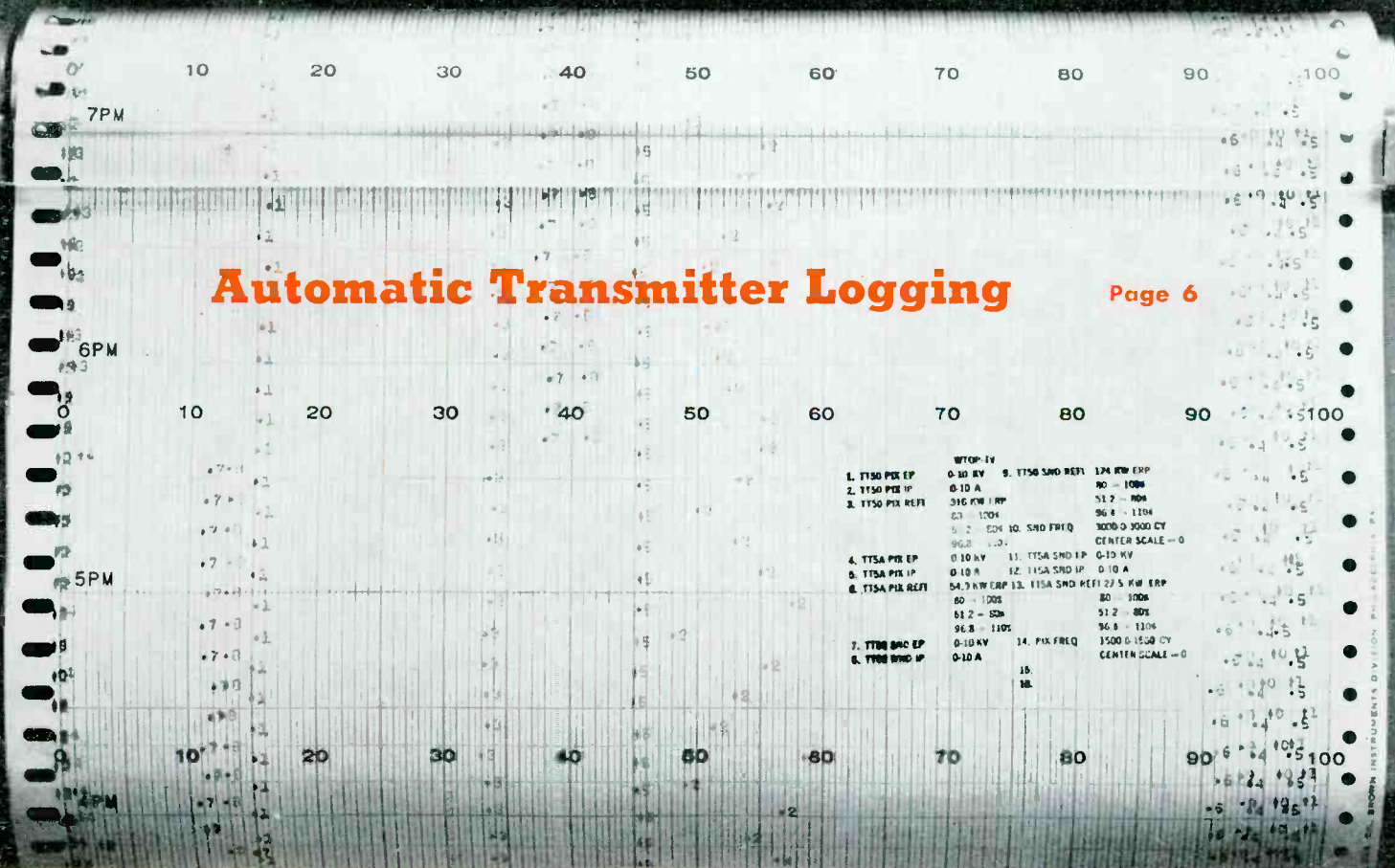
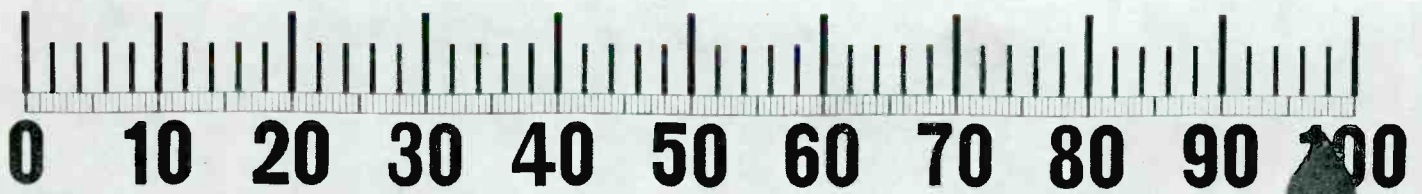


BROADCAST ENGINEERING



THE TECHNICAL JOURNAL OF THE BROADCAST INDUSTRY

Things to come:



