 Preventive16, Mar 60
 Rectifiers, mercury, care
 and testing.....8, Jun 60
 SCA16, Mar 64
 Studio
 —audio14, Jun 62
 —equipment, protective.....10, Nov 64
 —preventive12, Dec 62
 TV system
 —frequency response,
 amplitude linearity.....6, Jan 62
10, Jul 61
 —picture-signal standards.....6, Apr 61
 —sync generator.....18, May 61
 —video levels.....20, Jun 61
 Tape
 —recorder19, Jun 65
 —heads21, Dec 65
 —transports, reel-to-reel.....23, Oct 65
 Translators in isolated areas.....30, May 64
 Transmitter
 —air cleaning for.....26, Nov 64
 —radio4, Sep 62
 —safety note on.....16, Nov 62
LE 6, Jan 63
 —UHF-TV18, Nov 65

MATCHING NETWORKS

- Phasing-system specifications. 26, Jun 61
- Power dividers for directional antennas 4, Sep 61
- Tuning unit, antenna 22, Sep 62

MEASUREMENTS

- AM proof of performance. 20, May 63
- 20, Jun 63
- 16, Oct 63
- 12, Dec 63
- 28, Feb 64
- Antenna
- AM, RF bridge for 23, Jun 65
- current meters, remote-indicating 14, Aug 65
- Audio
- level 4, Jun 62
- transmission set
- construction 14, Sep 64
- use for AM 12, Feb 65
- Directional antenna
- checking pattern for 20, Jul 65
- proof of performance 26, Apr 63
- radials, running for 21, Jun 65
- Envelope delay, equipment for measuring 10, Feb 60
- FM
- subcarrier deviation 28, Apr 60
- transmitter 26, Apr 60
- Field intensity
- airplane use for 16, Mar 65
- AM 6, Jan 61
- Form 301 14, Mar 63
- helicopter, from 20, Aug 61
- interference 22, Feb 63
- meter, use for 10, Nov 65
- 23, Dec 65
- pattern distorted 19, Jan 63
- Frequency 14, Jun 60
- Impedance, telephone-line 26, Aug 64
- correction to LE 6, Oct 64
- Ionization 18, Jul 62
- Multimeter, built-in for 18, Jun 65
- Proof of performance,
- FM stereo 10, Aug 63
- correction LE 6, Nov 63
- RF
- ammeters, calibration 14, Sep 63
- power, for 20, Apr 65
- Services, frequency 17, Jun 60
- Sine-squared pulses in TV 12, Sep 60
- Spurious emission 74, Apr 65
- Standards, frequency 17, Jun 60
- WWV 17, Jun 60
- Stereo, phase-shift 10, Oct 62
- TV-antenna and transmission-line 24, Jul 65

METERS

- Antenna-current, remote-indicating 14, Aug 65
- Field-intensity, use of 10, Nov 65
- 23, Dec 65
- RF ammeters, calibration 14, Sep 63

MICROPHONES

- Development and technique. 14, Nov 59
- Filter, special-effects, for 24, Jun 63
- Loading problems 33, Jun 59
- Mixer, dual-input solid-state, for 40, Oct 64
- Music-pickup use 14, Feb 64
- Polar response of 6, Feb 60
- Tape mastering,
- techniques 66, Mar 65
- Unidirectional 6, Apr 60
- Wireless 16, Apr 65

MICROWAVE

- Communications by satellite. 8, Oct 61
- ETV, two-hop relay 16, Jan 62
- Maintenance procedures 16, Jun 64
- addition to LE 6, Nov 64
- STL design 9, Mar 60
- Station, Empire State Building 6, Oct 60
- TV systems, solid-state 30, May 65
- Video systems, specifications for 30, Oct 64
- 20, Nov 64
- correction LE 6, Mar 65

MISCELLANEOUS

- Balloon, runaway 47, Aug 60
- BROADCAST ENGINEERING acquisition by Howard W. Sams & Co., Inc. 18, May 62
- Clock location 4, Apr 61
- Conelrad
- automatic test procedure 6, Jun 61
- equipment requirement, NAB opposes 49, Aug 60
- Disaster, WDAF coverage of 20, Sep 59
- Forensic engineering 14, Jan 62
- History, Gates Radio 17, Jul 62
- Ionization research 18, Jul 62
- Net alert, CBS 30, Jan 61
- Olympics, radio-TV coverage of 17, Apr 60
- Paging system, add to audio monitor 10, Nov 62
- Parametric amplifiers 10, Jun 61
- Prism, inverting 21, Jun 59
- Purchasing trends, equipment 4, Aug 60
- Radar, weather 16, Jul 59
- 6, Dec 61
- Radome, large 14, Nov 61
- Satellite
- relays 8, Oct 61
- TV broadcast from 20, Aug 59
- Space, broadcasting from 29, May 59
- Station location, Form 301 14, Feb 63
- correction to LE 6, May 63
- Tape, recording, storage tips. 28, Jul 61
- Traffic-control system for spots 24, Jul 62
- von der Snikrah, Prof. 8, Aug 59
- 34, Sep 59
- 33, Oct 59
- 18, Dec 59
- 38, Nov 59
- 22, Jan 60
- 18, Feb 60
- 22, Mar 60
- 24, Apr 60
- 22, May 60
- 11, Jun 60

MIXERS

- FM, phase-shift measurement. 10, Oct 62

MOBILE

- Monitor unit, FCC 13, Apr 64
- Studio, color 14, Oct 60
- TV unit, custom designed 12, Aug 64
- VTR unit 12, Jun 65
- Van, broadcast equipment 8, Oct 62
- corrections LE 6, Dec 62
- parts for LE 6, Jan 63
- Video tape, TWW, England. 10, Dec 62

MODULATION

- AM-transmitter power, increasing 10, Jul 65

- Amplitude, theory 18, Mar 64
- Cross, cause and cure of 24, Jul 64
- FM
- measurement of 26, Apr 60
- serrasoid 4, Jul 59
- subcarrier measurement 28, Apr 60
- Grid, theory 28, Jun 63
- Monitors
- AM and FM, calibration of 12, Nov 64
- correction to LE 6, Jan 65
- operation of 44, Dec 64
- Single-sideband, compatible. 4, Aug 59

MONITORS

- Alarm, for faults 14, Dec 64
- Audio amplifier for 12, Aug 65
- FCC, mobile unit 13, Apr 64
- FM stereo, methods 10, Dec 63
- Frequency 16, Jun 60
- Maintenance 22, Oct 62
- Modulation, calibration of AM and FM 12, Nov 64
- correction LE 6, Jan 65
- Modulation for FM multiplex 14, Aug 59
- Multiplex, design 22, Feb 60
- 12, Mar 60
- Operation of, modulation and frequency 44, Dec 64
- Phase, sensitivity improvements for 24, May 65
- RF, oscilloscope use as 15, Oct 65
- Spectrum, for spurious radiation 16, Apr 63
- Stereo developments 10, Sep 64
- TV, solid-state 16, Mar 63
- Usage 16, Jun 60

MULTIPLEX

- Antenna for FM 26, May 60
- Cross-modulation, effect of VSWR on 4, Aug 61
- Crosstalk 12, Jun 59
- 18, Sep 60
- eliminating 15, May 59
- Educational FM, NAB opposes commercials 49, Aug 60
- Interference in FM receivers. 14, Sep 59
- Monitor design 22, Feb 60
- 12, Mar 60
- Multipath vagaries, FM 7, Jun 60
- Muting, selective 12, Nov 60
- Receiver installation 14, Dec 60
- Reception methods 18, Mar 60
- Regulations, FCC 22, Jun 60
- Review 18, Jan 61
- Subcarrier
- frequencies, selection of 10, Aug 59
- generation 9, Dec 59
- generator 6, Jan 60
- 8, Sep 60
- recovery 19, Jan 61

NEWSFILM

- Cleaning ultrasonically 34, Nov 64
- Slides, copying system 24, Oct 63
- System at KCRA-TV 38, Aug 64
- Tape systems, synchronized for audio 64, Apr 65

OFF-AIR PICKUPS

- FM relay 6, Nov 59
- heterodyne type 34, May 65
- Network, AM/FM 12, Aug 63
- TV 28, Aug 63

OPERATIONS

- Audio-level devices, use of...40, May 64
- correctionsLE 6, Jul 64
- Audio tape
- equipment34, Dec 64
- mastering66, Mar 65
- Automation
- make, not save, money...16, May 65
- planning for.....16, Apr 63
- Broadcast center,
 - AM/FM/TV42, Oct 64
- Camera techniques, TV.....10, Oct 64
- EBS15, Dec 65
- Helicopter use.....34, Aug 64
- Lighting, guide for.....18, Dec 64
- Microphone technique.....14, Nov 59
- Monitors, modulation and frequency.....44, Dec 64
- Newsfilm system.....38, Aug 64
- Part 73.....23, Apr 65
- Radio pierces great blackout20A, Dec 65
- Remote control for
 - high-power transmitters..16, Aug 65
- Safety, in station.....14, Nov 64
- Studio equipment, protective maintenance for.....10, Nov 64
- Telephone-line services.....18, Sep 65
- Television recorder.....22, Sep 59
- UHF-TV, planning for.....14, Feb 65
-12, Mar 65

OUTSIDE BROADCAST

- Olympics, 1960 winter.....17, Apr 60

OWNERSHIP

- UHF-TV station, planning for14, Feb 65
-12, Mar 65

PADS AND ATTENUATORS

- Isolation, use for.....12, May 64
-14, Jun 64
- Matching, use for.....12, May 64
-14, Jun 64

POWER SUPPLIES

- Generator, emergency.....10, Jul 62
- Line-voltage regulation for...10, Jul 64
- Rectifiers
- high-voltage, solid-state...16, Apr 64
- mercury, care and testing..8, Jun 60
- replacement, silicon.....28, Aug 61
- Solid-state36, Sep 63

PROOF OF PERFORMANCE

- AM28, Feb 64
-12, Dec 63
- station20, May 63
-20, Jun 63
-16, Oct 63
- transmission set, use for...12, Feb 65
- Carrier shift.....43, May 59
- Directional antennas, plan for22, Apr 63
- FM22, Apr 62
- noise measurement.....27, Apr 60
- stereo10, Aug 63
- correctionLE 6, Nov 63
- transmitter26, Apr 60
- Field-intensity, interference..22, Feb 63
- Frequency response.....23, May 59

- Harmonic distortion.....23, May 59
- Spurious radiations.....43, May 59
- TV transmitter.....12, Nov 65

RADIATION AND PROPAGATION

- AM, harmonic suppression..12, Apr 63
- Antenna
- AM, site test for.....16, Nov 65
- unipole26, Feb 63
- Clear channels, FCC and...22, Nov 61
- Contour
- calculations16, Dec 62
- Form 301.....13, Mar 63
- Directional antennas.....24, May 63
- adjustments of.....16, Nov 64
- design10, May 64
- measurements
- pattern checks, for.....20, Jul 65
- running radials for.....21, Jun 65
- operating20, Mar 64
- operation10, Jan 64
- correctionLE 6, Jun 64
- pattern distorted by water tank19, Jan 63
- phasing26, Oct 63
- primer on.....18, Dec 65
- soil conductivity, effects on.....12, Jun 64
- chartLE 6, Nov 64
- stability48, Apr 65
- FM
- FCC Rules.....28, Nov 62
- multipath vagaries.....7, Jun 60
- stereo, antennas for.....16, Dec 63
- vertical polarization.....14, Aug 64
- Field-intensity measurements
- airplane, use for.....16, Mar 65
- helicopter, use for.....20, Aug 61
- Frequency-vs-wave length calculations24, Aug 63
- Interference
- FCC Rules.....24, Mar 63
- tracing, TV.....14, Aug 63
- correctionLE 6, Oct 63
- Measurements
- dbu and dbk.....20, Nov 62
- field-intensity meter, use for10, Nov 65
-23, Dec 65
- Microwave STL.....9, Mar 60
- Spurious emission
- checks for.....74, Apr 65
- spectrum, monitors for...16, Apr 63
- UHF-TV, antennas for.....14, Jan 64

RECORDING, VIDEO

- Color, at networks.....12, Nov 63
- Cue
- device16, Feb 64
- facility22, Jun 59
- Editing10, Sep 62
- Erase facility.....22, Jun 59
- Frame-lock, Ampex.....22, Nov 62
- Fundamentals
- heads14, Jul 62
- introduction10, Feb 62
-6, Mar 62
- system requirements.....8, Apr 62
-24, May 62
- testing20, Jun 62
- Heads21, Jun 59
-14, Jan 61
- Mobile unit.....12, Jun 65
- British10, Dec 62
- Operating procedures.....22, Sep 59

- Portable systems.....16, Oct 65
- Preview system.....58, Aug 65
- Processor switch panel.....42, May 64
- Standardization24, Jun 59
- Synchronization25, Jun 59
- unit for two VTR's.....37, Mar 60
- Tape standards; international.16, Jun 61
- Techniques18, Apr 64
- Theory20, Nov 63
- Thermoplastic tape.....22, Jul 60
- Time-base compensation.....8, Nov 61
- Tip penetration.....14, Jan 61
- Uses of.....20, Jun 59

REMOTE CONTROL

- AM experience, CBS.....4, Nov 61
- FCC experience with transmitter18, Sep 59
- Multiple-function line pair..18, Apr 65
- Radio link, by.....10, Mar 61
-18, Apr 61
- System operation.....36, Oct 65
- Transmitters10, Sep 63
-10, Aug 65
- high-power, for.....16, Aug 65
- UHF-TV system.....52, Oct 65

REMOTE PICKUP

- Antennas, broadcast.....12, Jan 63
- Helicopter use.....34, Aug 64
- Olympic games, TV coverage18, Oct 60
- Telephone-line services for..18, Sep 65
- Transmitter, surplus conversion to.....14, May 64
- TV station in helicopter...20, Dec 61
- Van, broadcast equipment...8, Oct 62
- corrections to.....LE 6, Dec 62
- parts for.....LE 6, Jan 63

SAFETY

- Station, in.....14, Nov 64

SCA

- Basic principles of.....12, Sep 64
- Crosstalk12, Jun 59
- Interference, multiplex, in FM receivers.....14, Sep 59
- Monitor design, multiplex..22, Feb 60
-12, Mar 60
- Multiplexing, two-channel, KCMK8, Oct 59
- Muting, silence sensor for...19, Oct 65
- Problems, minimizing.....16, Mar 64
- Reception methods, multiplex18, Mar 60
- Remote-control, STL.....10, Feb 63
- Subcarrier
- frequencies, selection of..10, Aug 59
- generation9, Dec 59
-6, Jan 60

SEMICONDUCTORS

- Amplifiers
- audio, design.....18, Aug 62
- maintenance18, Nov 63
- remote, transistorized...10, Oct 59
- Audio
- distribution system.....28, Sep 63

—switching system.....34, Mar 65
 Broadcasting, applications in.16, Feb 65
 Chopper, video-modulation..26, Jun 64
 —alternate parts.....LE 6, Dec 64
 —modificationsLE 6, Aug 65
LE 6, Sep 62
 Circuit design.....6, Sep 62
 Microelectronic modules,
 196526, Mar 65
 Microwave-TV systems,
 uses in.....30, May 65
 Negative-resistance devices...16, Jul 65
20, Aug 65
 Power supply36, Sep 63
 Rectifiers, high-voltage.....16, Apr 64
 Switching devices, uses as...16, Jun 65
 TV
 —camera preamp, bias
 supply20, Jun 64
 —generator36, Apr 65
10, May 65
 —monitor16, Mar 63
 Thermoelectric generators...10, Aug 64
 Video switcher.....12, Sep 63

SPECIFICATIONS AND STANDARDS (See also FCC)

Ammeters, RF.....14, Sep 63
 Audio transmission for TV,
 CBS16, Aug 60
 Cartridge-tape standards,
 NAB8, Jan 65
 Rules and Regulations
 —3.1 to 3.39.....32, Aug 59
 —3.40 to 3.50.....35, Sep 59
 —3.181 to 3.18936, May 59
 —3.68141, Jul 59
 —3.901 to 3.97134, Oct 59
 —FM Technical Standards..36, Jun 59

STEREO

AM stations using.....40, Feb 60
 Amplifiers, phase checks for 18, Dec 63
 —additions to.....LE 6, Feb 64
 Broadcasting, new method..16, May 63
 Console, portable.....20, Sep 65
 Equipment at WEFM.....4, Jul 61
 Experiments at KISW-FM..18, Jan 60
 FM
 —antenna VSWR effects...16, Jan 63
 —do's and don'ts.....18, Sep 62
 —era, new.....32, Jun 61
 —FCC approves.....28, May 61
 —monitoring methods.....10, Dec 63
 —monitors, developments in.10, Sep 64
 —principles of, basic.....12, Sep 64
 —proof of performance...10, Aug 63
 —correctionLE 6, Nov 63
 —station
 —converting8, Dec 61
 —installation8, Dec 63
 —planning22, Dec 62
 —summary20, Dec 63
 PAM/FM system.....4, Dec 59
 Precedence effect, system
 using4, May 60
 Records, phonograph.....24, Aug 62
 System
 —FM, compatible.....27, Aug 59
 —standard, selecting.....10, May 59
 Tapes, phase cancellation in.36, Jun 64
 Tests, National Stereophonic
 Radio Committee.....2, Feb 61

STL

Antennas, TV, alignment of.44, May 64
 Design, microwave.....9, Mar 60

FM stereo, SCA, remote
 control10, Feb 63
 900-mc link.....22, Oct 64
 Remote control by.....10, Mar 61
18, Apr 61