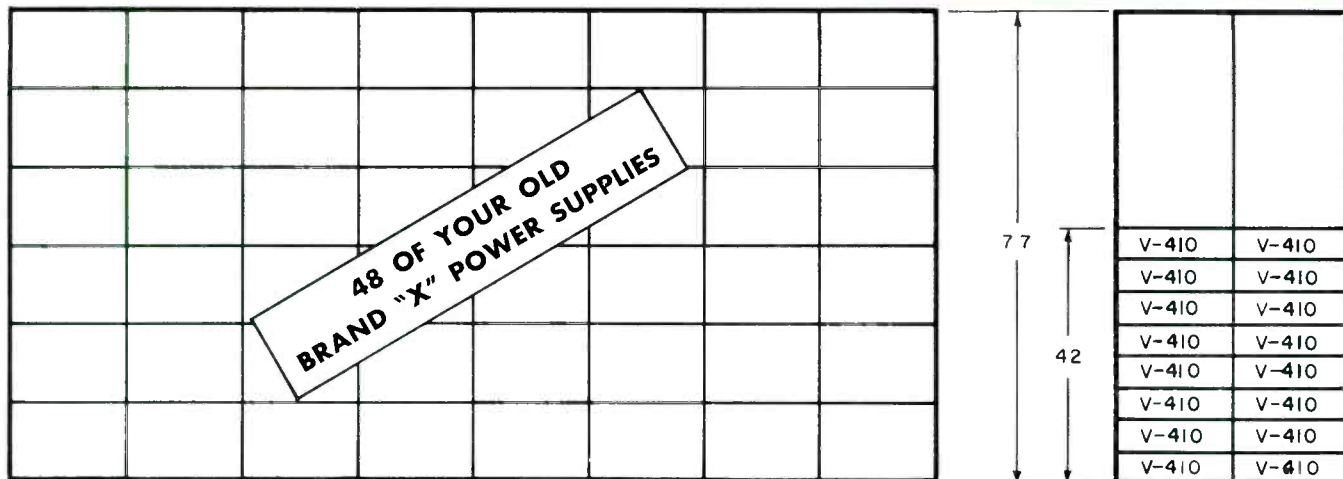
Automatic Transmitter Logging

Page 6

WTOP-TV			
1. TT50 PIX EP	0-10 KV	9. TT50 SMO REFI	174 KW ERP
2. TT50 PIX IP	0-10 A		70 - 100%
3. TT50 PIX REFI	316 KW I RP		51.2 - 80%
	60 - 100%		96.8 - 110%
	5.2 - 520	10. SMO FREQ	3000-0-3000 CY
	96.8 - 110%		CENTER SCALE - 0
4. TT50 PIX EP	0-10 KV	11. TT50 SMO IP	0-10 A
5. TT50 PIX IP	0-10 A	12. TT50 SMO IP	0-10 A
6. TT50 PIX REFI	316 KW ERP	13. TT50 SMO REFI	27.5 KW ERP
	60 - 100%		80 - 100%
	51.2 - 80%		96.8 - 110%
7. TT50 SMO EP	0-10 KV	14. PIX FREQ	1500-0-1500 CY
8. TT50 SMO IP	0-10 A		CENTER SCALE - 0
		15.	
		16.	

© BROWN INSTRUMENTS DIVISION, PHOENIX, ARIZONA

Slash - Your Operating Cost 1,000% With the FOTO-VIDEO V-410 Power Supply



COMPARE!	48 BRAND "X"	16 FOTO-VIDEO V-410
Output Current—(285 V DC)	24 A.	24 A.
Constant Current for Focus	No	Yes
Centering Supply	?	Yes
Power Input	22.8 KW	9.6 KW
Rack Space	616 inches	84 inches
Extra Power Costs	\$2,880/yr.
Extra Tube Costs	\$5,760/yr.
Extra Air Conditioning Costs	\$4,000 Fixed \$720/yr.
Total Extra Costs	\$4,000 Fixed \$9,360/yr.

Yes - the V-410's May Be Easily Paid For By Cost Savings in less than one year - and Save Space Besides!

FIELD PROVEN ALL-TRANSISTOR V-140 REGULATED POWER SUPPLY SYSTEM

Semiconductor rectifier — filter and All-Transistor Regulator provides the following broadcast voltages and currents:

Load current 200 ma. to 1.5 a.	275 to 285 V DC	Regulation vs. Line.....	± 0.5% maximum
Output voltage.....	5 MV RMS maximum	Source Impedance.....	0.5 Ohms maximum DC to 100 KC.
Ripple.....	± 0.5% maximum	Unregulated Output.....	Approx. 350 V up to 200 ma.
Regulation vs. Load.....	Built-in Voltmeter for output DC voltage and line input selector.		
Metering.....	Built-in.		
Overload Protection.....			

V-410 MON — Same as V-410, plus centering current. Adequate for centering of a broadcast master monitor or TV camera.
V-410 CAM — Same as V-410 MON, plus metering, plus a constant current supply of ma (metered) with control on front panel.
Overall size: 5 1/4" high for rack mounting. Depth 16 W. Weight approx. 35 lbs.
Highest reliability, optimum use of space and equipment, superior regulation, tubeless system means lowest maintenance. Modules available from Foto-Video easily converts a V-410 to a V-410 MON or a V-410 CAM.
EXTREMELY LOW ON COST, HEAT AND POWER.

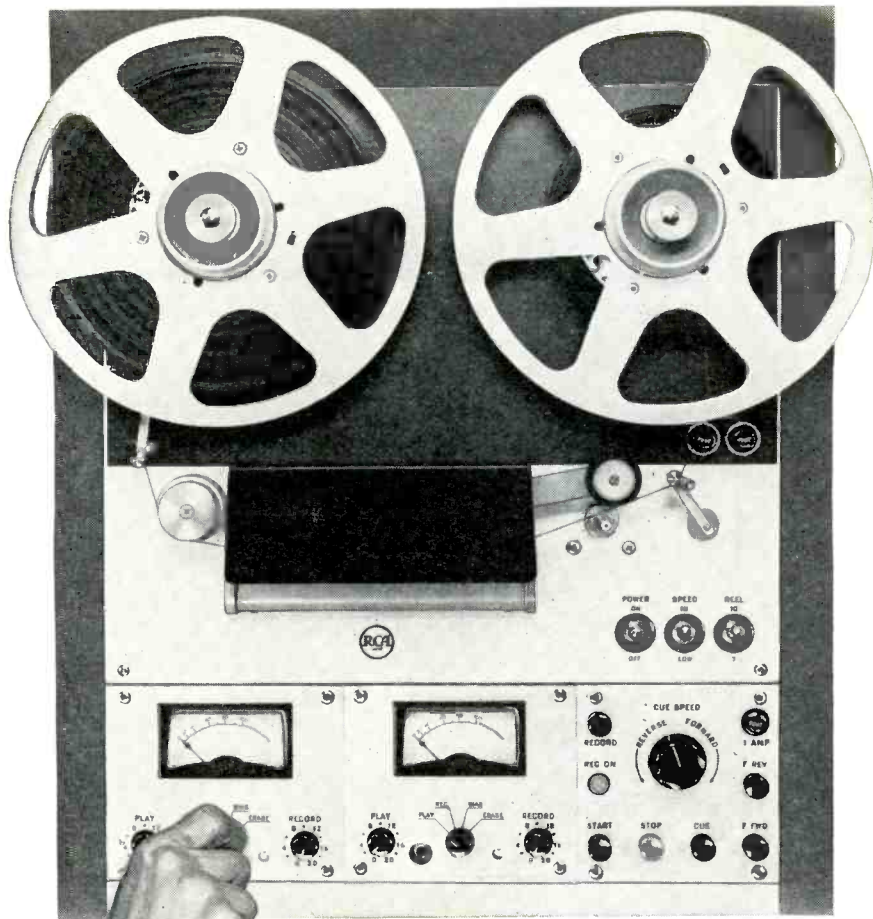
Foto-Video Electronics, Inc. Cedar Grove, N.J. Center 9-6100

West Coast Engineering and Sales Office

1317 West 214 St., Torrance, California — Phone Spruce 5-1003

(Write or Phone for Information)

NEW ALL TRANSISTOR PROFESSIONAL TAPE RECORDER FROM RCA



Ideal for Stereo or Monophonic Recording

You'll Appreciate These Convenience Features:

- Continuously variable cue speed control
- Easy access to all components
- Tape lifters DC solenoid operated
- Sapphires used to lift and guide tape
- Interlocked record operation
- 3¾ and 7½ in/sec tape speed provided (15 in/sec available)
- Half track recording with full or quarter track optional. Rack or console mounting.

"Convenience" features make operating the RT-21 Transistor Tape Recorder a pleasure. Many new RCA developments are included in this truly professional audio recorder which is the first audio recorder to include continuously variable cue speed control. Remote control of all operating functions greatly improves operator flexibility. Basic recorder is supplied in two sections—a transport tape panel and a control panel, permitting custom or standard rack mounting. A portable carrying case is also available. Duplicate record-playback amplifier is available for two or four track stereo recording.

*For complete information write to
RCA, Dept. S-367, Building 15-1, Camden, N.J.
In Canada: RCA VICTOR Company,
Ltd., Montreal. Another fine new product
from the Broadcast and Television Equipment
Division of RCA.*



The Most Trusted Name in Radio
RADIO CORPORATION OF AMERICA



BROADCAST ENGINEERING

THE TECHNICAL JOURNAL OF THE BROADCAST INDUSTRY

VOLUME 3

MARCH, 1961

NUMBER 3

Contents

Next—Automatic Transmitter Logging	6
Design Considerations for Radio Remote Control Operation	10
Custom Built Studio Console	14
A Simple Automatic Programmer	30

Departments

Technical Hints	32
Industry News	34
F.C.C. Regulations	36
New Products	39
Index to Advertisers	39
Classified Ads	40
Professional Services	40

Cover

Strip chart used in automatic logging. For methods used and results obtained from NAB studies and field tests of this new development, see article on page 6.

EDITORIAL

D. E. MEHL, Editor
 D. F. BOICOURT, Managing Editor
 DUDLEY ROSE, Presentation Editor
 E. P. LANGAN, Advertising Director
 S. F. WILSON, Production Manager

ADVERTISING SALES OFFICES

Flushing 54, New York
 PAUL AND DON WEIL
 39-01 Main Street
 Telephone INdependence 3-9098

Chicago 1, Illinois
 WILLIAM L. MILLER, JR.
 E. F. LUKENS
 C. E. PARKER
 307 N. Michigan Ave.
 Telephone FRanklin 2-5944

Cleveland 16, Ohio
 DAVID H. HERTEL
 3100 Wooster Road
 Telephone EDison 1-2370

Southwest
 C. H. STOCKWELL CO.
 4916 W. 64th Street
 Mission, Kansas
 Telephone RAndolph 2-4417

Los Angeles 57, California
 MAURICE A. KIMBALL CO., INC.
 2550 Beverly Boulevard
 Telephone DUmkirk 8-6178

San Francisco 5, California
 MAURICE A. KIMBALL CO., INC.
 681 Market Street
 Telephone EXbrook 2-3365

Paris 8, France
 JOHN ASHCRAFT
 67 Avenue des Champs Elysees
 Telephone Elysees 47-18

London W. 1, England
 JOHN ASHCRAFT
 9 Curzon Street
 Telephone GROSvenor 7406

Tokyo, Japan
 INTERNATIONAL MEDIA
 REPRESENTATIVES, LTD.
 Shadan Hojin, 14, 2-chome Marunouchi
 Telephone 571-4450

Editorial, Circulation and Advertising headquarters, 1014 Wyandotte St., Kansas City 5, Missouri; Telephone VICTOR 2-5955.



Subscription Price: U. S. \$6, one year; Outside U. S. A., \$7. Single copies, 75 cents. Adjustments necessitated by subscription termination at single copy price.

Broadcast Engineering is published monthly by Technical Publications, Inc., 1014 Wyandotte St., Kansas City 5, Missouri, U. S. A.

Corporate Personnel: Robert E. Hertel, President; Frank D. Smalley, Executive Vice-President; E. P. Langan, Vice-President; Kenneth Long, Vice-President; D. E. Mehl, Vice-President.

LOOK TO



FOR FM and MULTIPLEX MONITOR and RELAY RECEIVERS



\$174.50



\$144.50

McMartin built for economy, dependability and outstanding performance. McMartin designed to meet the needs of FM STATIONS, AM STATIONS WITH FM AFFILIATES, EDUCATIONAL NETWORKS, COMMERCIAL RELAY NETWORKS, CONELRAD DEFENSE NETWORKS AND STL LINKS.

MODEL TBM - 1000

- Sensitivity better than 1.0 microvolt for 20 db quieting
- 600 ohm program amplifier with output level control — distortion less than 1% at +10 dbm
- Separate monitor amplifier, self-contained speaker and phone jack (for external speaker or earphone)
- Relative signal strength metering
- VU meter calibrated at 0 and +10 dbm to monitor program output level — and indicate relative percentage of modulation
- Crystal controlled (frequency easily changed)
- Meter permits oscillator and RF self-alignment without external VTVM

MODEL TBM - 2000

- Monitors and relays multiplex program received from multiplex output of TBM-1000 or equivalent unit
- 600 ohm program amplifier with output level control — distortion less than 1.3% at +10 dbm
- Separate monitor amplifier, self-contained speaker and phone jack (for external speaker or earphone)
- Relative percentage of injection metering
- VU meter calibrated at 0 and +10 dbm to monitor program output level — and indicate relative percentage of modulation
- Crystal controlled (frequencies 25 to 80 kc easily changed)
- Meter permits oscillator alignment without external VTVM