STUDIO

Acoustics30, Jul 63
 —introduction to.....14, Sep 65
 —recording, for.....12, Feb 64
 Audio, maintenance.....14, Jun 62
12, Jul 62
14, Aug 62
 Building, WFAA.....34, Sep 60
 Design20, Oct 63
 Equipment
 —protective
 maintenance for.....10, Nov 64
 —solid-state applications,
 for16, Feb 65
 Lighting
 —guide for.....18, Dec 64
 —TV14, Apr 63
 —layouts20, Oct 59
 Maintenance
 —preventive12, Dec 62
 —TV20, Jul 63
 Radio
 —design14, Jun 63
 —planning12, Feb 61
 TV, trends in.....13, Dec 65

SWITCHING EQUIPMENT

Audio
 —crossbar-type18, Aug 64
 —push-button16, Dec 60
16, Dec 64
 —solid-state34, Mar 65
 Cartridge-tape unit.....32, Apr 63
 Reed system.....16, Sep 64
 Semiautomatic control
 table20, Apr 64
 Solid-state devices for.....16, Jun 65
 TV, preset switcher for.....6, Feb 61
 Vertical-interval.....24, Oct 61
 Video
 —construction28, May 63
 —correctionLE 6, Aug 63
 —solid-state12, Sep 63
 Waveguide, high-power UHF.8, Aug 61

TAPE RECORDING

(See also Specific Subject)

Audio
 —equipment34, Dec 64
 —mastering66, Mar 65
 Automatic cartridge
 audio system.....26, Sep 59
 Automation systems.....18, Feb 65
 Cuet, automatic.....22, Mar 62
 Delay system
 —automatic28, Jun 59
 —modification for.....34, Nov 63
 Echo effect.....13, Aug 59
 Facilities, updating.....10, May 65
 Film systems, synchronized for
 audio14, Jan 65
64, Apr 65
 Heads, care of.....21, Dec 65
 Maintenance19, Jun 65
 —reel-to-reel transports ...23, Oct 65
 Program
 —logger, use for.....12, Oct 64
 —system, automatic.....32, Sep 59
 Radio, use in.....20, Jan 60
 Reel-to-reel standards, NAB.16, Sep 65

Spots, tape equipment for..13, May 59
 Stereo, phase cancellation in.36, Jun 64
 Storage, effects on tape....38, Apr 61
 Systems, updating.....38, Nov 63
 Tape, manufacture of.....4, Jun 60
 Variable-speed addition to
 RCA TRT-126, Nov 63
 Video
 —frame-lock for Ampex....22, Nov 62
 —portable systems.....16, Oct 64
 VTR cue device.....16, Feb 64

TELEPHONE LINES

Impedance matching for...26, Aug 64
 —correction to.....LE 6, Oct 64
 Services, for broadcasters...18, Sep 65

TELEVISION

Amplifiers, cascaded
 wideband14, Oct 63
 Antennas, helical, theory for.20, Oct 65
 Audio levels, balanced.....12, Aug 60
 Aural power, effects of
 reduced14, Jan 60
 Automation at WKRC-TV....4, Jul 60
 Booster, experimental co-
 channel20, Sep 60
 Building, WJXT.....4, Nov 60
 Clamp circuits16, May 60
 Console, distribution.....14, Sep 61
 Distribution amplifier, video,
 transistorized26, Dec 61
 Educational, two-hop microwave
 relay16, Jan 62
 Envelope delay, equipment
 for measuring.....10, Feb 60
 ETV, low-cost station.....32, Feb 63
 Evolution of.....14, Jul 64
 Film
 —chain maintenance.....12, Oct 65
 —equipment, 8-mm.....14, Dec 61
 —projector sound systems,
 maintenance of.....23, Mar 60
 Image orthicon for color.....8, Jul 62
 Interference, tracing.....14, Aug 63
 —correctionLE 6, Oct 63
 Maintenance
 —studio20, Jul 63
 —system
 —frequency response,
 amplitude linearity.....10, Jul 61
6, Jan 62
 —picture-signal standards..6, Apr 61
 —sync generator.....18, May 61
 —video levels.....20, Jun 61
 Microwave
 —relay, Empire State
 Building6, Oct 60
 —systems
 —solid-state30, May 65
 —specifications for.....30, Oct 64
20, Nov 64
 —correction (to Oct).LE 6, Mar 65
 Mobile unit
 —custom designed.....12, Aug 64
 —VTR, for.....12, Jun 65
 Modulation checks, chopper
 for26, Jun 64
 —alternate parts.....LE 6, Dec 64
 —modificationsLE 6, Aug 65
LE 6, Sep 65
 Monitor, solid-state.....16, Mar 63
 Montreux Symposium.....23, Sep 65
 —corrections to.....LE 6, Dec 65
 Newsfilm system.....38, Aug 64
 Off-air pickup.....28, Aug 63
 Olympic games, coverage...18, Oct 60
 Operating a video tape
 recorder22, Sep 59

Power
—measurements for.....22, Apr 65
—ratio, aural-visual, study of. 28, Oct 59

Projector
—continuous motion.....8, May 60
—front32, Jul 61

RF
—monitor oscilloscope use as. 15, Oct 65
—patching system60, Apr 65

Radar, weather, broadcasting. 4, Oct 60

Recorder tip penetration.....14, Jan 61

Recording fundamentals
—introduction6, Mar 62
—system requirements.....8, Apr 62

STL antennas, alignment of. 44, May 64

Satellite, broadcast from. 20, Aug 59

Sine-squared pulses in
—system analysis.....12, Sep 60

Spare-parts inventory.....14, Jul 63

Spurious radiation, spectrum
—monitors for.....16, Apr 63

Station
—airborne20, Dec 61
—design20, Oct 63
—WTWO17, Oct 65

Stereo-color4, Jul 62

Studio
—lighting14, Apr 63
—layouts20, Oct 59
—mobile color14, Oct 60
—trends in13, Dec 65

Sync generator, solid-state. 36, Apr 65
.....10, May 65

Tape
—editing10, Sep 62
—fundamentals14, Jul 62
—introduction10, Feb 62
—system requirements.....24, May 62
—testing20, Jun 62
—recording, thermoplastic.....22, Jul 60

Test-equipment checklist.....10, Jul 63

Tower, candelabra. 24, Dec 60

Translators
—maintenance32, May 64
—system, 100-watt.....10, Jul 59
—UHF, vs VHF boosters.....28, Sep 59
—VHF18, Nov 60
.....30, Sep 61

Transmitters
—parallel operation.....24, Mar 64
—proof of performance.....12, Nov 65

Vertical-interval-test Rules,
FCC24, Oct 59

Video-recording techniques. 20, Nov 63

TELEVISION CAMERAS

Beam-alignment generator... 26, Dec 62
—correction to.....LE 6, Mar 63

Image orthicon
—color, for.....8, Jul 62
—sensitive4, Feb 60

Preamp bias supply.....20, Jun 64

Radar, weather, broadcasting. 4, Oct 60

Special-effect optics.....16, Jun 59

Techniques10, Oct 64

TEST EQUIPMENT AND INSTRUMENTS

Cartridge-tape, test tapes... 31, Nov 65

Checklist, broadcast use.....10, Jul 63

Multimeter, built-in.....18, Jun 65

RF bridge, for AM antennas. 23, Jun 65

TOWERS

AM, effects of lighting and isolation
—circuits on impedance of.....4, Sep 60

Candelabra24, Dec 60

Collapse at CKAC.....28, Apr 65

—corrections to.....LE 6, Jun 65

Concrete, in South Africa... 50, Feb 65

Construction, vibration
—problems in.....34, Jul 59

Emergency operations.....13, Apr 65

—correction to.....LE 6, Sep 65

Installation, directional
—antennas14, Nov 62

Maintenance17, Nov 62

—safety note on.....LE 6, Jan 63

Mechanical considerations... 18, Mar 63

VOA station, world's most
—powerful10, Jan 63

TRANSLATORS

Antenna location for.....12, Dec 64

ETV, UHF-TV use for.....12, Dec 59

Maintenance in isolated
—areas30, May 64

System, 100-watt.....10, Jul 59

Television22, Feb 62

VHF18, Nov 60
.....30, Sep 61

—boosters, vs.....28, Sep 59

TRANSMITTERS

Air cleaning for.....26, Nov 64

Alarm, plate-power failure.. 24, Aug 64

AM
—diplexing14, Jul 60
—kit2, Jun 60
—one-kw37, Jul 59
.....24, Jul 61

—4-400A use in.....18, Mar 65

Aural power, effects of
—reduced on TV receivers.. 14, Jan 60

Automation for.....10, Jun 65

Class-C amplifier theory... 18, Aug 65

—correction to.....LE 6, Nov 65

FM
—design18, Aug 60
—stereo, planning.....12, Nov 62
—correctionLE 6, Jan 63

—20-kw4, Aug 62

Logging, automatic.....6, Mar 61
.....20, Sep 63

Maintenance16, Nov 62
—safety note on.....LE 6, Jan 63

—broadcast22, Oct 62

—UHF-TV18, Nov 65

Matching network to antenna. 12, Jan 64

Microwave, maintenance... 16, Jun 64

—addition to.....LE 6, Nov 64

Parallel operation for TV... 24, Mar 64

Radio, maintenance.....4, Sep 62

Remote control.....10, Sep 63

—FCC experience with.....18, Sep 59

—high power, for.....16, Aug 65

—radio, by.....18, Apr 61

—systems, theory.....36, Oct 65

—UHF-TV, for.....52, Oct 65

Remote-pickup, surplus
—conversion to.....14, Apr 64

Solid-state applications for... 16, Feb 65

TV
—aural-visual power ratio... 28, Oct 59
—cochannel supplemental... 20, Sep 60
—proof of performance.....12, Nov 65

Translators, VHF.....30, Sep 61

UHF, high-power.....28, Mar 63

TRANSMISSION LINE

CATV, choosing for.....18, Jul 65

Coax
—characteristics of.....40, Feb 65

—installation of.....40, Feb 65

—pressurizing10, Jan 65

—use, RG-17/U.....14, Jan 63

Counterweighted system... 74, Mar 65

Installation, directional
—antenna15, Nov 62

Interference, prevention... 16, Oct 62

Matching to antenna,
—networks for.....12, Jan 64

RF-patching system for TV.. 60, Apr 65

Switch, waveguide, high-
—power8, Aug 61

TV, measurements for.....24, Jul 65

Theory26, May 63

Waveguide, cylindrical... 37, May 60

UHF-TV

Antennas for transmitting... 14, Jan 64

Remote control, pioneer
—system52, Oct 65

Station, planning for.....14, Feb 65
.....12, Mar 65

Switch, waveguide, high-
—power8, Aug 61

Translators
—ETV, for.....12, Dec 59
—vs VHF boosters.....28, Sep 59
—100-watt10, Jul 59

Transmitter
—high-power.....28, Mar 63
—maintenance18, Nov 65

VIDEO EQUIPMENT

Automation at WKRC-TV... 4, Jul 60

Camera techniques.....10, Oct 64

Console, distribution.....14, Sep 61

Distribution amplifier,
—transistorized.....26, Dec 61

Film
—8-mm14, Dec 61
—projector sound systems,
—maintenance of.....23, Mar 60

Maintenance, system
—frequency response,
—amplitude linearity.....10, Jul 61
.....6, Jan 62

—picture-signal standards... 6, Apr 61

—sync generator.....18, May 61

—video levels.....20, Jun 61

Modulation chopper.....26, Jun 64

—alternate parts.....LE 6, Dec 64

—modificationsLE 6, Aug 65
.....LE 6, Sep 65

Monitor, solid-state.....16, Mar 63

Plug, multicontact, uses for. 30, Jul 59

Processor switch panel... 42, May 64

Projector
—continuous-motion8, May 60
—front32, Jul 61
—light-value48, Aug 60

Recording
—fundamentals8, Apr 62
—thermoplastic tape.....22, Jul 60

Switcher
—construction28, May 63
—correctionLE 6, Aug 63
—preset6, Feb 61
—reed16, Sep 64
—solid-state12, Sep 63
—vertical-interval24, Oct 61

Tape
—editing, electronic.....10, Sep 62
—fundamentals
—heads14, Jul 62
—introduction10, Feb 62
.....6, Mar 62
—system requirements... 24, May 62
—testing20, Jun 62

VTR's, portable.....16, Oct 64

WASHINGTON BULLETIN

AM

- allocations
 - Rules clarified.....28, May 65
 - standards, new.....30, Dec 64
- clear channels, high power and duplication.....21, Jul 64
- freeze
 - lifted35, Oct 64
 - to be.....23, Jun 64
- stations
 - daytime28, Apr 64
 - presunrise operation...27, May 64
- Aeronautical stations, 108-mc35, Oct 64
- Antenna farms, tall-tower...31, Nov 64
- propagation curves, and...24, Mar 65
-35, Jul 65
- proposals34, Feb 65
- Applications
 - filing fees
 - changes28, May 65
 - waivers40, Sep 65
 - program form, AM FM...66, Oct 65
 - public inspection.....34, Jun 65
- Auxiliaries, relaxed station identification proposed for.32, Dec 65
- "Beep" requirement, AT&T to delete35, Jul 65
- CAB development.....27, Apr 65
- CATV28, May 64
- "leapfrogging," FCC concern over40, Sep 65
- microwave
 - authorizations27, Dec 64
 - service21, Sep 64
 - exclusive.....31, Dec 65
- operating data, FCC requests42, Aug 65
- proposal filings heavy...33, Nov 65
- regulation, FCC.....23, Mar 65
- action33, Jun 65
- telephone-company activity in67, Oct 65
- CCIR, U.S. fares well at...34, Jun 65
- Call letters
 - notice requirement.....21, Jan 65
 - policy modified.....34, Jun 65
- Class IV stations, nighttime-power increase urged for.32, Nov 64
- Commercial loudness.....28, Dec 64
- action expected from

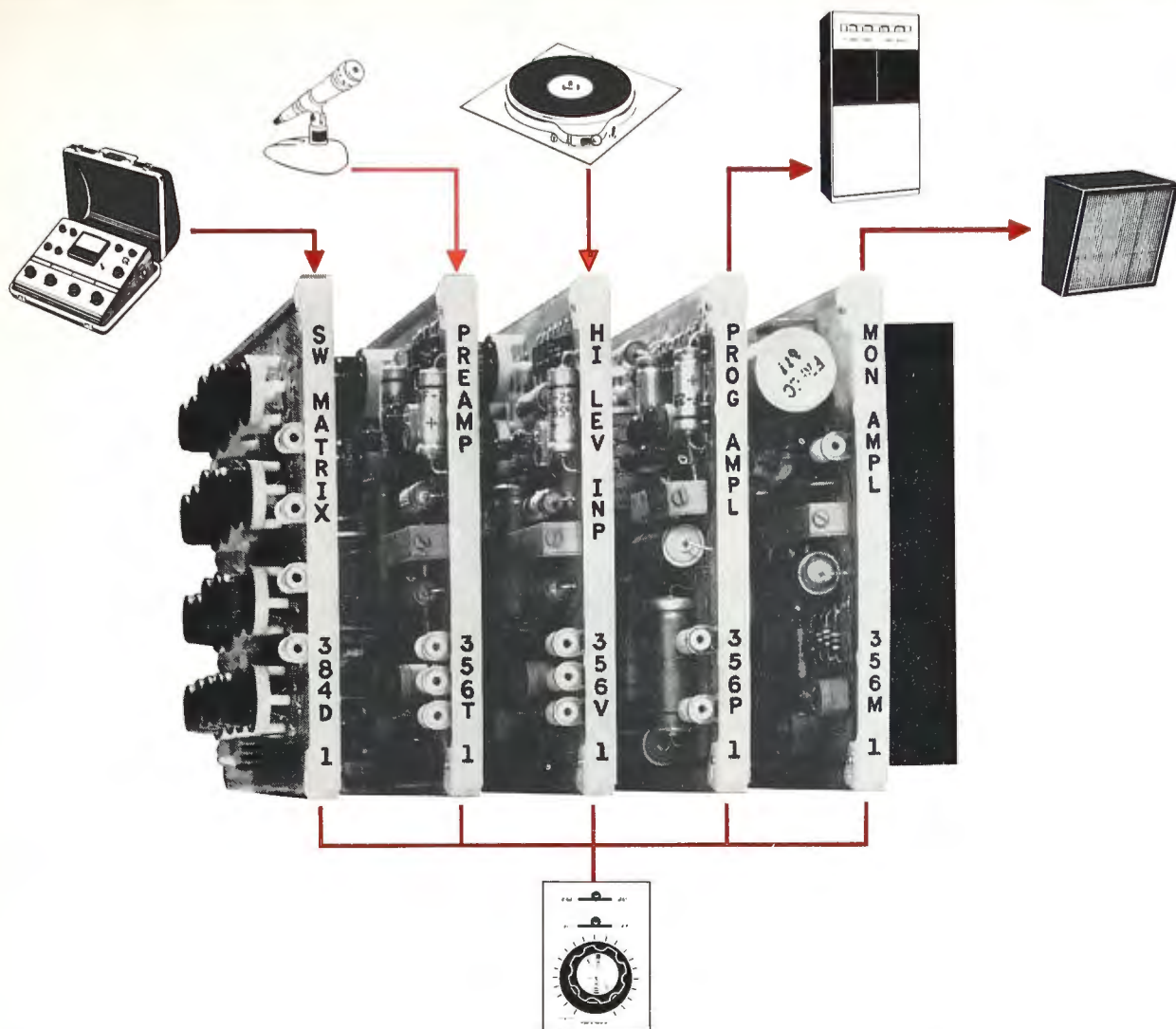
- FCC33, Feb 65
- policy statement issued...41, Aug 65
- studied by FCC.....28, Apr 64
- Directional antennas
 - licensees, relief for.....67, Oct 65
- requirements
 - operator, unchanged...22, Jan 65
 - remote-control, NAB seeks relaxation of....39, Sep 65
- "Double Billing" officially outlawed32, Dec 65
- EBS alerting device proposed41, Aug 65
- ETV, MPATI request denied.42, Aug 65
- FCC, Commissioner, engineer as new.....33, Apr 65
- Rules enforcement.....22, Sep 64
- FM
 - allocations changes.....31, Nov 64
 - interference
 - harmonic23, Jun 64
 - problems27, May 65
 - Rules protect.....42, Aug 65
 - monitoring
 - modulation, studies of..34, Apr 65
 - multiplex, relaxation asked36, Nov 64
 - power
 - increases for.....27, Dec 64
 - vertically polarized...22, Aug 64
 - program duplication, AM, deadline postponed.....27, May 65
 -39, Sep 65
 - simplex operation discontinued21, Aug 64
 - stations, new Rules proposed27, Apr 64
 - correction28, May 64
 - stereo, monitors for....24, Jun 64
 -28, Apr 64
 - vertical polarization...36, Oct 64
- Field-strength/distance curves: antenna farms.....35, Jul 65
- Fines and revocations.....21, Aug 64
- IEEE Broadcasting Symposium22, Sep 64
- License fees.....28, May 64
- Ownership multiple, Rules
 - affirmed36, Jul 65
 - revised22, Aug 64
- Public-inspection Rules, changes in.....31, Dec 65