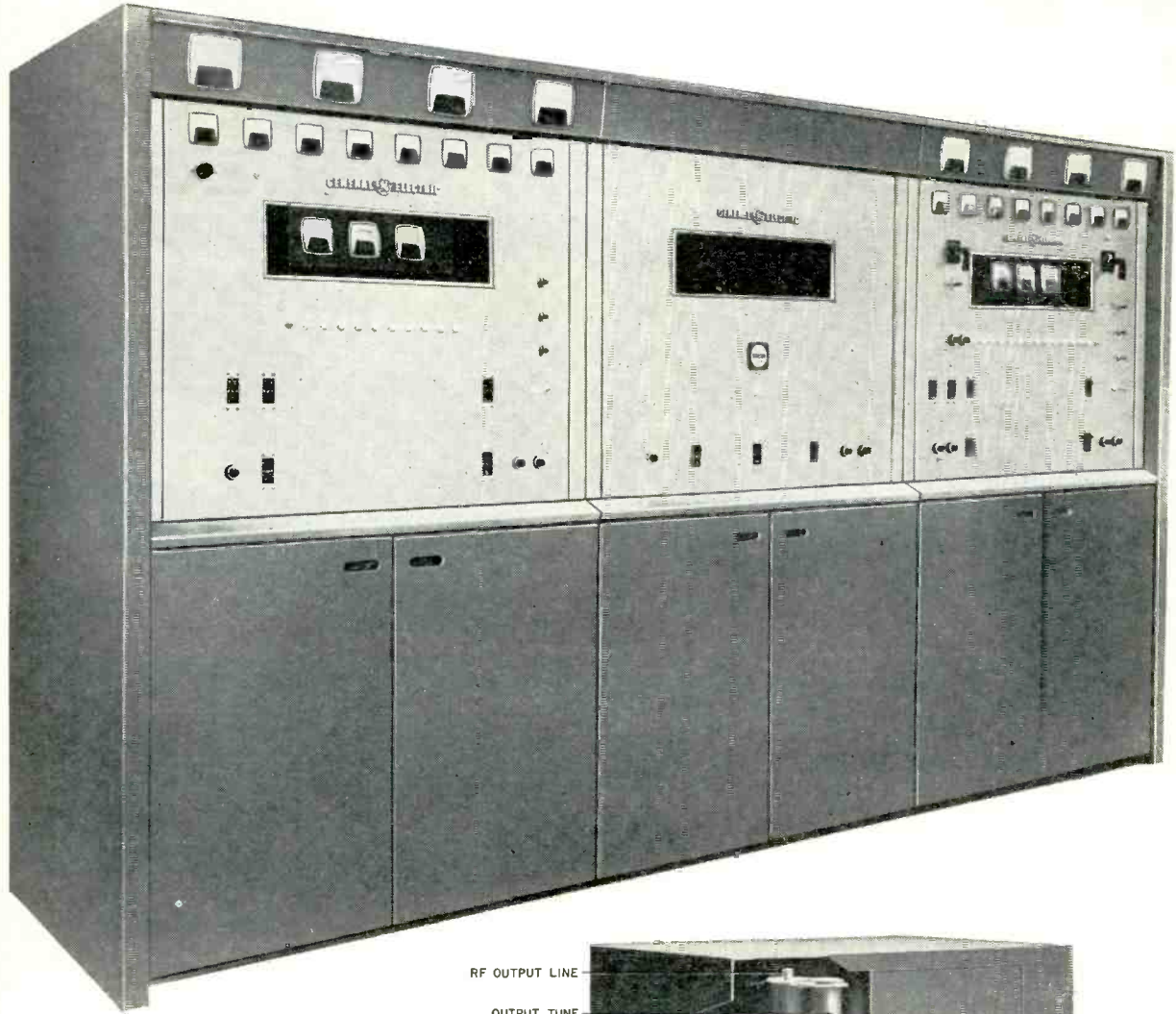
CONTINENTAL MANUFACTURING, INC.

1612 California St.

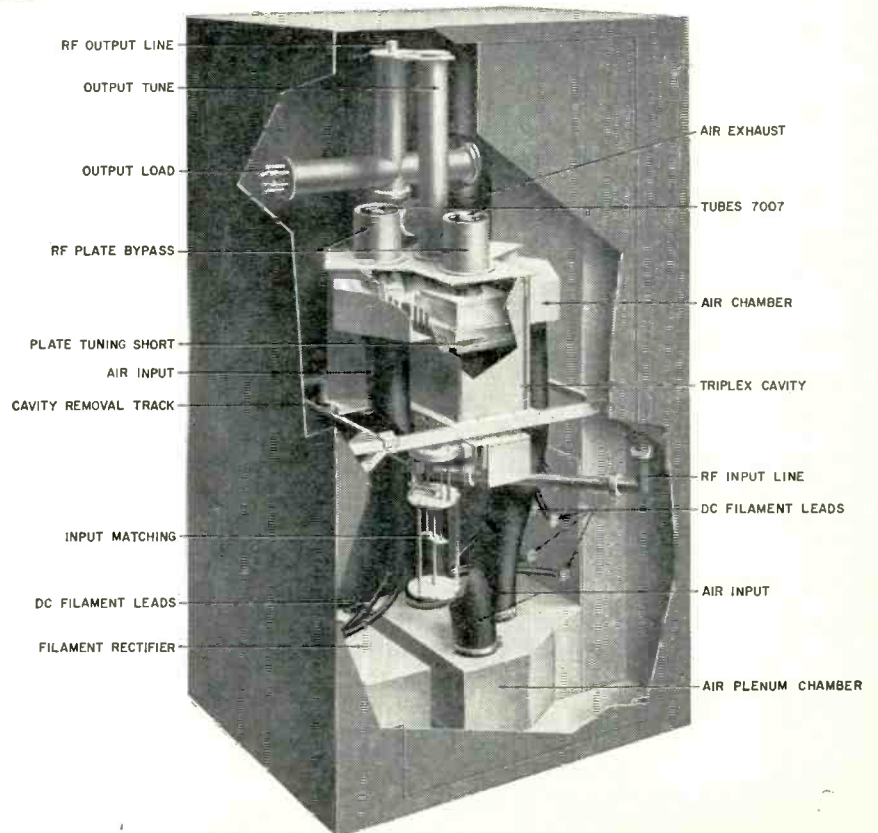
Telephone: 342-2753

Omaha, Nebraska

Now...316 kw ERP for Channels 7-13



The TF-14-A amplifier is housed in three standard size cubicles designed to mount side by side in a straight line. The rectifier cubicle, however, may be placed in a remote location since operating controls are in the aural and visual cubicles.



...with driving power less than 5kw!

GENERAL ELECTRIC'S NEW 35 KW HIGH-CHANNEL TV AMPLIFIER LETS YOU EXPAND YOUR COVERAGE AREA TO THE FCC LIMIT WITH NO COSTLY CHANGES IN PRESENT EQUIPMENT!

The General Electric VHF high-channel TV power amplifier Type TF-14-A is designed to provide 35 KW sync peak power for channels 7-13. Your present 5 KW transmitter provides ample power to drive the TF-14-A amplifier to a full 316 KW ERP signal when you employ a standard three-bay helical antenna (2,000-foot tower or higher), or a 12-bay batwing antenna (1,500-foot tower or higher).

Important new design features assure higher picture quality, greater reliability, and simplicity of operation. A new and exclusive double-stud output loading control delivers optimum output matching. The "brute force" bias supply, a 3 phase bridge circuit whose output is filtered for reduction of the 360 cycle component, eliminates problems associated with vacuum tubes. The unique triplex cavity with three parallel tubes makes possible the use of fewer components, protects against detuning. DC filaments improve video signal-to-noise ratio. Separate aural and visual reflectometers, specially designed by General Electric, provide maximum antenna protection, internal amplifier protection. And the new "built-in" electronic r-f sweep generator simplifies tuning.

To take advantage of this great step forward in TV transmission, simply call your G-E Broadcast Equipment Sales representative. For complete technical data write Section 4931, Technical Products Operation, Communication Products Dept., General Electric Company, Lynchburg, Virginia. In Canada: Canadian General Electric Company, 189 Dufferin Street, Toronto, Ontario. Elsewhere: International General Electric Company, 150 East 42nd Street, New York, New York.

- High quality signal — black and white or color
- Conservatively rated, flexible power output
- Low power drive
- Front panel metering and tuning adjustment
- Separate aural and visual antenna protection
- Separate operation of aural and visual amplifiers, if necessary
- Interchangeable components, smaller inventory
- Greatly simplified tuning

GENERAL  **ELECTRIC**

Automatic Transmitter Logging

The National Assn. of Broadcasters and several broadcast stations have conducted studies and field tests to develop a system for automatically recording transmitter parameters on strip charts. The methods used in the tests and the results obtained are described in this article.

By D. E. MEHL*

Reference material courtesy of the National Assn. of Broadcasters

ON JAN. 13, 1961, the National Assn. of Broadcasters submitted to the F. C. C. a petition for institution of rule making proceeding to amend the rules to authorize the use of automatic logging devices for maintaining broadcast transmitter logs. If this amendment is finalized a big step forward in the modernization of broadcast practice will have been taken. As part of an industry which has taken giant strides in the sophistication and improvement in reliability of electronic apparatus, broadcasters should not be bound by an archaic requirement which is wasteful of manpower and of dubious effectiveness in achieving the purpose for which it was originally intended.

Why Logging Is Required

The purpose of the rules requiring that certain readings be observed and recorded every 30 minutes is to ensure proper supervision of the radiated signal and other apparatus and to provide a record for the F. C. C. and station management of the station's operations. Supervision is absolutely necessary in order to prevent off-frequency operation and to maintain the radiated carrier at the authorized power level. In the case of directional antenna systems the phase and power of the antenna elements must be monitored to prevent interference to other stations. The logging requirements do not specifically require readings which would not directly indicate that the

condition of the radiated signal was not normal.

These purposes in 1961 can be more properly accomplished through electronic and electro-mechanical means than by the methods which have become a tradition in the industry. The state of the art which imposed the requirement for continuous observation and adjustment of radio transmitters has advanced far beyond the pioneering days of broadcasting when transmitters were babied to keep them properly adjusted. Today many people charged with the responsibility of maintaining a transmitter log see it as principally a legal requirement rather than as a supervision of the radiated signal. Considering that many of those keeping logs are non-technical people occupied with other duties it isn't hard to understand the lack of enthusiasm for this chore, important as it is. This probably is a cause for the laxity in the proper maintaining of transmitter logs noticed by the F.C.C. in recent years.

With automatic logging techniques the original purpose of logging requirements can be fulfilled in a superior and more efficient manner. In the first place any malfunction will be detected and remedial action or a fault alarm actuated sooner than if only 30-minute observations are made. This is because the recording intervals will be much more frequent than with manual logging. With the human element removed the accuracy of readings will be improved. Studies and tests have confirmed that in general the accuracy of mechanical logging

will be superior to that of human readings and recording. Not only the present required parameters can be recorded mechanically but additional readings which may be desirable can be included. The resulting record obtained will not only be more valuable to the station and Commission personnel but will virtually eliminate the many violations which have been a cause for concern.

Field Experiences

To develop a modern system of automatic transmitter logging for broadcasters the National Assn. of Broadcasters in cooperation with a number of broadcast stations and manufacturers has made a study of the requirements and developed and field tested the new techniques. The results of these studies and tests are summarized in the petition to the Federal Communications Commission to amend the rules to permit automatic logging in lieu of manual. The study includes a comparison of manual recordings and automatic mechanical recordings for similar periods at the various stations as well as the detailed technical descriptions of the equipment used at the stations.

Tests at WTOP

Station WTOP in Washington, D. C. installed equipment which automatically records the operating parameters of its AM, FM, and TV transmitters. The readings are taken at eight-minute intervals on a strip chart which will record 15 different circuits. The strip chart is provided with a scale of 0-100 units. It moves

*5119 Sycamore Dr.
Mission, Kansas

at a speed of 2 inches per hour and is calibrated in 10 minute segments. The scale can be expanded to any convenient value in multiples of 10. For example if the plate current was 8 amperes the scale could read 0 to 10 amperes. A rubber stamp is used to identify each point by number and indicate the multiplier factor for each reading. A dot in front of the number is the exact point of measurement on the chart. There is sufficient paper on one chart roll for a month's operation.

The automatic logging measuring and telemetering unit installed at the WTOP-AM transmitter occupies 20 inches of vertical standard relay rack space and weighs approximately 150 pounds. All sampling is transduced to direct current or voltage of low level and close to ground reference. Voltages from the various parameters are converted into low dc voltages and fed to the selector switch. Each voltage is then fed through the selector switch into the measuring servo. From this point, the signal is transmitted by the telemetering servo on a single pair of conductors to the central remote control point where the automatic logger is installed. At WTOP the remote control point is located at the television master control center. Each recorded parameter indicates on the recorder chart as a printed number. Once each day the function and scale value of the numbered point is printed on the chart. Another stamp is used to indicate the time on and off of each carrier, the date and program on and off.

Alarm Circuits

Eight alarm circuits are used in the WTOP system. The alarms are cam-operated microswitches located on the back of the recorder chassis. The alarms can be associated with any circuit desired by the station. For example two alarm points are used for frequency deviation to signal a deviation either above or below the 20 cycles maximum deviation permitted. Similarly two other points are used to sound the fault alarm if the transmitter carrier output varies beyond limits. The tower lighting occupies six measuring points, three for beacons and three for side lights. The sampling voltages are obtained by inserting current transformers in series with the ac circuits feeding each tower. The



rectified voltage is fed back to the transmitter building via shielded cable in conduit.

Accuracy

The logging equipment is accurate to within 0.25 per cent. This is accomplished by use of manganon wire, highly stable resistors, and Zener diode stabilized power supplies accurate to 0.1 per cent. A bridge circuit is used to supply a standard variable millivoltage to null-balance the incoming signal. A retransmitting slidewire, also powered by a Zener supply, gives an electrical signal to the telemetering servo input. The servo is accurate to 0.25 per cent.