- Remote pickups, multihop relaying for aural.....22, Jan 65
- Satellite
 - Early Bird.....33, Jun 65
 - relay, ABC proposes private33, Nov 65
 - stereo via.....34, Feb 65
- TV
 - aural-visual ratio.....27, May 64
 - Rules made final.....27, May 65
 - channels, sharing of....23, May 65
 - field-strength curves.....21, Sep 64
 - frequency-monitor
 - requirement eliminated.21, Jan 65
 - rule postponed.....32, Feb 65
 - land-mobile sharing, and..24, Jun 64
 - microwave-relay band, sharing28, Dec 64
 - nonbroadcast, FCC control of.....21, Aug 64
 - propagation curves
 - conference on.....66, Oct 65
 - further revision for..33, Nov 65
 - receiving-antenna improvement program39, Sep 65
 - stereo sound for.....22, Jan 65
 -24, Mar 65
 - subscription21, Jul 64
 - transmitters, remote control of.....21, Jul 64
 -33, Feb 65
 - vertical polarization...36, Oct 64
 - Tape-cartridge standards...22, Jul 64
 - Telemetering, subaudible...22, Jul 64
 - Tower-height limit, Congress proposes33, Apr 65
 - Translators
 - CATV, equal treatment with33, Feb 65
 - grants, interim policy....36, Jul 65
 - Rules, relaxed.....41, Aug 65
 - proposed33, Apr 65
 - UHF28, May 64
 - allocation, new table.....21, Sep 64
 -35, Jul 65
 - corrections to be made.34, Nov 65
 - release expected.....24, Mar 65
 - low-power stations proposed34, Apr 65
 - permits
 - FCC tightening on....21, Jan 65
 - unused, review for....28, May 65

Broadcast Engineering

7-YEAR SUBJECT-REFERENCE INDEX

This index illustrates the wide scope of BROADCAST ENGINEERING coverage of the technical aspects of broadcasting. To keep abreast of this growing and dynamic industry, just fill out and return the handy subscription form bound in this month's issue. As a bonus, you'll receive the Broadcast Engineers' Maintenance Guide.



Actual size of card $6\frac{3}{8}'' \times 4\frac{1}{2}''$

Now, Collins photoconductive controls can be custom designed for your studio !

Eliminate pops, clicks and hums by replacing mechanical contacts with Collins' new photoconductive modules.

Arrange cards (solid state modules with integral switching) in any configuration you want.

Concentrate all your sensitive wiring within card cage, away from all interference.

Remote your amplifiers with a simple 4-volt, dc wire (instead of shielded cable).

Eliminate your biggest maintenance problem: worn or dirty mechanical contacts. With photoconductive cells

instead of relays and switches, you won't have a mechanical contact in your program circuits.

Simplify troubleshooting. Replace attenuator, input switches, and amplifier output switches with one quick shuffle of cards.

For the finest audio available, let Collins' specialists custom design your studio. Contact your Collins Sales Representative, or send a block diagram of your requirements to Collins Radio Company, Broadcast Communication Division, Dallas, Texas 75207.



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

Circle Item 20 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 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.



BOYNTON STUDIO DEPT. BE10

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

SOLE DISTRIBUTOR FOR

SYNCRON AU-7a CONDENSER MICROPHONE

Dealerships available

Circle Item 21 on Tech Data Card

Local Color

(Continued from page 19)

put per watt of power is slightly higher than with conventional incandescent lamps.

Whatever lights you choose, color requires careful lighting, and careful lighting demands control of light direction and intensity. Aside from the mentioned four-stop range of dimming, you'll need to use scrims, screens, fixture movement, and spotting down or flooding out of fresnels to get satisfactory color pictures. Aluminum screen (not copper, which shades the light toward the red) can be used to reduce light output, with each layer of screen reducing output about 15%. New lighting-grid designs allow easy repositioning of fixtures. Whatever you use, the care the lighting men take is far more important than the fixtures themselves.

Base light tends to be higher in color temperature. This is due in part to attempts to reduce contrast range to a practical figure. A reasonable contrast range is twenty to one, though thirty to one is still okay. In a local studio, it is often difficult to measure contrast range, but excess contrast can be identified by shadows that are dark and heavy and appear multicolored on the screen. A general rule is not to raise contrast above the level where detail becomes invisible in dark shadow areas.

Conclusion

Because this article is for engineers, many of the problems of scene designers, costume designers, and makeup men aren't mentioned. However, these people must be allowed ample opportunity to view their work on both color and monochrome monitors until they become confident of their new skills. Color is a naturally expressive medium—a medium that is pleasant to work in once the fundamentals become second nature. ▲



you lost your turn by missing our ad in the September issue. Go back and look at page 26 for **NEW REMOTE CONTROL** from **BIONIC INSTRUMENTS, INC.**

Circle Item 22 on Tech Data Card

ENGINEER'S EXCHANGE

Quick Transmitter Neutralizing

By Walter L. Johnson, Jr.,
Chief Engineer,
WELS, Kinston, and WGOL,
Goldsboro, North Carolina

Quite often engineers get together and discuss how they do things and the problems encountered in doing certain of those things.

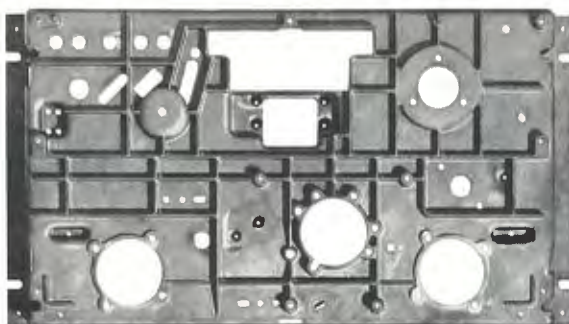
One of the most frequent complaints concerns the neutralizing of transmitters with the old "coil of wire and a bulb" method. The most frequent problems have been: 1. finding a place on the coil "hot enough" to make the bulb glow, and 2. the fact that in most cases, after the bulb goes out, there is a lot of turning of the neutralizing adjustment left to do in order to find the exact null.

For the past year or so, we have tried neutralizing transmitters with a VOM and have had very good results. Not only is it possible to get enough "juice" to obtain a reading, but the null can be pinpointed exactly and easily.

The method is very simple: 1. Disconnect the high voltage going to the final tubes as usual in the neutralizing process. 2. Connect one lead of your VOM to the ground or shield of the RF coax at the transmitter and the other lead to the transmitter "hot" antenna terminal. 3. Set the VOM to "AC volts" and at the highest possible scale. 4. Turn on the transmitter (high voltage to finals disconnected). 5. Turn the voltage switch of the VOM down the scale until you get a good reading. 6. Turn the neutralizing adjustment for minimum meter reading. 7. Go down the voltage scale on the VOM, adjusting the neutralizing control as you go until you get the lowest RF reading at the lowest possible voltage scale. Sometimes you may not be able to go to the lowest voltage scale on the meter; it depends on the transmitter, meter sensitivity, voltage scale, and other factors.

● Please turn to page 48

BROADCAST ENGINEERING



DIE-CASTING



[RHYMES WITH LASTING]

■ Quality in a professional tape recorder has got to last. That's why a sturdy, solid die-cast main plate backs up famous Magnecord durability.

Only a solid die-casting can provide rigid support and stable alignment of assembled parts. Mounting holes and bases are molded in for perfect uniformity between each instrument, insuring precise location and smooth operation. This extra strength in a Magnecord reduces wear to a minimum, cuts down-time and lowers maintenance cost.

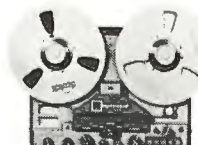
Casting about for a professional tape instrument that is broadcast-ready and stays that way? Write for our new brochure featuring the complete line of Magnecord recorder/reproducers.



Model 1021 \$708



Model 1022 \$788



Model 1028 \$995



Model 1048 \$995



magnecord SALES DEPARTMENT
MIDWESTERN INSTRUMENTS, INC.

Subsidiary of Telex Corporation / P. O. Box 1526 / Tulsa, Oklahoma 74105

Circle Item 23 on Tech Data Card



RADIO STATION WFOX LOVES REK-O-KUT

Engineer Edward Willie depends on Rek-O-Kut turntables, as he has for over a decade to deliver the finest in recorded sound for his disc jockey shows. Hundreds of radio stations use Rek-O-Kut turntables. They operate with the same clock-like precision for many years. Owning a Rek-O-Kut is a long-term love affair.

ALMOST EVERYBODY LOVES REK-O-KUT



REK-O-KUT B-12H TURNTABLE \$165.00

Three speed. Noise level: -59 db below average recording level. Wow and flutter: 0.085% RMS. Custom-built, heavy duty Hysteresis Synchronous motor for constant speed and "hush" performance. On-off signal indicator. Less tone arm and base.



KOSS

REK-O-KUT

2227 N. 31st Street • Milwaukee, Wisconsin 53208
Circle Item 24 on Tech Data Card

Letters

(Continued from page 6)

transmitter and observed after the VSBF. The ringing and overshoot at the pulse edges are observed on a scope. The phase equalizers may be adjusted to reduce these effects as much as possible. The equalizer settings rarely need to be changed.

DEAR EDITOR:

My article, "Cartridge Recorder Playback with Automatic Cuing," (July 1965 BE, page 22) contained some diagrammatic errors which have been called to my attention by several readers.

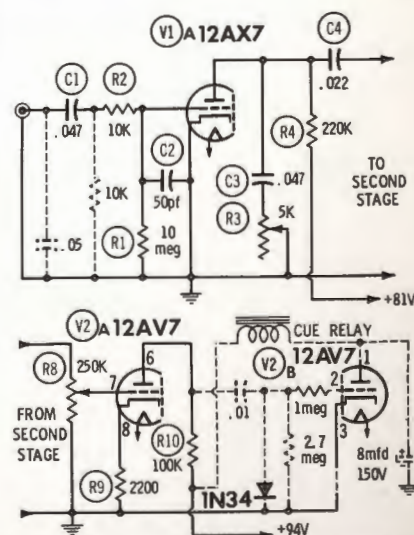
The Viking PB60 Preamp used for cue purposes was modified as follows: 1. The input has a .05-mfd 150-volt capacitor across it to bypass bias voltage which causes false cues. 2. A 10K ½-watt resistor loads the input to ground between C1 and R2. 3. The V2B plate, pin 1, derives B+ through the cue-relay coil, and has an 8-mfd, 150-volt capacitor to ground. 4. The cathode of V2B, pin 3, is grounded. 5. The grid of V2B, pin 2, is connected to the plate of V2A, pin 6, through a .01-mfd 600-volt capacitor in series with a 1-meg resistor. The point between the capacitor and grid resistor is grounded through a 2.7-meg load resistor and the 1N34.

In operation, the bias-free signal is amplified and then coupled to V2B through the .01-mfd capacitor. The signal is rectified, however, before it reaches the grid of V2B, and so develops current across the tube. The change is smoothed by the 8-mfd, 150-volt capacitor and causes the coil to operate the cue relay.

In the original article, I neglected to note the insertion of the bias bypass capacitor, and the schematic was somewhat confused.

JOSEPH D. COONS
President & General Manager,
WOHI AM-FM,
East Liverpool, Ohio

Author Coons also supplied a schematic diagram showing the modifications. The input and output stages are reproduced below.—Ed. ▲



NOTE: MODIFICATIONS ARE SHOWN IN DASH LINES.

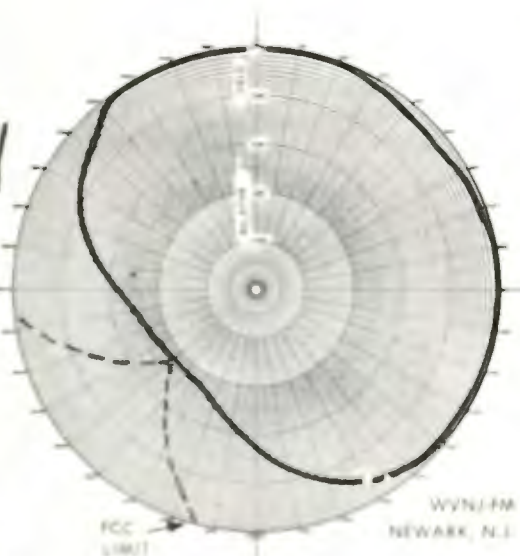
JAMPRO

Directionalized **F M** Antennas are **PATTERN TESTED** prior to shipment

The new Jampro testing range allows our design engineers to erect, test and adjust every antenna to conform to your specific vertical and horizontal pattern requirements before shipment is made.

Since the mounting pole and tower affect the radiated pattern, our engineers can actually duplicate your mounting specifications when adjusting your new directional antenna. We'll even adjust for phasing and spacing of the dual legs, which is often required in tight or multiple null patterns.

Contact Jampro for newly developed technical information regarding Dual Polarized FM Directional Antenna measurements and performance.



ADVANTAGES OF JAMPRO'S NEW DIRECTIONALIZED DUAL POLARIZED FM ANTENNA

Effective radiated power can be increased and will protect neighboring short spaced stations. The 100% bandwidth is not affected and the antenna peak gain is nearly always increased.

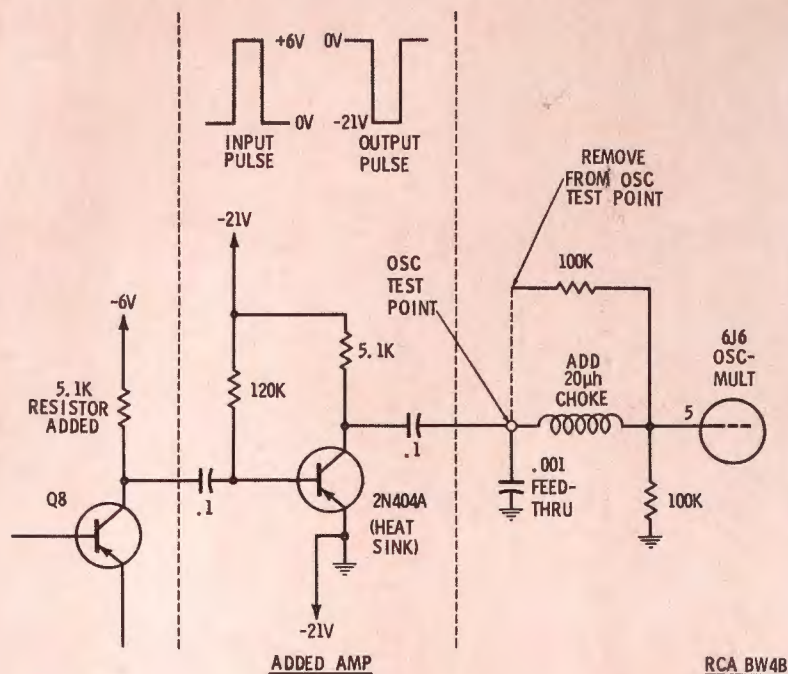
JAMPRO**ANTENNA COMPANY**

6939 POWER INN ROAD

SACRAMENTO, CALIFORNIA

PHONE: AREA CODE 916
442-1177

Circle Item 26 on Tech Data Card



We have used this method often for over a year, and it has worked perfectly for us. It is certainly a time-saver and is the most accurate "quick" method we have tried.

Mr. Johnson is the first winner in our Engineers' Exchange contest. He will receive a volume of his choice from the Howard W. Sams Modern Communications Course or Broadcast Engineering Notebooks series. We'll award a similar prize for the item judged best each month. Why not submit yours?

Chopper Modification

by Roger L. Peters,
Engineering Maint.,
KMTV, Omaha

This amplifier (at left) was added to the solid-state chopper (July 1964 BROADCAST ENGINEERING) so the unit, which was designed for use with a diode, can be used with an RCA BW4B demodulator or a similar unit. The -21-volt pulse turns off the 6J6 grid, giving a no-carrier zero reference.



Swabs are for babies; S-200 is for cleaning tape heads (even while tape is running)

If you've been cleaning tape heads with a twist of cotton on a toothpick—stop. Save time and do a better job with S-200 Magnetic Tape Head Cleaner. S-200 is a formulation of Freon TF® with other fluorocarbons in convenient aerosol cans. It thoroughly cleans tape heads, guides and helical scan slip rings in seconds, can be applied to running tape without interfering with

transmission. And heads stay clean longer. Users report over twice as many passes of tape between cleanings with S-200 than with swabs. S-200 Magnetic Tape Head Cleaner is recommended by leading tape manufacturers. Available in 6 and 16-oz. cans.