Transducers

Voltage transducers are usually in the transmitters especially if remote control is used. They are voltage dividers to reduce voltage to a low value at ground reference. Current transducers are shunts, usual-

ly in the ground side of circuits, and of sufficient size to give a voltage if remote control is used. For large current measurement at high voltage above ground reference, a saturable reactor, powered by the 120-volt, ac power line is used to isolate the high-potential current electrically. The reactor requires a full-wave rectifier and filters, plus voltage division, to reduce the input to an acceptable level for the logging equipment. Frequency monitors include a meter circuit for output reading. Usually there is a provision to substitute an external meter for a 10 per cent resistor. A calibrated resistor in the range of the external meter resistance can be inserted instead, to give an adequate millivoltage for either microamperes or milliamperes in the meter circuit. The logging equipment uses this millivoltage directly. This millivoltage is generally at ground reference, and where it exceeds 100 volts, an

isolation servo with ground reference transmission is required.

Equipment

The automatic logging equipment installed at WTOP was developed by the Brown Instrument Div., Minneapolis-Honeywell Regulator Co. The equipment is designed to operate in conjunction with any of the standard remote-control systems and utilizes for logging purposes one of the two normally required telephone lines used in the remote control system. During normal logging operations, the remote control metering line is connected to the logging equipment. Should a remote manual reading or equipment adjustment be desired using the remote-control equipment, the logging equipment is disconnected by means of a switch and the manual functions performed. To facilitate inspection of the logging equipment and circuit functioning, it is recommended that the logging equipment be located at the remote control point. If desired an independent telephone line can be used for the logging operation.

The Minneapolis-Honeywell Automatic Logger consists of two units, a logger transmitter and a logger receiver. The logger receiver system specifications are as follows:

1. Multipoint Elektronik Strip Chart.

2. Points identified by number, reading on chart are printed directly to left of number, 30 second cyclic printing, 8 minutes to repeat points.

3. 12 inch wide chart—11 inch calibrated width.

4. Recorder accuracy — warranted $\frac{1}{4}$ of 1%.

5. Null-balance, electronic amplifier servo motor driven.

6. Contains multipoint selector switches synchronized with point identification.

7. One set selector switches used for multipoint alarm—8 independent hi or low alarm set points available for use with any of 12 points. Hi and low can be used on one point. Each alarm can be wired to more than one point, if desired. One Manual Reset button for all alarms. Eight alarm lights in panel below recorder for alarm point identification.

8. Second selector switch used for synchronizing multipoint selector at transmitter with multipoint selector at recorder.

9. Only one telephone line pair required, which is used for both recording and synchronizing.

10. 115 v 60 cycles power required for operation.

11. Pen speed 12 seconds full scale.

12. Chart speed 4 inches per hour with change gears for 1, 2, and 3 inches per hour.

13. Fluorescent illumination of chart.

14. Glass chart tear off bar.

15. 120 foot chart roll.

16. Chart graduated 0 to 100 even, with 200 divisions.

0—2—100 divisions (Ratio)

0—100—200 divisions

0—2—100 divisions (Ratio)

17. Case, universal for flush or surface mounting, black finish, dust and moisture proof.

All circuits to be recorded by this equipment must be either dc voltage or direct current. RF can, of course, be rectified, filtered and converted to an equivalent dc voltage or direct current with one side at ground potential. Consequently, any and all circuit values pertaining to the transmitter (AM/FM/TV) and the frequency monitor reading can be logged and, if desired, controlled with appropriate apparatus deriving its exciting signal from this equipment. The accuracy of the automatic logging system is well within the F. C. C. tolerances for remote indicating devices which are contained in Section 3.39 of Part 3 of the Commission's rules.

The logger-transmitter system specifications are as follows:

1. Can receive voltages at levels as low as 20 millivolts and telemeter through 3600 ohms of transmission line loop (30 miles of No. 22 gage copper wire.) This could easily be extended to 10,000 ohms loop resistance if required.

2. Only a single twisted pair is required for transmission. Since the transmitted signal is a dc current, the transmission line must be complete metallic path free from any dc current shunt paths such as repeaters or audio transformers. Also, because dc current transmission is used, a cable pair rather than open wire pair should be used wherever possible, to prevent leakage.

3. The telemetering system is not affected by changes in transmission line resistance or by variations of the power supply placed on the line.

4. The telemeter signal is a constant current type. The output current is solely proportional to input voltage.

5. Accuracy is warranted $\pm 0.25\%$

6. Operated from 115 V 60 cycle current.

7. Inputs

0 to 1 Volt

—25 to 0 to +25 MV

8. Output

5 to 10 MA DC

9. Means to accept synchronizing code from remote recorder to insure identity of parameter as recorded on remote chart.

10. Non-shorting selection of the various input parameters to be measured. No two inputs are ever cross-connected by selector switch. The input to the multipoint telemeter unit has dc isolation from ground. Maximum voltage differential from ground should not exceed 400 volts.

11. Fifteen selection points available.

Station KFI in Los Angeles participated in the automatic logging field tests for approximately nine months. The automatic logging equipment used by KFI is identical in all respects to that used by WTOP and described previously in this article.

WIP in Philadelphia installed and tested a set of prototype equipment designed for automatic control and logging. A strip recorder which automatically logs the operating parameters was installed at the WIP studios. The system is in addition to and separate from the existing remote control equipment. The recorder at the studio is an RCA MI-27554 and is of the single point strip chart type. It operates at a speed of 2 inches per hour and contains paper for over two weeks of operation. The system at WIP provides for the following functions.

1. Automatic power control of the transmitter.

2. An alarm to indicate inability of the power control to maintain power output within required limits.

3. An alarm to indicate transmitter overload.

4. Negative peak limiting.

5. Modulation peak check.

6. Automatic logging of operating parameters.

Automatic power control is achieved by sampling the common point current and automatically maintaining it at the value corresponding to the licensed power within a tolerance plus 5% and minus $2\frac{1}{2}\%$. This is accomplished by the use of an RCA MI-27966 Remote Pickup Unit connected at the common-point and operating as an RF to DC current transducer. The output of the transducer is a function of carrier current only and does not respond to the modulation.

The output of the transducer is fed to the input of an RCA Automatic Power Output Control. The Power Output Control unit constantly samples this input from the transducer and, if it varies beyond the above tolerance, acts to correct the transmitter output power by operating a motorized transmitter power output control.

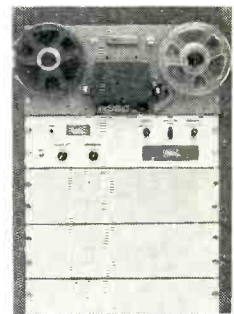
In the event that the automatic power output control cannot correct the transmitter to proper output level within a selected period (in

(Continued on page 22)

...FEATURES YOU NEED AND CAN AFFORD

Here in an Ampex under \$1000 are all the features broadcasters have requested—combined in a professional recorder so compact it fits just 14 inches of rack space. The Ampex PR-10 offers complete remote control, full monitoring facilities, two professional speeds, optional self-threading, all-electric pushbutton controls, and new frictionless clutch system for gentle tape handling. Alignment controls are all accessible from the front panel, permitting simple installation and adjustment. All parts have been thoroughly life-tested to give broadcasters assurance of studio quality performance and low maintenance over a long life of continuous daily operation.