Write on letterhead for literature and free sample.

©Du Pont trademark

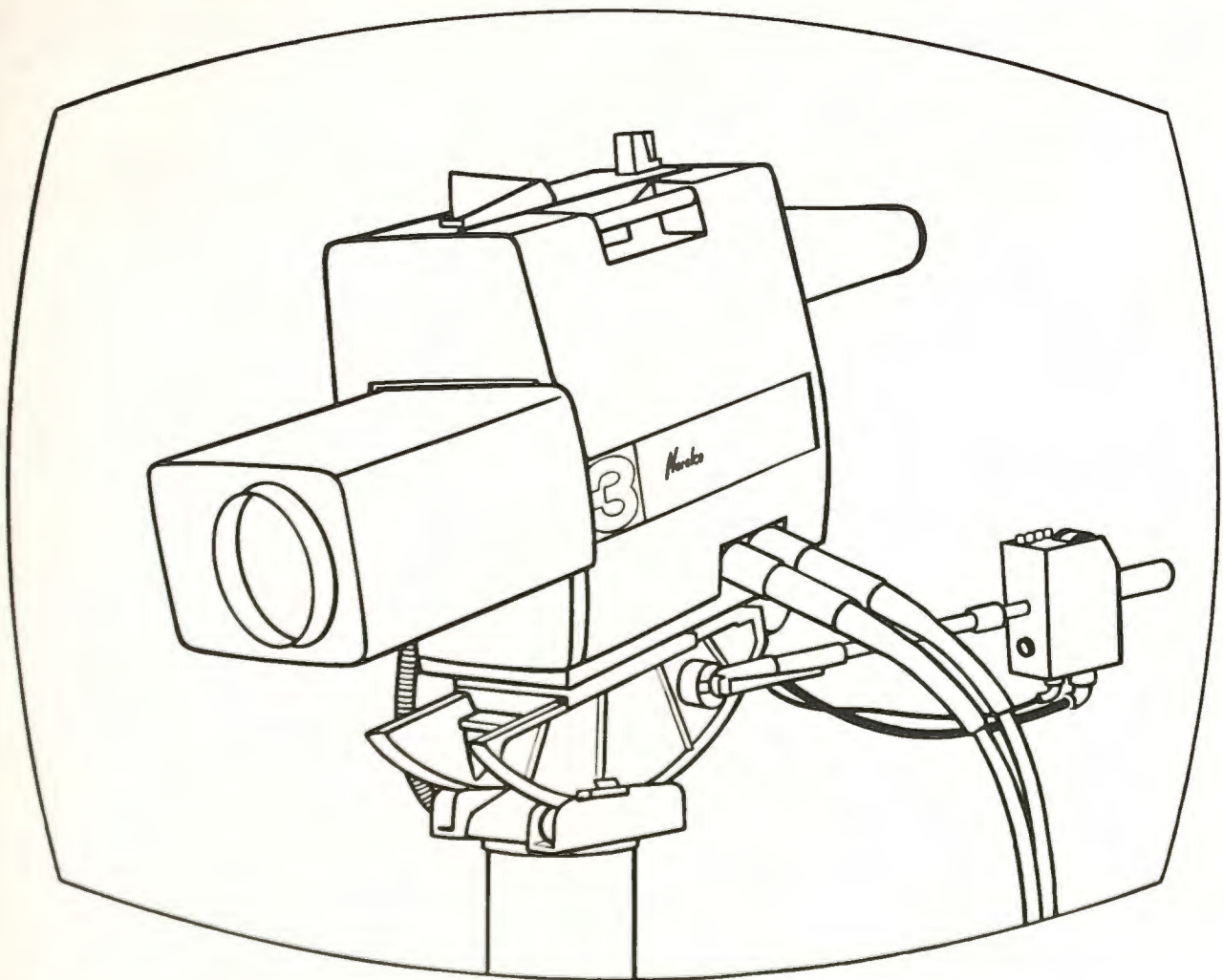


**miller-stephenson
chemical co., inc.**

Route 7, Danbury, Conn.

Circle Item 26 on Tech Data Card

COLOR IT FAITHFUL



The revolutionary Plumbicon television camera tube was designed after years of development work supported by original research on "spectroscopically pure" lead compounds at Philips Research Laboratories division of North American Philips Company in Briarcliff, New York.

Color cameras utilizing these amazing tubes are now in production and are manufactured at the Studio Equipment operation in Mount Vernon, New York. Many of these cameras now have more on-air time than any other modern color camera in network

operational use. The results of this breakthrough have been quoted as the most spectacular improvement in home color television reception—a significant stimulus to viewer, set maker and advertiser alike.

Out of this research and development depth, constant improvements are being made. Color fidelity has now been greatly improved over the amazing results thousands have already witnessed.

With the magic of these new cameras, you too can *Color it Faithful!*

Norelco Plumbicon Cameras are manufactured in Mt. Vernon, N. Y.

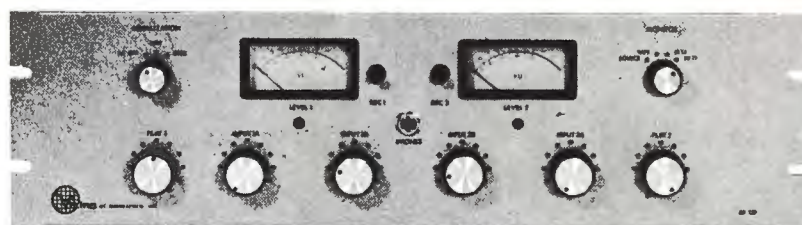


NORTH AMERICAN PHILIPS COMPANY, INC.
900 South Columbus Avenue, Mount Vernon, New York 10550

Plumbicon
is a registered trademark

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

Circle Item 27 on Tech Data Card



Studio 96

QUALITY DESIGNED FOR BROADCASTERS AND SOUND STUDIOS

Two speed tape transport with automatic sequence braking, choice of hyperbolic head configurations, hysteresis capstan drive and heavy duty reel drive motors, remote control jacks and 10½" reel capacity. Superbly smooth tape handling — interlocked "fool-proof" switching — fit for every studio.

Rack mount ready from \$585.45

MATCHING SOLID STATE ELECTRONICS

Record and playback amplifiers of modular design with interchangeable plug-in options, mixing controls, A-B monitoring, 600 OHM line output illuminated VU meters, exceed NAB standards.

Rack mount ready

Monaural RP110-R2 \$299.00
Stereo RP120-R2 \$399.00



MADE BY SKILLED AMERICAN CRAFTSMEN AT

Viking OF MINNEAPOLIS®

9600 Aldrich Ave. S. Minneapolis, Minnesota, 55420

CANADA: Alex L. Clark, Ltd., 3751 Bloor St. W., Islington, Ontario
Electro Tec Marketers, Ltd., 1624 W. Third Ave., Vancouver, British Columbia
CENTRAL & SOUTH AMERICA: ManRep Corp., P.O. Box 429 N. Miami Beach, Florida, U.S.A.
OVERSEAS EXPORT: International Division Viking of Minneapolis, Inc., 9600 Aldrich Ave. S., Minneapolis, Minn., U.S.A.

Circle Item 28 on Tech Data Card

BOOK REVIEW

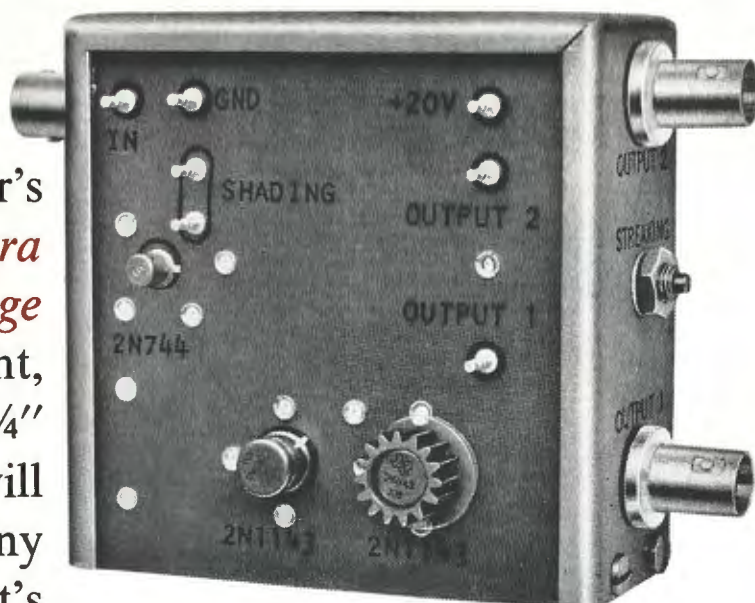


Lightning Protection Code 1965 (NFBA No. 78); National Fire Protection Association, Boston, Mass.; 59 pages, 5" x 7½", paperback, 75¢.

This is the latest revision of a code first adopted in 1904. It was prepared by the NFPA Committee on Lightning Protection; the 1965 edition was adopted by the NFPA at its annual meeting last year.

The text of the code is broken down into three major sections: Protection of Persons, Protection of Buildings and Miscellaneous Property, and Protection of Structures Containing Flammable Liquids and Gases. The first section describes what persons should and should not do during a thunderstorm. Basically, it consists of a listing of locations that are dangerous and those that are relatively safe. The second section, consisting of 43 pages, describes methods for affording lightning protection to everything from large buildings to farm animals. The section begins with discussions of factors to consider when planning a structure and factors influencing the decision concerning whether to protect a structure or not. The installation of lightning rods and conductors is covered, and grounding practices are listed. Protective measures for aircraft (while on the ground) and boats are included. The final 10 pages of the code detail methods appropriate for the protection of structures in which flammable gases and liquids are contained.

In addition to enumerating the provisions of the Code, this publication contains a considerable amount of explanatory material. A reading of these sections should impart an understanding of the nature of lightning discharges and can help to clear up any misconceptions the reader may have concerning this subject. ▲



International Nuclear's *transistorized TCA3 camera amplifier fits any image orthicon camera.* That's right, this miniaturized (3¼" x 3¼" x 1¼") camera amplifier will replace vacuum tubes in any image orthicon camera. It's completely transistorized and is very simply mounted within the camera. Microphonics are eliminated. Operating voltage is obtained from 285 volt source already in camera and is post-regulated. *The TCA3 fits any image orthicon camera.* A transistor protective device is included in case the high-voltage blocking capacitor at the image orthicon anode should short-circuit. Signal connectors are BNC type as well as solder-terminals. TCA3 circuit uses but three transistors, all proven EIA types. Output stage delivers signals for view-finder as well as camera chain. Peaking and streaking controls are included and are easily adjusted by use of standard RETMA resolution chart. *We promise, the TCA3 camera amplifier will fit any image orthicon camera.* They are on-the-air proven in TK10/TK30, TK11/TK31, 4PC4A1 and TA124E cameras. Instructions, necessary hardware and pre-cut cables are included.

PRICE, F.O.B. NASHVILLE \$295.00 EACH

For more complete information write or phone:

INTERNATIONAL NUCLEAR CORPORATION

608 NORRIS AVENUE • NASHVILLE, TENN. • PHONE 615-254-3366

Circle Item 29 on Tech Data Card



NEWS OF THE INDUSTRY

NATIONAL

Grant for ETV Station

A Federal grant of \$296,220 has been made to the South Carolina Educational Television Commission to activate a noncommercial educational television station on channel 35 in Columbia. Funds will be used to purchase an antenna, tower, transmitter, and other equipment. The total cost of the project is estimated at \$592,441.

The station plans 30 hours a week of programs for classroom use, and another 30 hours for teacher instruction, public affairs, and cultural programs. It will become the principal link in the developing South Carolina educational television network because of its proximity to the production facilities and video tape library at the Columbia ETV Center. Other stations in the network are at Charleston and Greenville.

The new station will serve a popula-

tion of 646,000 persons, including 208,000 students in 400 schools.

Tall Tower in Texas

A new tower built for Fort Worth-Dallas television station KTVT is 1553' high compared with 1472' for the Empire State Building. The tower was fabricated by Kline Iron & Steel Co. in Co-

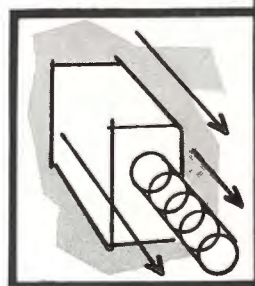
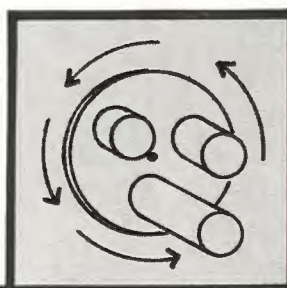


lumbia, S. C., and then hot-dip galvanized en route to the erection site in Dallas County. By having the steel galvanized in transit, the station saved itself the cost of shipping the required 22 tons of zinc from South Carolina to Texas. Designed to increase KTVT's coverage area by 55%, the tower took six weeks to erect. The top section was set in place by helicopter. Main supporting members of the 310-ton tower are of 6" high-tensile steel rod. Holding the unit are 21 steel guy wires anchored in concrete foundations buried 20' in the ground. An elevator can carry two men to the tower top and back to the ground in 30 minutes.

CATV for Alabama

Three CATV systems for use in Alabama are to be financed, engineered, and furnished by Stromberg-Carlson Corp. under a contract awarded by West

From the discontent of man...



the world's best progress springs

Ella Wheeler Wilcox

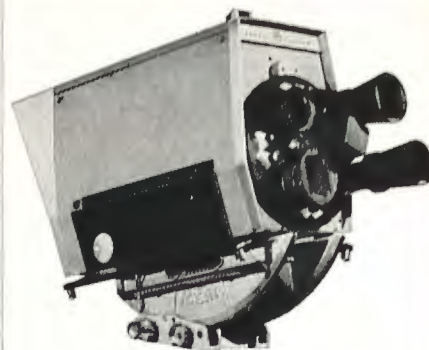
Challenged by the limitations imposed by the cumbersome device of the turret, Zoomar has given the camera a new dimension—an exciting lifelike versatility approaching that of the human eye—a tool that dramatically helps to translate into being the skill and imagination of the engineer and operator. Zoomar, 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.

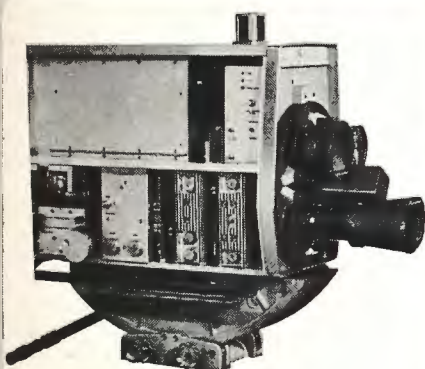
Zoomar, Inc. GLEN COVE, N. Y. 11542 • 516 676-1900 HOLLYWOOD, CALIF. 90028 • 213 465-2789

Circle Item 30 on Tech Data Card

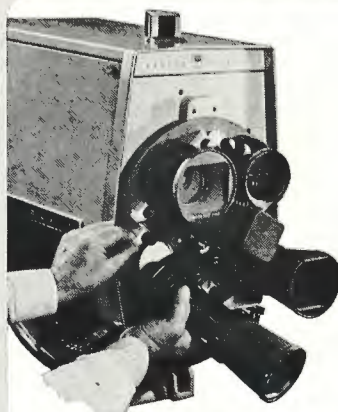
A FEW REASONS WHY YOU CAN'T BUY A FINER TELEVISION CAMERA ...AT ANY PRICE



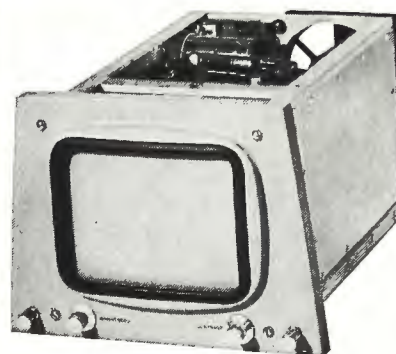
Impressive, designer-styled exterior. Clean lines, ultra-compact package houses field-proven Tarzian 3" Image Orthicon camera system. Highly portable. Easy to handle. Uses conventional camera cable.



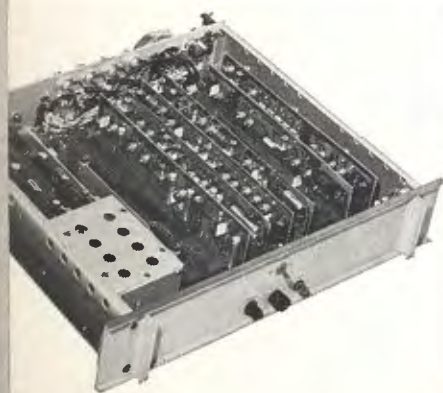
100% transistorized plug-in electronics for reliability and fast, convenient troubleshooting. Hinge out yoke assembly allows rapid change of 10 tube.



Built-in remote iris control. Quick-change lens insert system accepts variety of lenses, fixed focus and zoom.



Plug-in, self-contained 8-inch viewfinder assembly, interchangeable with other Tarzian live cameras. All circuits accessible without removing viewfinder.



Modular proc amp completes camera system. (Also interchangeable between cameras.) Totally transistorized electronics on plug-in circuit cards. Compact, highly portable.

SPECIFICATIONS

Scanning rate	525 lines, 30 frames, 60 fields, 2:1 interlaced
Line repetition rate . . .	15,750 cycles per second
Resolution (horizontal) . .	600 lines picture center 500 lines picture corners
Signal-noise ratio	Limited only by image orthicon
Remote iris control	Time for full range, 3 seconds accuracy of setting ± 0.25 lens stop
Output signals	Horizontal drive, 4 volts ± 0.5 volts; Vertical drive, 4 volts ± 0.5 volts; Sync, 4 volts ± 0.5 volts; Blanking, 4 volts ± 0.5 volts, Viewfinder video (ex- ternal) 0.7 volts intercom audio.
Viewfinder size	8" tube
Intercom	Dual transistorized

These are but a few reasons. For all the rest, call, or write, for 8-page brochure, "3000L 3" Image Orthicon Camera System."

S A R K E S
BROADCAST EQUIPMENT DIVISION



T A R Z I A N
BLOOMINGTON, INDIANA

Circle Item 31 on Tech Data Card
www.americanradiohistory.com



Mariner IV looked at Mars thru a GEC vidicon . . .

New projects and programs have created more opportunities and challenges at GEC. With excellent lab and support facilities, we are expanding our scope and depth in our four divisions. We seek a professional for the following assignment in our Electronics Division.

ELECTRONIC ENGINEER

Experienced in video circuits, with background in video and deflection amplifiers. Degree or equivalent experience. Salary open. Write: Fred Cason, Mgr Prof Emplmnt, Box 798, Garland, Texas 75041


GENERAL ELECTRODYNAMICS
CORPORATION
AN EQUAL OPPORTUNITY EMPLOYER

Circle Item 32 on Tech Data Card

Alabama TV Cable Company, a subsidiary of Alabama Telephone Company. The systems will serve subscribers in Sulligent, Winfield, and Vernon, Ala. The company already operates a CATV system in Hamilton, Ala. Five channels will be available to Sulligent and Winfield, and six to Vernon. Towers 200' high will be erected at the three locations for mounting the antennas to pick up channels from Columbus, Miss.; Birmingham, Ala.; and Tupelo, Miss. Vernon will also receive a channel from Meridian, Miss.

Broadcasters Considering Automation

Approximately two-thirds of the nation's AM and FM broadcasters are considering automation, 27% actively and 38% after further refinement. This conclusion was drawn from the 680 responses to a nationwide survey conducted for **International Good Music, Inc.** The respondents included 234 network-affiliated stations, 189 AM directional, 423 AM nondirectional, 238 FM-only, and 25 AM-FM stations. By population of city of license, 26% are located in areas of 100,000 or more, including 11 respondents in areas above 2½ million population; 46% in areas of 10,000 to 100,000; and 28% in areas of less than 10,000.

Six TV Stations to Transmit From Hancock Center

Six Chicago television stations plan to locate their transmitting antennas atop the 100-story **John Hancock Center**. The stations are: **WGN-TV** (channel 9), **WMAQ-TV** (channel 5), **WBBM-TV** (channel 2), **WTTW** (channel 11), **WXXW** (channel 20), and **WSNS** (channel 44). The stations are expected to begin transmitting from the top of the \$95 million structure on North Michigan Avenue during the summer of 1968.

Plans, still subject to approval by the Federal Aviation Agency, call for twin transmission towers 2049' above sea level, or 1449' above ground. Each TV tower would rise 344' above the roof. Also proposed is a 100' common FM radio antenna located between the two TV towers. This antenna is designed to serve 15 stations. Cost of the TV facility is estimated at \$5 million.



What's new?

See page 7 this issue.

Circle Item 33 on Tech Data Card



WGN-TV has transmitted from the top of the Prudential Building since 1955; its present antenna height is 914'. **WMAQ-TV** has operated from the Kemper Insurance Building since 1948 with an antenna height of 749', and the **WBBM-TV** antenna (height 683') has been atop the American National Bank Building since 1948. **WTTW** and **WXXW**, educational stations, transmit from atop the 1000 Lake Shore Drive Building. **WSNS** is a new station which has not begun operation.

300-Mile CATV System

Opening ceremonies for the 300-mile Greater Harrisburg CATV system were scheduled for early December. The system, built by **Jerrold Electronics**, is to serve Harrisburg and 17 surrounding communities in Dauphin and Cumberland Counties and will have a potential of 55,000 subscribers. CATV is not completely new to the Harrisburg area; **Perfect TV** has operated a five-channel system in a small section of the city since 1951. This company plans to connect its present 500 subscribers to the new system as soon as it is completed. Initially, the system will provide 11 TV channels, including a locally originated time-weather-music channel, and six FM radio stations. While five or more UHF channels (including an educational TV channel from Hershey, Pa.) will be carried on the Harrisburg cable, subscribers will need no UHF converters to watch them. All UHF channels are converted to unused VHF channels at the CATV head-end.

National Commission on ETV

A national commission on educational television to be established and financed by the **Carnegie Corporation of New York** has received approval of President Johnson. It will conduct a broad study of educational television to define its role in America and make recommendations for its future.

Dr. James R. Killian, Jr., chairman of the corporation of the Massachusetts Institute of Technology, will be chairman of the Commission. Other members are:

BROADCAST ENGINEERING

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.

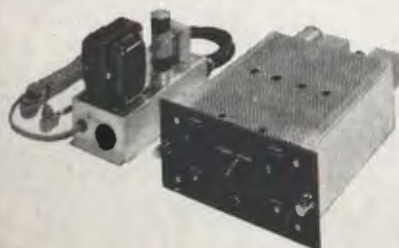
It is extremely rugged and will require little or no down time as the years go by. Too, when comparing it to other moderately priced omnidirectionals, it is lighter in weight, supremely well-balanced for “handability,” has a detachable cable, and a rubber mounted cartridge for minimizing handling noises.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

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.



Circle Item 34 on Tech Data Card

Remarkable!!!

NEW LANG SOLID STATE TAPE PLAYBACK PROGRAM/ AMPLIFIER



The remarkable new LANG completely transistorized single channel, low noise, equalized tape head playback amplifier provides unsurpassed preamplification, equalization and raising of the program signal to line level.

The LANG TPA features separate high and low frequency equalization controls to permit the tape head output to be accurately adjusted to the NAB playback curve. The LANG TPA also contains a five-stage silicon transistor amplifier capable of delivering + 24 dbm output with less than 1% total harmonic distortion. A built-in output transformer provides balanced output connections. Radio frequency and switching interference is eliminated by a shielded connector compartment and feed-thru capacitors.

The LANG TPA is contained in a completely enclosed 5 x 12 x 1 3/4" heavy gauge aluminum chassis with adjustment controls located on the front panel. Standard input, output and power connectors are mounted on the rear apron.

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 36 on Tech Data Card

Crown
INTERNATIONAL
— First Choice of those
who demand the Best!



**SOLID
STATE**

Model SS822
2 Track Stereo

From
\$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-1
Elkhart, Indiana 46517

Put a **Crown** in Your Future!

Circle Item 37 on Tech Data Card

James B. Conant, former president, Harvard University; Lee A. DuBridge, president, California Institute of Technology; Ralph Ellison, author; John Hayes, president, Post-Newsweek Stations; David Henry, president, University of Illinois; Oveta Culp Hobby, president, The Post, Houston, Texas; J. C. Kellam, president, Texas Broadcasting Corporation and president, Board of Regents, State Senior Colleges of Texas; Edwin Land, president, Polaroid Corporation; Joseph McConnell, president, Reynolds Metals Company; Terry Sanford, former Governor of North Carolina; Rudolf Serkin, concert pianist; Leonard Woodcock, vice-president, United Automobile Workers of America.

The Commission will recommend lines along which noncommercial television stations might most usefully develop during the years ahead. It will consider their financial problems and make recommendations as to how these problems might be met. It will focus its attention principally, although not exclusively, on community-owned channels and their services to the general public.

The Commission is expected to take twelve to fifteen months to make its study, after which time it will publish a report and recommendations. The Commission's headquarters will be located at 26 New Street, Cambridge, Massachusetts.

Group Seeks Better TV Reception

The public will enjoy clearer, ghost-free pictures, advertisers will get more for the \$2 billion plus they now spend on television, and television stations will be able to add to their viewing audience—these are the announced objectives of the newly formed **American Institute for Better Television Reception**. This group will work in conjunction with distributors, retailers, equipment manufacturers, and television stations in major markets across the country. In addition, the Association of Maximum Service Telecasters—an association representing over 160 television stations operating at maximum transmitting power—has encouraged its members to promote adequate home receiving antennas and is providing coordination assistance for those members who are participating on a local basis with the Institute's campaign.

The Institute was created to solve a problem long frustrating many television-station engineers: how to get the public to install their sets so they can see pictures as good as those being transmitted. The Institute believes that in the majority of instances this can be done with the installation of adequate antennas.

STOP you lost your turn by missing our ad in the September issue. Go back and look at page 26 for **NEW REMOTE CONTROL** from **BIONIC INSTRUMENTS, INC.**

Circle Item 35 on Tech Data Card

Field work of the Institute is carried on by field representatives of the various manufacturers who cooperate with local television stations in setting up orientation and training meetings with distributors, dealers, and servicemen. At these meetings, the men who are responsible for the sales, installation, and maintenance of television sets are given intensive briefings on the purposes and objectives of the Institute. A certificate then issued the dealer is serial-numbered and states he has been designated an Accredited Reception Specialist by the AIBTR. The certificate carries the AIBTR seal and remains the property of the AIBTR; it may be removed if complaints are made against the dealer.

The consumer-education campaign includes public-service spots carried by the various cooperating stations. It is expected that as the program progresses, displays and demonstrations will be developed to show the public how much better their television sets work when properly installed with an efficient outdoor antenna.

To Manufacture CATV Equipment

A new company to produce and market Community Antenna Television (CATV) equipment has been organized by **Kaiser Industries Corp.** and **Cox Broadcasting Corp.** The new company, to be known as the **Kaiser-Cox Corp.**, will be based in Phoenix, Arizona. It will be owned equally by Cox Broadcasting and the Kaiser Aerospace & Electronics Corp. subsidiary of Kaiser Industries.

The Kaiser-Cox organization will immediately establish warehousing facilities and district sales offices in St. Louis, Pittsburgh, Atlanta, Oakland, Phoenix, Portland, and additional locations yet to be selected. The company's line of solid-state equipment will be manufactured in Phoenix.

CATV's Consolidated

A new interstate Community Antenna Television system has resulted from a consolidation of operating companies in Washington, Oregon, and California. All of the companies were already held in overlapping or associated ownership. The new company, **Tele-Vue Systems, Inc.**, will operate systems in Seattle and Everett, Washington; Roseburg, Grants Pass, Medford, Ashland, and Klamath Falls, Oregon; and Dublin and the San Ramon Valley, Pleasanton, Corte Madera, Larkspur, San Rafael, Marinwood, Terra Linda, Santa Venetia, Petaluma, Antioch, and Livermore, all in the San Francisco Bay area of California.

Officers of the newly-formed company are Homer A. Bergren, Seattle, president; Lindsey Spight of San Francisco, executive vice-president for the southern division; Fred G. Goddard of Aberdeen, Washington, executive vice-president for the northern division; and William Montgomery of Seattle, secretary and treasurer.

BROADCAST ENGINEERING

ANDREW

Lower attenuation...
new HELIAX®

1/4", 3/8", 1/2" flexible
coaxial cables for

- Military
- Broadcast
- CATV
- Mobile Radio
- Data Processing and
Instrumentation Systems

These new air and foam cables offer lower attenuation in small physical sizes. Type FH1, 1/4" Foam HELIAX has 30% lower attenuation, 60% smaller size and 50% less weight than RG8/U. The copper inner and outer conductors assure optimum electrical performance with long life reliability. Available in long splice free lengths with or without polyethylene jacket.

For additional information on HELIAX, contact your regional Andrew sales engineer or write P.O. Box 807, Chicago, Illinois 60642.

8-65

Circle Item 38 on Tech Data Card

Andrew
CORPORATION
28 YEARS OF ENGINEERING INTEGRITY

NOW MEASURE FM STEREO AT 4% THE COST OF PRESENT UNAPPROVED STEREO MONITORS



\$89.50

Why spend \$2300 or more now when the FMD-1 Wide Band FM Detector will enable you to measure your stereo composite signal?

MEASURES:

- Stereo Separation > 45 db
- Pilot Phase < 1/2°
- Stereo Levels (L+R), (L-R), Comp.
- Distortion < 0.1%
- AM Noise
- From Transmitter or Antenna

Ideal for stereo proof-of-performance and type-acceptance measurements.

BELAR ELECTRONICS LAB.
1204 Childs Avenue • Drexel Hill, Pa.

Circle Item 39 on Tech Data Card



**SALESMEN ARE
GOING
PLACES**
with the new
BP-211 BRIEFCASE

TAPE CARTRIDGE PLAYBACK



\$198.00

Now all your Sales Presentations can be PROFESSIONAL and IMPRESSIVE!

A slim SAMSONITE attache case and fully transistorized tape cartridge playback — all in one! Operates on either A/C or rechargeable battery. Plays up to 3 hours without recharging. Full fidelity speaker. Plays all cartridge sizes. Light weight with portfolio in lid section for papers and sales aids.

Write or Phone

SPARTA
ELECTRONIC CORPORATION
6450 Freeport Blvd.
Sacramento, Calif

Circle Item 41 on Tech Data Card

PERSONALITIES

Robert W. Frierson has been named engineering manager of Magnetics, a Division of GJM, Inc. As engineering manager, Mr. Frierson will have total responsibility for all magnetic head and drum design. A graduate of the University of California at Berkeley, he brings some 15 years of magnetic-recording experience to Magnetics. He is a member



of the Institute of Electrical and Electronic Engineers and the American Society of Astronautical Engineers.

David S. Newborg has been appointed manager, antenna merchandising, for the Broadcast and Communications Products Division, Radio Corporation of America. In his new post, Mr. Newborg succeeds Joseph P. Ulasewicz, who has been transferred to the RCA International Division. He will have product responsibility for radio and television broadcast antennas.

Mr. Newborg joined RCA in 1943 following his graduation from the Georgia Institute of Technology with a bachelor of science degree in electrical engineering. During his undergraduate years, he held full-time technical jobs with Atlanta radio stations.

PROPERTY TRANSACTIONS

Radio Stations WZIP and WZIP-FM, Cincinnati, Ohio, have been sold by



you lost your turn by missing our ad in the September issue. Go back and look at page 26 for NEW REMOTE CONTROL from BIONIC INSTRUMENTS, INC.

Circle Item 40 on Tech Data Card

Greater Cincinnati Radio, Inc. (owned by the Waukegan, Illinois News Sun) to the Zanesville, Ohio Publishing Company. WZIP is a 1000-watt daytimer on 1050 kc, and WZIP-FM is on 92.5 mc with 70 kw. The sale price was \$367,500. The purchaser also owns WOMP AM-FM, Bellaire, Ohio; WNXT AM-FM, Portsmouth, Ohio; WHIZ AM-TV, Zanesville, Ohio; and WTAP AM-FM-TV, Parkersburg, West Virginia. The seller continues to own WKRS, Waukegan, Illinois.

The sale of radio station KTHS, Berryville, Arkansas has been announced by Ernest Howard, president of Ozark Radio and Equipment, Inc., licensee of the station. The purchaser is KTHS, Inc., Maurice F. Dunne, Jr., President. Mr. Dunne is a Lake Forest, Illinois business man and will be associated in this venture with Charles Earls, formerly manager of KAWA, Waco, Texas. KTHS is a 1000-watt daytime station operating on 1480 kc. The sale price was \$50,000.

Radio Station KFHA, Tacoma, Washington has been sold, subject to FCC approval, by Radio Sales Corporation to Lloyd Burlingham for a total consideration of \$84,000. Radio Sales Corporation has owned and operated KFHA since June 7, 1961. Mr. Burlingham owns KTOB, Petaluma, California; WIXN, Dixon, Illinois; and KNOG, Nogales, Arizona. KFHA operates with 1000 watts, daytime only, on 1480 kc.