FEATURES AND ESSENTIAL DATA PR-10-1 Monophonic model (\$845) available full track or half track—PR-10-2 Stereo/Monophonic model (\$945) records and plays stereophonic, monophonic, sound-on-sound, cue track, selective track and two-microphone sound • Pushbutton controls of professional relay/solenoid type • Full remote control provisions and accessory remote unit • New automatic 2-second threading accessory, optional • All new compact electronics • Professional monitoring includes A-B switches, VU meters, and 600 ohm output circuits • Separate erase, record and play heads on individual mounts • Open fourth head position for optional 4-track or other playback head • Two speeds: 15 and 7½ ips or 7½ and 3¼ ips • Hysteresis synchronous motor • Proved electrodynamic clutch system for lowest flutter ever in a portable/compact recorder • Plug-in modules for flexibility of equalization and input characteristics • Portable or rack mount • Dimensions for both models: 19" w by 14" h permitting easy replacement of many older rack recorders • Associated equipment includes a four-position stereo/mono mixer (MX-10) and a new 40 watt speaker-amplifier system (SA-10).



PR-10



Literature including specifications, features, benefits and applications available from Ampex. Write Dept. BE-4
ASK ABOUT THE NEW AMPEX FINANCE AND LEASE PLANS.

AMPEX PROFESSIONAL PRODUCTS COMPANY • 934 Charter St., Redwood City, Calif. • Ampex of Canada Ltd., Rexdale, Ontario.

Design Considerations for Radio Remote Control

By JOHN A. MOSELEY*

Ideal FM transmitter sites are often located at points which are not convenient for wire line facilities. To take advantage of mountain top and other attractive locations it becomes necessary to establish program and control circuits by radio link. This article describes the factors to consider in planning a radio remote control system.

Introduction

FM broadcasters are seeking ways to expand their listening audience and obtain additional financial return from multiplex operations. Substantial improvement in station coverage is achieved by employing mountain top sites to increase the effective antenna height. At this point, radio remote control and telemetering become important considerations. In Part I of a two-part article, the author discusses system requirements and general factors in radio remote operation. Part II will consider the specific engineering details of the equipment.

Radio remote control for broad-

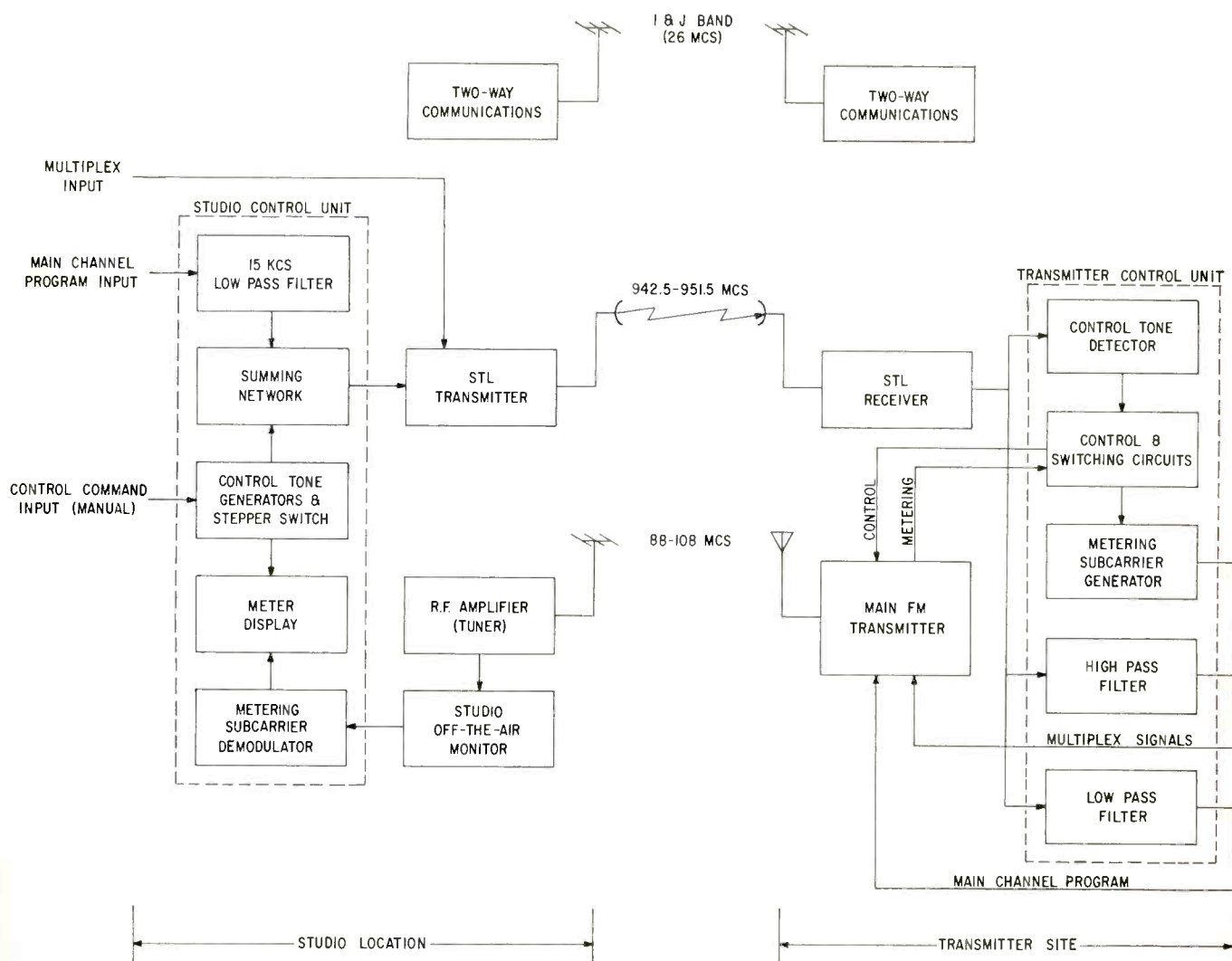


Figure 1. Block diagram of basic elements of a radio remote control system.

Operation

cast stations is not new, but usage is not widespread nor the advantages fully understood. Specifically, transmitter sites located far beyond telephone service may now be utilized, and at still other sites where wire circuits are utilized, the high rental costs may be eliminated by the use of radio remote control. Recent changes in FCC regulations have recognized the growing need for radio remote control systems by providing for transmitter telemetering and control of FM stations. With some minor changes the system which will be outlined may be adapted to AM transmitters as well.