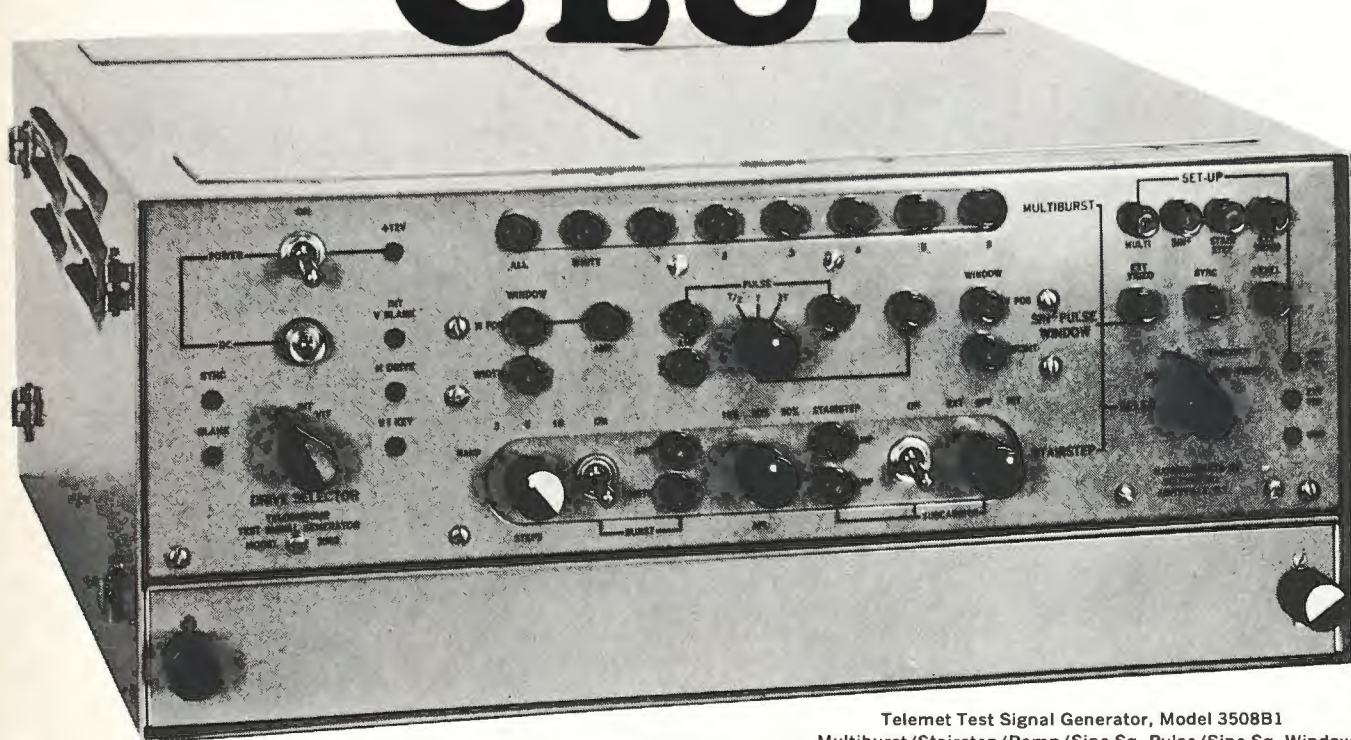
Radio Station KSEE, Santa Maria, California, has been sold, subject to FCC approval, by Cal-Coast Broadcasters, to Frank G. Macomber, White Plains, New York, for a total consideration of \$153,750. Edward E. Urner, owner of Cal-Coast, was founder, vice-president, and general manager of KLYD radio and television, and vice-president and general sales manager of KERO, both Bakersfield, California. He is presently employed by Crowell-Collier Broadcasting Corporation as general manager of their San Francisco-Oakland outlet, KEWB. Mr. Macomber has been associated in a program capacity with stations in Virginia, North Carolina, Texas, and Vancouver, B. C.

KSEE operates with 1000 watts, daytime only, on 1480 kc and has been on the air since 1961.

WJUD, a 1000-watt daytimer on 1580 kc, broadcasting from St. Johns, Mich., has been purchased by Mr. Robert D. Ditmer from Clinton County Broadcasting, Inc. Mr. Ditmer is currently general manager of Radio Station WHGR, Houghton Lake, Michigan. Sale price is \$82,500. ▲

BROADCAST ENGINEERING

JOIN THE CLUB



Telemet Test Signal Generator, Model 3508B1
Multiburst/Stairstep/Ramp/Sine Sq. Pulse/Sine Sq. Window

OVER 300 of these units are in daily use throughout the television industry — and this doesn't include the individual test signal generator modules (3501, 3502, 3503, etc.), of which hundreds have been sold.

This kind of popularity doesn't just happen...it's the combined result of awareness of customer requirements, capable engineering, quality production and continuing service.

If you're not already a member of the Model 3508 club, why not join now? It costs no more to go first class.



TELEMET COMPANY

185 DIXON AVENUE, AMITYVILLE, N.Y. • PHONE (516) 541-3600

NEW PRODUCTS

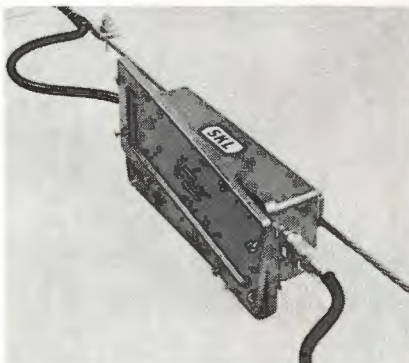


Vidicon Camera Chain

A vidicon camera chain built around the GE Model TE-14 camera is designated Model TMC-214 by **Tele Mation, Inc.** The addition of the Model TMV-101 camera-control unit converts the TE-14 to EIA and FCC specifications. A 5" transistor viewfinder, Model RE-575, is available for live applications.

The TMC-214 is intended to provide solid-state circuitry, high resolution, low power consumption, and stable performance for live, remote, or film applications in educational or broadcast installations.

Circle Item 63 on Tech Data Card



Transistor Trunk Amplifier

The Model 265 trunk amplifier is a high-output transistorized trunk amplifier with full 12-channel response. Its built-in temperature compensation, gain and tilt controls, AC cable-powering, and power regulation adapt it to both new system design and modernization of existing systems. The unit is designed to compensate for all losses in 20 db of cable over the band of 54 to 216 mc from -20°F to $+120^{\circ}\text{F}$. Low noise output and low cross-modulation permit the cascading of 50 or more amplifiers. The SKL Model 265 is housed in a waterproof cast-aluminum box with a captive cover; it may be mounted on the messenger or, with a bracket, on a pole. The unit is equipped with special sealed Type N connectors.

Circle Item 64 on Tech Data Card



Video Waveform Monitor

A cabinet-model version of its RM529 video waveform monitor is being manufactured by **Tektronix, Inc.** The Type 529 is designed for side-by-side mounting with a picture monitor in standard racks; it requires $8\frac{3}{4}$ " of rack space. A field case is offered as an optional accessory. The monitor features extensive use of semiconductors and is engineered to provide stable displays of vertical-interval test signals with adequate brightness even at the fastest sweep speeds. A line selector can be used to choose any line for display; the displayed line as viewed on the associated picture monitor is automatically intensified by a brightening pulse. No modification to the picture monitor is required.

Other features include positive field selection and back-porch DC restoration which is not affected by color burst. Power consumption is 80 watts, and no fan is used.

Four different frequency-response characteristics, required for analyzing VIT signal displays, including sine-



SOUNDS THAT SELL START WITH... The New Fairchild F-22 Condenser Microphone

By breaking away from traditional condenser microphone design and using the latest in solid state field effect transistor technology and micro-circuitry, FAIRCHILD is able to produce this quality condenser microphone at an astonishingly low and sensible price, there by putting the ultimate microphone quality within the reach of every sound engineer.

price \$160

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 43 on Tech Data Card

Get 3 Seconds to 1 Hour

TIME DELAY

... with the new SPARTA-MATIC CD-15
TAPE CARTRIDGE UNIT

★ Separate record, playback and erase heads allow time delays for "on the air" TELEPHONE CONVERSATIONS!

★ Can be used as a "special effects" generator to create ECHO CHAMBER and REVERBERATION effects.



SPARTA ELECTRONIC CORPORATION

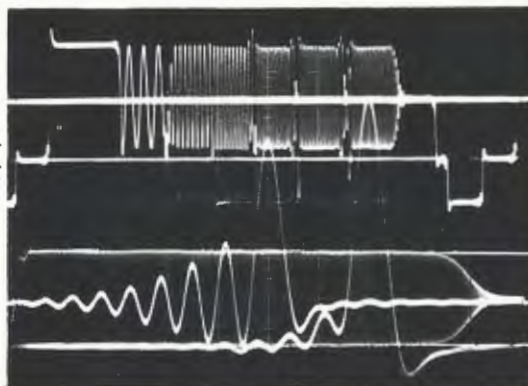
6450 Freeport Blvd.
Sacramento, Calif

Circle Item 44 on Tech Data Card

5 QUESTIONS

most engineers ask before they buy our solid-state transmitter **COLOR Phase Equalizer & Low Pass Video Filter**

TYPICAL SYSTEM OUT-
PUT — SWEEP, MULTI-
BURST, 2 T AND T PULSE



1. What is the overall Frequency Response of the Equalizer System including the Video Low Pass Filter?

Ans. ± 0.5 db 10 cps to 4.0 Mc/s; -1.0 db max. at 4.2 Mc/s; -20.0 db min. at 4.75 Mc/s; more than 20.0 db down above 4.75 Mc/s.

2. Will it work with my transmitter? What type of variable delay does it have?

Ans. This new system has 50 delay positions in each of the LF, HF and Notch Equalizers, approaching continuously variable delay — adequate to meet any phase correction requirement of your transmitter.

3. How much rack space does it take?

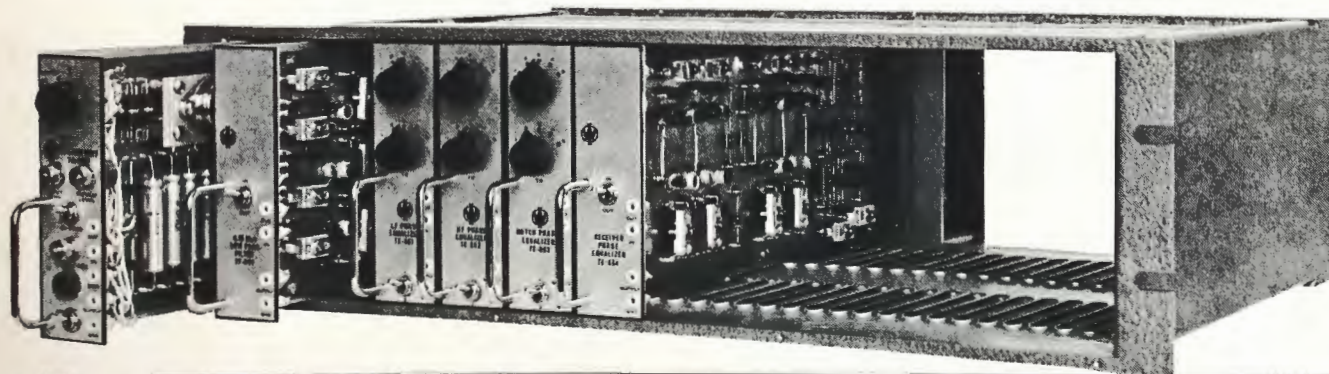
Ans. A Complete system for a transmitter occupies only half of a $5\frac{1}{4}$ " rack frame.

4. Does it have by-pass facilities?

Ans. Yes, automatic by-pass for the entire system, and selectable by-pass for video low pass filter, receiver equalizer, and variable delay modules.

5. How much does it cost, and how long is delivery?

Ans. The entire system is only \$3,450 (including notch equalizer) F.O.B. Linden, and we are currently making delivery from stock.



WARD ELECTRONIC INDUSTRIES

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

Circle Item 45 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 48 on Tech Data Card



What's new?

See page 7 this issue.

Circle Item 47 on Tech Data Card

squared testing, can be selected by a front-panel control. A special graticule is provided for transmitter modulation monitoring. The Type 529 can be used in conjunction with color process amplifiers for YRGB displays or RGB displays. Price of the monitor is \$1100.

Circle Item 65 on Tech Data Card



Headset With Microphone

TV Special No. 106040 Commentator's Headset was specially designed for broadcast-studio use. Impedance of the noise-canceling dynamic microphone is 150 ohms. The 275-ohm receiver is housed in a hard-shell circumaural earcup fitted with a foam-filled earcushion. Roanwell Corp. supplies the set with 5' 4-conductor cordage; the microphone circuit is shielded.

Circle Item 66 on Tech Data Card

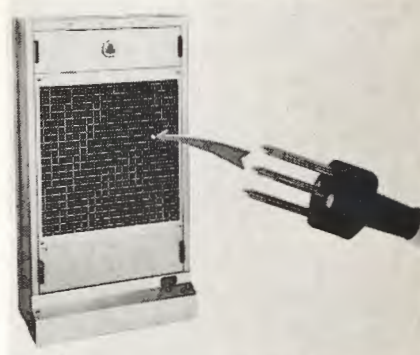


Solid-State CATV System

An all-transistor CATV system for carrying 12 TV channels through up to

50 amplifiers at -57 db cross-modulation is being sold under the name "Starline" by Jerrold Electronics Corp. A feature of the system is compact, unitized stations. All equipment for each complete main station is contained within a single aluminum housing designed to provide an airtight, waterproof, vapor-proof, and dustproof enclosure. Starline stations are usually messenger-mounted. Changes in gain-control settings cause virtually no deterioration in noise figure or cross-modulation, so amplifier spacing may be varied. The equipment line includes a series of "Feeder Makers," which plug into the bridging-amplifier stations to provide a choice of one, two, three, or four line outputs. Other features include all silicon transistors, seized center conductors, and full-wave power rectification.

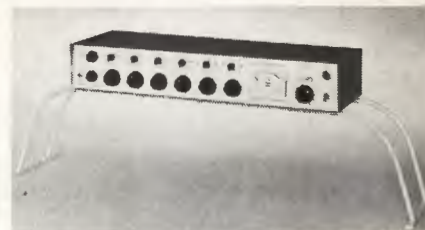
Circle Item 67 on Tech Data Card



Distribution Panel

This crossbar distribution panel for television picture signals is designed to provide low crosstalk so that a 6-conductor sound-and-picture matrix of up to 60 input and 60 output channels can be switched. The basic panel, developed by an IIT Swiss subsidiary, accommodates 20 inputs and 20 outputs of 6 wires each. Switching is by insertion of a special plug at the crosspoint of the two desired channels. A lamp in the head of the plug can be provided to signal active channels. A 20-by-20-channel panel measures 20.5" x 19.3".

Circle Item 68 on Tech Data Card



Compact Console

This console—built for use in crowded control rooms, for remote broadcasts, or in other applications where compact construction is desirable—contains dual turntable, tape, and microphone inputs and program, monitor, and cue outputs. Gain potentiometers are also included in the system for control of all microphones; turntable and tape outputs; and monitor, cue, and master volume. Additional serviceability is provided by "cue-

C. L. GARDNER COMMUNICATION CONSTRUCTION CO. BUILDERS OF COMPLETE ANTENNA SYSTEMS

- Antenna rehabilitation
- Tower erection
- Inspection and maintenance
- TV, AM, FM rigging
- Subcontracting

Write, wire or phone for estimates

C. L. GARDNER COMMUNICATION CONSTRUCTION CO.

422 Washington Building
Washington, D. C. 20005
AREA CODE 202 ST 3-2903

Circle Item 46 on Tech Data Card

you can

use your television camera

1. for both remote and studio telecasts
2. in the widest possible range of light levels
3. with zoom or turret-mounted lenses (remote iris optional)
4. with any one of a wide variety of I.O. pickup tubes

if it's General Electric's new PE-26...

the only truly "universal" monochrome I.O. camera on the market today. It weighs only 70 pounds, requires a mere 170-watts of power, takes up less than 2.5 cubic feet, is self contained except for remote control panel and monitoring (the monitoring and control panel for a two-camera system takes only 2' of rack space)...and is

completely transistorized (and we mean completely).

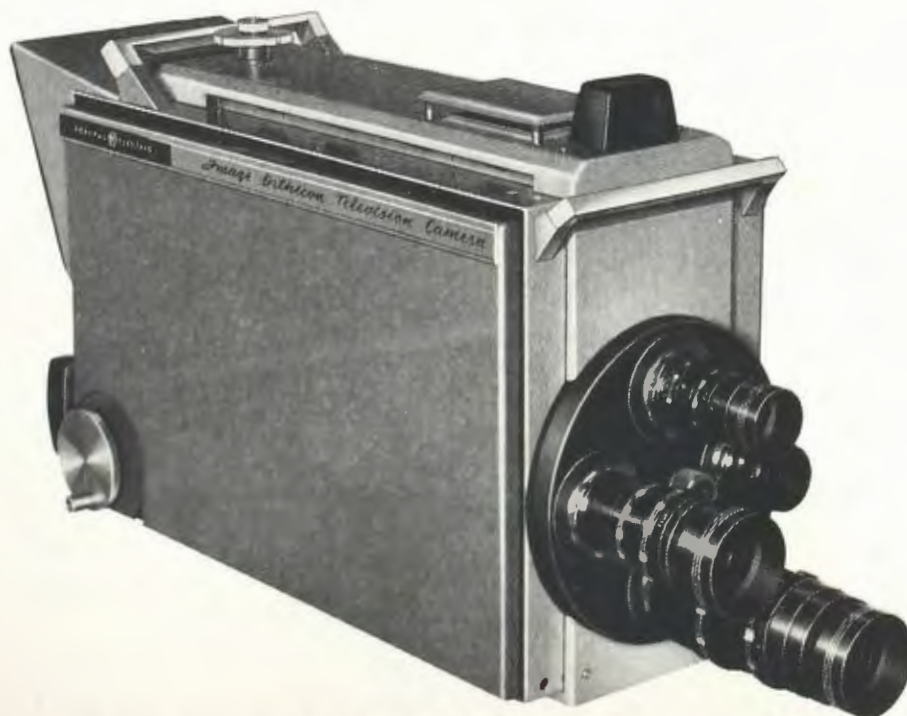
There's no other camera like it. And like it you will, after you see it in action. You can, simply by contacting your G-E Broadcast Equipment Representative, or: General Electric Company, Visual Communications Products, #7-315, Electronics Park, Syracuse, N.Y. 13201.

GE-20

Visual Communications Products

GENERAL  ELECTRIC

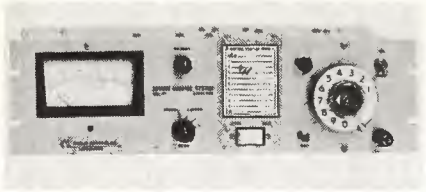
Electronics Park, Syracuse, New York



Circle Item 49 on Tech Data Card

on-off" switches which allow for cuing either tapes or records during broadcasts. A VU meter is included. The unit is of modular construction. The console is supplied with removable legs which are designed to straddle two turntables. It is sold by **United Radio Supply, Inc.**

Circle Item 69 on Tech Data Card



Transmitter Remote Control

The Model WRC-10T is a 10-channel solid-state transmitter remote-control sys-

tem that requires only a single DC-pair telephone circuit between the studio and transmitter sites. Raise, lower, control, and fail-safe functions are carried on the same circuit simultaneously with return telemetry information. Temperature-stabilized inductors and capacitors are used for reliable performance. Gold-plated circuits are printed on epoxy/glass-fiber cards. A vertical rack space of 5 1/4" is required for the transmitter and studio control units. A single transistor type is employed in all circuits. Also, a line of accessory kits is available for motor tuning, plate-current measurement, tower-light indication, etc. This remote-control system is a product of **Moseley Associates, Inc.**

Circle Item 70 on Tech Data Card

ously variable slow motion and a special control device which permits complete remote operation of the recorder.

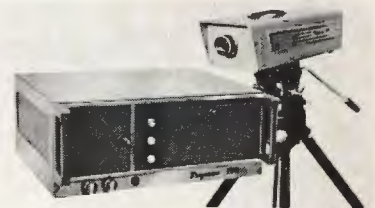
Circle Item 71 on Tech Data Card



Solid-State TV Monitors

Transistorized circuitry and plug-in modular construction are design features of the TPB Series of television monitors. The **Miratel Electronics, Inc.** series is available in 8" through 17" sizes with custom-chassis, rack-mounting, or standard cabinet configurations.

Circle Item 72 on Tech Data Card



I-O Camera

The **Rayscan 150** image-orthicon television camera is a two-piece system with fixed scan rates from 525 to 1023 lines. The camera has been designed so that, by choice of pick-up tubes, pictures may be obtained from scenes illuminated only by starlight, yet with adequate bandwidth to obtain 900 TV lines horizontal resolution with 875 scan lines per frame. The camera weighs 28 lbs and measures

What's new?

See page 7 this issue.

Circle Item 51 on Tech Data Card

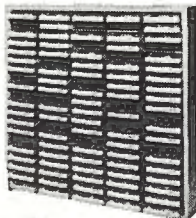
SPOTMASTER

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 52 on Tech Data Card



Electronic Tape Editor

An electronic editing accessory is now available as optional equipment with the **Amplex VR-660B** portable Videotape recorder. The device, called **Edicon**, permits increased flexibility in production of program material for broadcast or closed-circuit applications. Push-button editing of moving recorded tape is possible without stopping to splice or cut. Long or short insertions in existing programs may be substituted, and scene-by-scene assembly of new programs with no picture disturbance between cuts is possible.

The VR-660B recorder is priced at \$11,500, and the editing accessory is priced at \$1000. Other accessories available with the VR-660B include continu-

all systems* GO...

You're A-OK with **QRK**

*Monaural or Stereo



Whether it's stereo or monaural... when you launch a recording on a **QRK Professional Turntable**, you can depend on an instant "cue" and the superlative performance that has made **QRK** famous. **QRK Professional Turntables** have only 3 rotating parts in their patented design. The exclusive "platter-dapter" adapts to all discs without pop-up gadgets. Every **QRK** unit is backed by a full year warranty and prompt service.

See your dealer or write for complete illustrated literature.

QRK ELECTRONIC PRODUCTS

2125 N. Barton • Fresno, California



Circle Item 50 on Tech Data Card

BROADCAST ENGINEERING

5½" x 7½" x 20". The camera control measures 7" x 17" x 17". The Ray-tronics system draws 175 watts. Accessories include EIA synchronization, a selection of optics, and automatic light control.

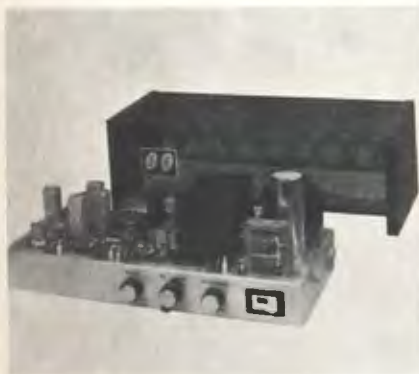
Circle Item 73 on Tech Data Card



Stop-Motion Video Recorder

Playback of TV tapes in slow motion, stop motion, reverse motion, and double-speed motion is available in a portable TV recorder produced by Precision Instrument Co. Designated the PI-7100, the 90-lb device allows forward and reverse playback at continuously variable speeds from 0 to 16" per second—nominally twice recorded speed. The instrument features stacked coaxial reels and helical-scan, closed-loop recording. It is fully transistorized, has a 3.5-mc bandwidth, and can record up to 96 minutes on a single 10½" reel of 1" tape. Two auxiliary tracks for audio commentary are individually recordable and erasable.

Circle Item 74 on Tech Data Card



SCA Receiver

The S/6 SCA multiplex receiver is

STANCIL-HOFFMAN CORP.

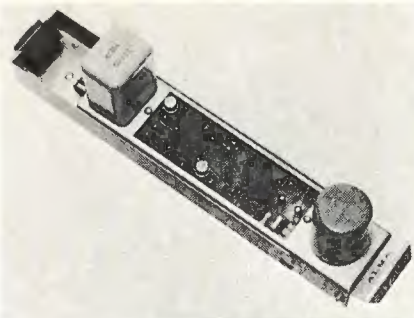
- MINITAPE PROFESSIONAL BATTERY Operated Portable Recorder, Mono Stereo, Synchronous.
- MAGNETIC FILM RECORDERS, Single and Multi-Channel, 16, 17½, 35 MM.
- BROADCAST LOGGING Recorders, Slow Speed Single Channel to 32 Channels.
- HIGH SPEED TAPE DUPLICATORS for Full, Half and Two Track Stereo Duplication.

921 N. Highland Ave., Hollywood 38, Calif.

Circle Item 56 on Tech Data Card

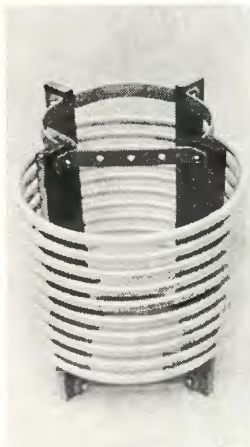
completely solid-state and of modular design. The four printed-circuit strips (RF, IF, subcarrier detector, and amplifier) can be removed and replaced, since all the interconnections are made with plug-in jumpers. This approach allows repair by inexperienced help using the substitution method. It also allows the receiver to be updated or modified for special application without the purchase of an entire unit. The S/6, manufactured by Dayton Electronic Products Co., Inc., includes a 15-watt amplifier and is priced at \$165.

Circle Item 75 on Tech Data Card



Preamplifier/Amplifier

The Model AE-2500 differential audio



RF COILS

Tube and ribbon types, all amperages. Featuring curved end brackets for easy tuning, accurate adjustment. Switches, connectors. Lowest prices, guaranteed quality.

NO DUTY.

GELECO ELECTRONICS LTD.

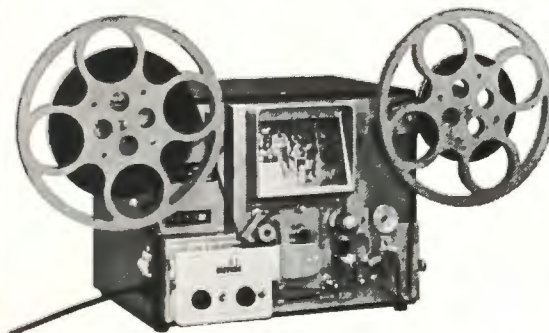
61 Curlew Drive, Don Mills, Ont.
416-444-5991

Circle Item 54 on Tech Data Card

PROGRAM DIRECTORS
CHIEF ENGINEERS
EXECUTIVES

SAVE TIME

Identifying, Evaluating, Cataloging,
Inspecting 16mm Motion Picture Film
on the



moviola
LIBRARY
READER

- View at up to five times sound speed.
- View at governed sound speed.
- Twelve sided prism, high quality, projection system.
- Rapid rewind without switching reels.
- Performs all functions forward and reverse.
- Available with or without sound.

moviola
manufacturing co.
motion picture | tv equipment

5539 Riverton Ave., North Hollywood, Calif.
Telephone: 877-2173
Cable Address: Moviola, North Hollywood, Calif.

Circle Item 53 on Tech Data Card

CAMERA TUBE BREAK- THROUGH 4½" ELCON NOW available



Long-Life, High Performance Television Camera Tube. An entirely new principle of operation, perfected by English Electric Valve, provides improved performance and increases tube life 3 to 4 times that of previous image orthicons.

LONG-LIFE Achieved Without any Corresponding Disadvantages—

- No burn-in or "sticking" ■ Improved S/N ■ "Crisp" live pictures
- Sensitivity, resolution and gray scale remain constant over the life of tube ■ Reduced black compression.

This new ELCON tube can be used with existing image orthicon cameras, as well as in the newer transistorized zoom cameras built specifically to take maximum advantage of its performance.

For detailed information on this important technical breakthrough, write for Bulletin 410.

ELCON . . . stocked, tested and warranted only by VISUAL, the leader.



Sold Nationally By

VISUAL ELECTRONICS CORPORATION

356 west 40th street • new york, n. y. 10018 • (212) 736-5840

LOOK TO VISUAL FOR NEW CONCEPTS IN BROADCAST EQUIPMENT

amplifier pictured here offers such characteristics as selectable gain (48 to 70 db by the insertion of a single resistor). Specifications are: total harmonic distortion .05% at any test frequency and measured at +25 dbm; output noise equivalent to an input of -127 db when strapped for 70 db gain and terminated in 150 ohms; frequency response within ½ db from 20 cps to 20,000 cps at +25 dbm. The Alma Engineering amplifier is also available with RIAA equalization.

Circle Item 76 on Tech Data Card



RF Calorimeter

Measurement of RF power to 500 mc is possible with the RF Termaline® coaxial load resistors and their companion calorimetric assemblies made by Bird Electronics. The calorimeter device is placed in series with the coolant flow of the load resistor. The input-to-output temperature differential at a constant flow rate yields power data from a chart; depending on the power level, probable error is as small as 2%.

These calorimetric assemblies are self-checking at DC or 60-cps AC and are not affected by ambient conditions. The coaxial load resistors are designed for a VSWR below 1.1 from DC to 500 mc, with 3½" flanged or unflanged line connectors. Continuous power ratings of 15 kw, 25 kw, and 50 kw are available with matching thermometers and flow indicators. ▲

Circle Item 77 on Tech Data Card

MOVING?

Don't Lose
Touch . . .



Receive B-E
as usual at
your new address

Write:

BROADCAST ENGINEERING
Circulation Dept.
4300 West 62nd St.
Indianapolis 6, Ind.

ENGINEERS' TECH DATA

AUDIO & RECORDING EQUIPMENT

80. ATLAS SOUND—Catalog 565 illustrates and describes public-address loudspeakers, microphone stands, and accessories for commercial sound applications.
81. CBS LABS—Literature on the "Volumax" automatic peak controller and the "Audimax III" solid-state automatic level control.
82. QUAM—General catalog No. 65 lists speakers for color-TV replacement, PA systems, high-fidelity, and general replacement.
83. SONY—Full-color catalog describes 1966 line of tape recorders and full recording accessories.
84. SPARTA—Catalog sheet details new tape-cartridge system; new-product brochure is also available.
85. UNIVERSITY SOUND—Cardioid, dynamic, and professional miniature microphones are listed in 1966 catalog.

86. VIKING OF MINNEAPOLIS—Pictorial folder shows plug-in components, mechanism, outside views, and specification chart for Model 230 tape transport.

CATV EQUIPMENT

87. JERROLD—Eight-page brochure features "Starline" solid-state unitized CATV systems.
88. SKL—Folder lists and provides specifications for head-end, trunk, and distribution equipment; accessories; and special products for CATV use.

COMPONENTS & MATERIALS

89. 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.
90. MULLARD—Flier sheets provide cross-reference data and price list on tubes for special-purpose, industrial, and broadcast applications.
91. SWITCHCRAFT—New-product bulletin No. 155 describes Series X "Glo-Button," a nonelectrically illuminated switch.

ColorDyne

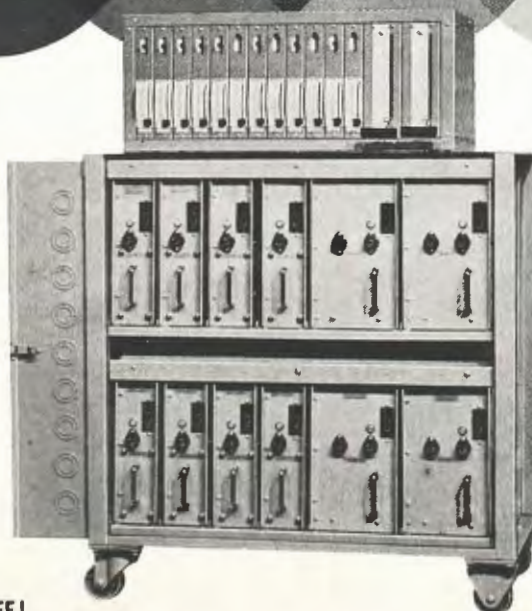
PORTABLE DIMMING SYSTEMS!

• SOLID STATE • LIGHTWEIGHT

A thoroughly proven compact dimming system. For location or studio! Plug-in racks contain as many as 12 Power Pack Dimmers with total capacity of 80KW. For 120-volt or 230-volt AC operation. Remote Control Center may be operated up to 1000 feet from dimmer plug-in racks.

Also Available: Individual Portable Dimmers, each with its own control.

ONE YEAR UNCONDITIONAL GUARANTEE!



Write for Detailed Literature



1015 Chestnut St., Burbank, Calif.
Phone (213) 843-1200

Circle Item 57 on Tech Data Card

MICROWAVE DEVICES

- 92. 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.
- 93. MICROWAVE ASSOCIATES—Sixteen-page brochure, bulletins, and technical report detail applications and specifications for TV-broadcast solid-state microwave-relay equipment.

MOBILE RADIO & COMMUNICATIONS

- 94. MOSLEY ELECTRONICS—Catalog lists complete line of 1966 Citizens-band equipment.
- 95. SPRAGUE—Circular M-853 describes SK-1, SK-10, SK-20, and SK-30 "Suppressikits" for vehicles with alternators or DC generators.

RADIO & CONTROL ROOM EQUIPMENT

- 99. IGM—Full-color eight-page illustrated brochure shows monitor unit, timer module, punch-card reader, automatic network switcher, and other control-system units.

POWER DEVICES

- 96. HEVI-DUTY—Bulletin 7-22 supplies data on line-voltage regulator using saturable-core reactor.
- 97. PRECISE—Regulated power supply is illustrated and described in technical bulletin.
- 98. SOLA—Buyers guide VR-200 includes applications, theory of operation, and specifications for line-voltage regulators.

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

Circle Item 58 on Tech Data Card

REFERENCE MATERIAL & SCHOOLS

- 100. CLEVELAND INSTITUTE—Booklet outlines courses in electronics, including those for broadcast engineering and FCC license preparation.
- 101. HOWARD W. SAMS—Literature describing popular and informative technical publications; includes latest catalog of technical books.

STUDIO & CAMERA EQUIPMENT

- 102. CLEVELAND ELECTRONICS—Data concerns modifications using new yoke assembly to update 3" image-orthicon camera.
- 103. COLORTRAN—General catalog for 1966 includes company line of lighting accessories and dimming systems for motion-picture, TV, and still-photographic applications.
- 104. MOLE-RICHARDSON—Technical bulletins 102-107 illustrate line of quartz-iodine lights for studio use.
- 105. TELEPRO—Flier sheets describe twin-douser projection system and prompting system.
- 106. TV ZOOMAR—New literature features Autocam programmed remote control pan and tilt equipment; literature describes lenses for IO and vidicon use.

TELEVISION EQUIPMENT

- 107. COHU—Technical data sheet No. 6-382 describes video-switching matrix system. Information includes typical input-to-output data and performance specifications.
- 108. COLORADO VIDEO—Sheet gives data for the Model 301 video analyzer which displays TV waveforms directly on picture monitors.
- 109. FAIRCHILD—Photographs and abbreviated specifications for cameras, monitors, and accessories are given in catalog for CCTV equipment.
- 110. SYLVANIA—Fold-out brochure lists applications, equipment complement, and specifications for mobile TV van.
- 111. THOMSON-HOUSTON—Brochure features solid-state color flying-spot scanner. Block diagram and specifications list are included.
- 112. 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

- 113. HOLLAND ELECTRONICS—Bulletins describe 75-ohm test terminations for coax; type N, PL 259, and BNC connectors are included.
- 114. WORKMAN—Catalog sheet No. 92C describes transistor-diode checker.

TOOLS

- 115. ENTERPRISE DEVELOPMENT—Bulletins feature Models 300 and 100A desoldering-resoldering iron for PC-board use.

TRANSMITTER & ANTENNA DEVICES

- 116. BAUER—Block diagram and specifications for 7500-watt FM transmitter are given on data sheet.
- 117. FORT WORTH TOWER—Brochure describes line of factory-built communications buildings.
- 118. GATES—Brochure depicts transcription turntables and accessories. Flier sheets give specifications for solid-state monitor amplifier and Model FM-1G 1,000-watt FM transmitter.
- 119. MOSELEY ASSOCIATES—Six-page brochure describes new solid-state 10- and 21-channel remote-control systems.

RUSSCO BROADCAST Turntables



\$169.50

**Separate Tone Arm
mounting plate for
easy installation**

- Single lever controls 33, 45, 78 speeds
- Plays 45 RPM's without adapter
- Illuminated speed indicators
- Sold with or without arm (GREY or REK-O-KUT)
- Instant acceleration
- Heavy duty—professional quality
- Competitive low price
- Call or write for folder

**Unconditionally
Guaranteed**

—against defects in
material or work-
manship when given
normal maintenance

**SOLD DIRECT
—OR TO
DEALERS**

RUSSCO Electronics Mfg.

6879 N. SUNNYSIDE, CLOVIS, CALIF.
PH. 299-4692

Circle Item 60 on Tech Data Card

**NOW you can get CARTRIDGE REBUILDING
CONVENIENCE - ECONOMY**



**PLUS Quality Workmanship
Reliable Service
48-hour processing**

**PLUS ALL cartridges PRETESTED under actual
broadcast conditions.**

**IF you are particular about how you
spend a dollar, it's simple, economical
and convenient to have your old car-
tridges reconditioned and reloaded.**

**JOA will inspect, recondition and reload
your cartridges with ANY LENGTH
TAPE you specify.**

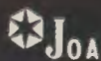
NO minimum.

**NO extra charge for replacement of
minor parts.**

**New Fidelipac cartridges in any size are
also available for immediate shipment
from stock.**

**JOA incorporates all of these as a part of
their service to the broadcaster.**

Phone or write:



Cartridge Service
P. O. Box 3087,
Philadelphia, Pa. 19150
Area Code 215, TUrner 6-7993

Circle Item 59 on Tech Data Card

Advertisers' Index

Andrew Corp.	57
Automatic Tape Control, Inc.	12
Belar Electronics Lab.	58
Bionic Instruments, Inc.	28, 44, 56, 58
Boyton Studio	44
Broadcast Electronics	30, 62, 64
Bradford Information Center.	28
CBS Labs	5
Cohu Electronics	3
Collins Radio	43
C. L. Gardner Communication Construction Co.	62
Continental Electronics	9
ColorTran	67
Crown International	56
Dage TV Co.	Cover 3
Eitel-McCullough, Inc.	27
Fairchild Recording Co.	6, 60
Gates Radio Co.	8
Geleco Electronics Limited.	65
General Electric Co.	63
General Electrodynamics Corp.	54
International Nuclear Corp.	51
Jampro Antenna Co.	47
JOA Cartridge Service.	69
Lang Electronics, Inc.	6, 56
Lenkurt Electric Co.	13
Magnecord, Midwestern Instruments.	45
McMartin Industries, Inc.	7, 54, 62, 64, 69
Miller-Stephenson Chemical Co.	48
Moviola Mfg. Co.	65
Norelco Studio Equip.	49
QRK Electronics	64
Rek-O-Kut	46
RCA Broadcast and Communications	10, 11
RCA Components and Devices.	Cover 4
Rohn Mfg. Co.	6
Riker Industries	Cover 2
Russco Electronics Mfg.	69
Sarkes Tarzian, Inc.	30, 53
Shure Brothers, Inc.	55
Sparta Electronics Corp.	58, 60
Sony Superscope	29
Stancil-Hoffmann Corp.	65
Telemet Co.	59
Viking of Minneapolis.	50
Visual Electronic Corp.	66, 68
Ward Electronic Industries, Inc.	61
Wilkinson Electronics	24
Zoomar	52



What's new?

See page 7 this issue.

Circle Item 61 on Tech Data Card

Here are three
good reasons why
you should subscribe to

Broadcast Engineering

1. March pre-NAB

Convention Issue

Complete preview of the 1966
NAB Convention and Engineering
Conference, plus an outstanding
lineup of feature articles.



2. May post-NAB

Convention wrap-up

A review of the convention with
special emphasis on new tech-
niques and new equipment trends.

3. The other ten issues during the year will keep you up-to-date on technical developments in broad- casting.

A handy subscription form is bound in-
side the cover of this issue for your con-
venience. Simply fill it out and return it
to us, and you'll receive the Broadcast
Engineers' Maintenance Guide free of
charge.

Professional Services

VIR JAMES

CONSULTING RADIO ENGINEERS
Applications and Field Engineering
345 Colorado Blvd.
Phone: (Area Code 303) 333-5562
DENVER, COLORADO 80206
Member AFCCE

JAMES C. McNARY

Consulting Engineer
National Press Bldg.
Washington 4, D. C.
Telephone District 7-1205
Member AFCCE

CARL E. SMITH

CONSULTING RADIO ENGINEERS
AM, FM, TV and CATV

8200 Snowville Road
Cleveland, Ohio 44141
Phone: 216-526-4386
Member AFCCE

CAMBRIDGE CRYSTALS

PRECISION FREQUENCY
MEASURING SERVICE

SPECIALISTS FOR AM-FM-TV
445 Concord Ave. Phone 876-2810
Cambridge, Mass. 02138

AMPEX HEAD ASSEMBLY RECON-
DITIONING SERVICE for all Ampex
professional model recorders. This
professional service features precision
relapping of all heads for maximum
head life. Your assembly is thoroughly
cleaned and guides are replaced as re-
quired. Price includes optical and
electrical inspection and complete
testing on Ampex equipment in our
plant. Full track or half track assem-
blies . . . \$35.00. One to two day ser-
vice. "Loaner" assemblies available, if
necessary. LIPPS, INC., 1630 Euclid
St., Santa Monica, California 90404.
(213) EX 3-0449. tf

Barnett F. Goldberg, P.E.

CONSULTING ELECTRONICS ENGINEER
AM, FM & TV
APPLICATIONS AND FIELD ENGINEERING
ACOUSTICS AND VALUATION-APPRAISAL
WORK
803-253-8347
1138 BULL STREET, COLUMBIA, S.C. 29201

VIDEO TAPE RECORDER

AUDIO HEAD ASSEMBLY SERVICE

Precision relapping of all heads and
supporting posts, including cleaning
and testing. Ampex head assembly
with "cue" tracks, \$75.00 complete.
RCA units also relapped. One to two
day service. LIPPS, INC., 1630 Euclid
St., Santa Monica, Calif. 90404. (213)
EX 3-0449. tf

LAWRENCE BEHR ASSOCIATES, Inc.
RADIO ENGINEERING CONSULTANTS
AM - FM - TV - CATV
LAWRENCE BEHR, PRESIDENT
2501 East Fourth Street
Greenville, North Carolina
919-PL 8-3966
NCAB SBE IEEE

OSCAR LEON CUELLAR

Consulting Radio Engineer
AM-FM-TV
411 Phoenix Title Building 623-1121
Directional Antennas Design
Applications and Field Engineering
Tucson, Arizona 85701
Member IEEE

Classified

Advertising rates in the Classified Sec-
tion 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 equip-
ment or supplies regularly produced by
manufacturers unless the equipment is
used and no longer owned by the manu-
facturer. Display advertising must be
purchased in such cases.

EQUIPMENT FOR SALE

Audio Equipment bought, sold, traded.
Ampex, Fairchild, Crown, McIntosh, Vik-
ing, F. T. C. Brewer Company, 2400
West Hayes Street, Pensacola, Florida.
3-64 tf

Television/Radio/communications gear of
any type available. From a tower to a
tube. Microwave, transmitters, cameras,
studio equipment, mikes, etc. Advise
your needs—offers. Electrofind Co., 440
Columbus Ave., NYC. 212-EN-25680.
8-64 tf

COMMERCIAL CRYSTALS and new or
replacement crystals for RCA, Gates, W.
E., Bliley, and J-K holders; regrounding,
repair, etc. BC-604 crystals; also service
on AM monitors and H-P 335B FM mon-
itors. Nationwide unsolicited testimonials
praise our products and fast service. Eid-
son Electronic Company, Box 96, Temple,
Texas. 5-64 tf

AMPEX 350 SERIES reconditioned cap-
stan drive motors (BODINE NCH-33 only)
\$85.00 exchange. Send us your old one,
or order for \$100.00 and get \$15.00 back
after sending old one in. Ours have new
bearings and rewound stator. Package
motor well. **TABER MANUFACTURING**
& **ENGINEERING CO.**, 2619 Lincoln Ave.,
Alameda California. 1-65 12t

Everything in used broadcast equip-
ment. Write for complete listings. Broad-
cast Equipment and Supply Co., Box 3141,
Bristol, Tennessee. 11-64 tf

New and Reconditioned Remote Pickup
and 2-way radio equip., Fire and Police
Receivers. All brands and models. Sales
Manager, Box 238, Phone 817-594-5171,
Weatherford, Texas. 5-65 12t

Parabolic Antennas, 6' aluminum solid
surface complete with dipole and mount-
ing bracket. Now tuned for 1750 MC for
\$125 set. Tuned to 950 MC for \$175 set.
Sierra Western Electric Cable Co., 24th
and Willow Streets, Oakland, California.
Phone 415 832-3527. 12-65 tf

Cleaning out of surplus mica capacitors,
all like new at 50% regular trade dis-
count: G-5: two, .005; G-4: three, .0051,
two, .0047; G-3: three, .0024; G-2: three,
.0027; four, .001. Also Johnson unused
222-103 and 145-102-13 coils at big dis-
count. No duty as all U.S. made. Geleco
Electronics Ltd., 61 Curlew Drive, Don
Mills, Ontario. Phone 444-5991. 1-66-1t

Trim 504 Audio Patch cords \$4.00. Audio
jack panels for 19" racks, 10 pair \$8.95.
Repeat coils 500-500 ohm flat to 20kc
\$4.00—Relay racks and equipment cabi-
nets. Write for list. Gulf Electro Sales,
Inc., 7031 Burkett, Houston, Texas.
1-66-1t

We need used 250, 500, 5K & 10K Watts
AM Transmitters, No Junk. Broadcast
Electronics Corp. 1314 Iturbide St., La-
redo, Texas 78040. 1-66-tf

BT3-A 3 Kilowatt GE transmitter w/
4BT1B-1 Amplifier, converted to ampex
finals, spare tubes, GE limiter; \$3800.
RCA BC-2B console w/power supply.
KTGM, 9805 East Iliff Ave., Denver Colo-
rado. 1-66-1t

Record Cutter Head. Never used since
rebuilt by Gramplan in England. Send us
your recording styli for regrounding, \$6.50
each, fully guaranteed. Cook Recorders,
205 Ardys Place, Vista, California 92083.
1-66-1t

EQUIPMENT WANTED

WANTED TO BUY . . . Used, 1 and 5 KW
AM or FM Broadcast transmitters, re-
gardless condition or age. Write or call
Continental Electronic Wholesale Corp.,
457 West 28th St., Hialeah, Florida 33010.
Phone 305-888-3511. 1-66-2t

Employment

America's largest Radio and Television
Employment Agency has immediate open-
ings with stations in all parts of the
country for experience Engineers. Send
resume today to: Nationwide Broadcast
Services, 645 North Michigan Avenue,
Chicago, Illinois. 1-66 tf

Broadcast engineers and technicians
wanted for operation in Samoa—studios
and transmitters operation and mainte-
nance—good living conditions and ade-
quate family housing—write for inter-
view, NAEB, R & D Office, 1346 Con-
necticut Avenue, Washington, D.C. 20036.
1-66-1t

PERSONNEL

VIDEO ENGINEER with broadcast ex-
perience to learn sales. Must be ambi-
tious, aggressive, have good personality
and drive a late model car. Some travel.
Draw and commission. Immediate earn-
ings with excellent opportunity for high
income. All replies confidential. Write
full details Box 913, 6311 Yucca St.,
Los Angeles, Calif. 90028. 1-66 1t

Business Opportunities

EXCLUSIVE FRANCHISE

Amazing new liquid plastic coating used
on all types of surfaces interior or ex-
terior. Eliminates waxing when applied
on Asphalt Tile, Vinyl, Linoleum, Vinyl
Asbestos, Hard Wood, and Furniture.
Completely eliminates painting when ap-
plied to Wood, Metal, or Concrete sur-
faces. This finish is also recommended for
boats and automobiles.

NO COMPETITION

As these are exclusive formulas in de-
mand by all businesses, industry and
homes. No franchise fee. Minimum in-
vestment—\$300. Maximum investment—
\$7,000. Investment is secured by inven-
tory. Factory trained personnel will help
set up your business.
For complete details and descriptive lit-
erature write:

CHEM-PLASTICS & PAINT CORP.

1828 Locust, St. Louis 3, Mo.
6-65 14t

DISTRIBUTOR

WANTED

No competition. To service and set up
new accounts in exclusive territory.
Investment secured by fast moving
inventory of amazing plastic coating
used on all types of surfaces interior
or exterior. Eliminates waxing when
applied to any type of floor. Elim-
inates all painting when applied to
wood, metal or concrete surfaces.

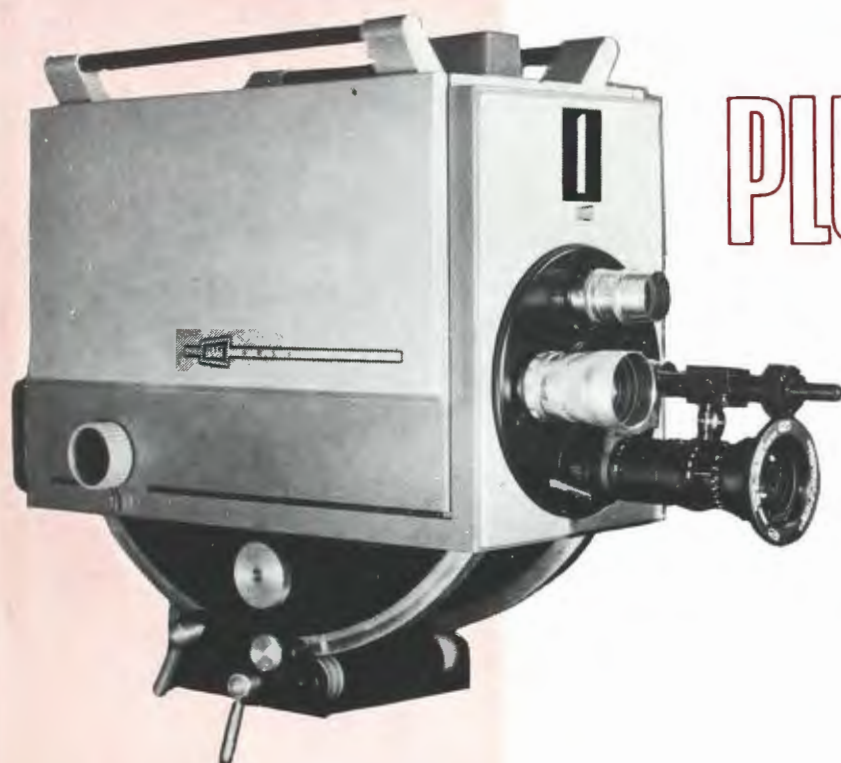
Minimum Investment — \$ 500
Maximum Investment — \$12,000

For details write or call:
Phone: 314 AX-1-1500
Merchandising Division
P. O. Box 66
St. Ann, Missouri 63074

**YOU
CHOOSE
with**

DAGE

**FEATURES
PERFORMANCE
AND RELIABILITY**



PLUMBICON

VIDICON

**SEPARATE
FIELD MESH**

Dage engineering has developed the 520 solid state camera chain which outperforms any other vidicon equipment presently available for commercial or educational broadcasting and video taping. Check feature for feature and see why this is the system for your studio.

**RELIABLE SOLID STATE CIRCUITRY • HIGH SIGNAL TO
NOISE RATIO • MORE AVAILABLE OPERATOR FEATURES •
TREMENDOUS DETAIL RESPONSE AND SENSITIVITY • HIGH
RESOLUTION CAPABILITIES WITH NO DISTORTION •
PLUMBICON PROVIDES PICTURE WITHOUT LAG**

RAYTHEON

*No matter what your equipment needs are, Dage has the **BIG** answer for you with the new 520 Broadcast Camera Chain for use with **PLUMBICON, VIDICON, or SEPARATE FIELD MESH***

Dage-Bell Corporation

A SUBSIDIARY OF RAYTHEON COMPANY

455 Sheridan Avenue, Michigan City, Indiana, Dept. 30-8

Circle Item 62 on Tech Data Card

How to climb aboard the **color** bandwagon easily, economically, with RCA-4415/S, -4416/S image orthicons...

Color TV is really rolling in high gear... And now, you may be facing the question of creating a color facility—with new studios, lighting, air conditioning and other equipment.

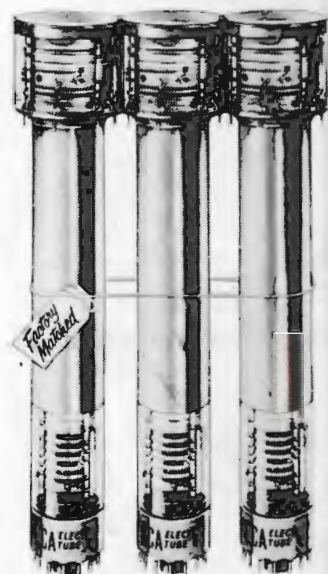
Being old-timers at color, we anticipated some of these facility problems and developed the RCA-4415/S, -4416/S, a matched-set of three image orthicons. They perform well in cameras for color at lighting levels usually available in black-and-white studios and eliminate the need for extra air conditioning equipment as well.

Another good feature of these tubes is that they behave more like the old faithful 5820A or 7293A's that you have been using in black and white during the past years. In the color camera, they can stand more over-exposure and are a little less finicky on the operating controls. For example, when you have a suntanned actress working in a gleaming white kitchen, you can operate with the highlights fairly far above the image orthicon knee without having the color picture going to pot.

We make up carefully matched sets consisting of two 4415/S Image Orthicons for the red and green channels, and one 4416/S Image Orthicon for the blue channel where a lot of "umph" in blue sensitivity is needed. The three mates of the set are matched to track very well and produce a nice uniform color picture. In addition, the sensitivities are balanced so that each tube is just about working at its maximum sensitivity and you are not throwing away extra light in the optical system to favor one low sensitivity channel. The result is good color pick-up at black-and-white studio lighting levels.

For further information about RCA Image Orthicons contact your RCA Broadcast Tube Distributor.

RCA ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.



**Available From Your
RCA Broadcast Tube Distributor**



The Most Trusted Name in Electronics