Basic Requirements

Let us begin by considering what a radio remote control system should provide and then discussing how it is best accomplished. First and most obvious, the system should provide for (1) positive control circuits with the necessary fail-safe protection and, equally important, (2) a reliable means of returning the transmitter meter readings to the controlling studio. It should further provide (3) a method of relaying a broadcast quality program channel to the remote transmitter, and it should have (4) the capacity for adding several multiplex program channels. Lastly, the remote control system should include (5) a means of communication between the studio and transmitter. Figure 1 is a block diagram of the basic requirements as established here.

Most of these requirements can be met by utilizing proper control signals in conjunction with a Studio-Transmitter Link (STL). The use of simplex supersonic control tones is a reliable and a relatively simple means of establishing full transmitter control. Other ways, a digital code for example, are available as control techniques, but these are frequently complex and costly. Part 4



Figure 2. This shows the Studio Control Unit of a radio remote control system. Control signals and metering detection are incorporated in this unit.

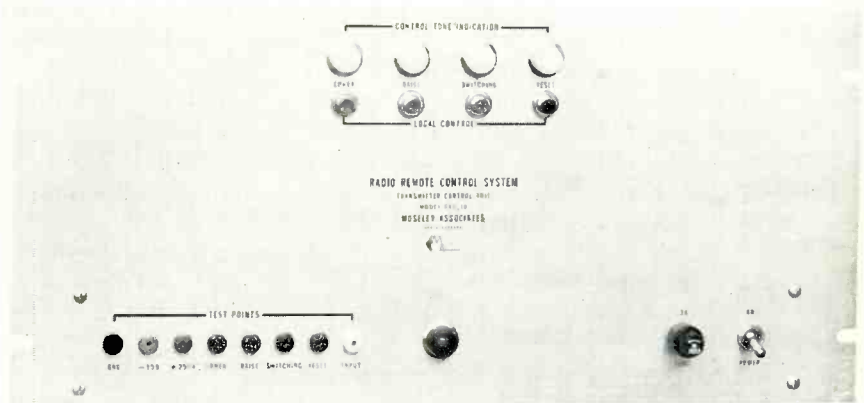


Figure 3. Adequate test points are important in proper servicing of the Transmitter Control Unit.

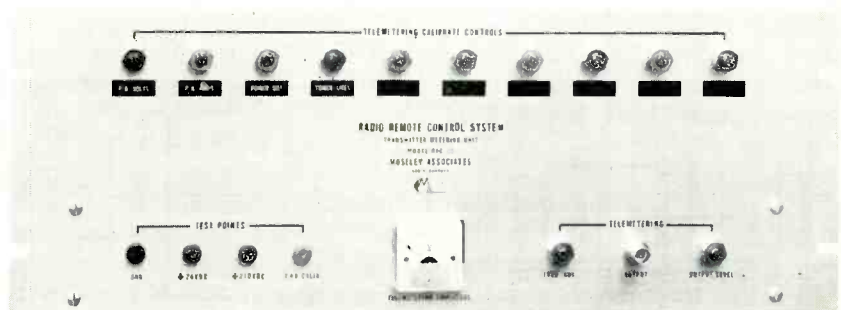


Figure 4. The metering Subcarrier Generator is shown here. Calibration and center frequency controls are on the front panel.

Subpart D of the F. C. C. Rules and Regulations provides for standard AM and FM broadcast STL stations operating in the 942.5 mcs to 951.5 mcs band. An STL can then be used to relay the control signals to the remote transmitter site as well as meeting the requirements for conveying the main pro-

gram and multiplex channels to the transmitter. Fail-safe operation of the main FM remote transmitter can be accomplished by a carrier operated relay in the STL receiver; and in the event of a failure of the STL, the remote transmitter is removed from the air. The control tones must be compatible with the

*Moseley Associates, Box 3192, Santa Barbara, Calif.

other intelligence carried over the STL to avoid undesirable cross-modulation products. As shown in Figure 1, the metering information is returned to the control point by a multiplex channel on the main FM carrier. In May, 1960, Section 3.293 of the F. C. C. Rules and Regulations was amended to authorize the use of a multiplex subcarrier in the 20 kcs to 75 kcs spectrum to convey metering information. Compatibility of the metering subcarrier with existing or future (stereo) SCA operations is, of course, a prime consideration but presents no problem in a properly designed system. For an AM transmitter, other means must be employed to return the metering information as a multiplex subcarrier cannot be used.

The requirement for communication between the studio and remote site can be met by adding a multiplex channel on the STL and then multiplexing the main FM transmitter for talk-back to the studio. Alternately, surplus communication equipment readily available at reasonable prices will adequately satisfy order circuit requirements. F. C. C. Regulation 4.432(e) provides for the use of I and J remote pick-up channels (26 mc) for communications associated with an authorized STL.

Studio Equipment

When considering the equipment required at the controlling studio location, it becomes evident that the units associated with the control system can be divided into two categories. The first is a Studio Control Unit which might be considered as the master control panel for the remote controlled transmitter, and the second is the STL transmitter.

The Studio Control Unit, serving as the key item in the system, should be easy to operate and include only those controls on the front panel that are needed in actual operation. These controls should be clearly marked, and the labeling should refrain from all but the obvious forms of abbreviations. It is in this unit that tones necessary to accomplish the desired degree of control are added with the main channel program material and fed to the STL transmitter. The various control tones are selected by switches corresponding to the function the operator wishes to per-

form. As the control tones are subsonic and present only when a control command is transmitted, no noticeable effect on the quality of the main channel program occurs. As will be evident in Part II of this article, the frequency spectrum between the upper audio limit (15 kcs) and the lower multiplex band edge (20 kcs) is ideally suited for the control signals. Experience has shown it is practical to include up to six separate control channels in this 5000 cps band. For the average installation three or four channels will provide for adequate transmitter control. As an example, three control tones can perform the standard *on* (raise), *off* (lower), and *stepper* switch functions. Pulse duration techniques can be employed to maintain synchronization between the stepper switch in the Studio Control Unit and the stepper switch at the remote transmitter site. By employing a suitable filter and selective amplifiers at the remote location, the control tones need only modulate the STL between 5 and 10 per cent.

Some provision should be made in the Studio Control Unit to remove any harmonics or spurious signals in the main program channel that fall in the control channel spectrum. A low pass filter exhibiting at least 30 db attenuation in the control spectrum should be utilized. This will then eliminate random operation of the control circuits by extraneous program signals.

The Studio Control Unit must also demodulate and intelligently recover the modulation of the metering multiplex subcarrier and display it on the appropriate meter. Usually the stepper switch at the studio routes the metering signal to the correct meter. The operator then is able to actuate either of the on or off control signals and to observe the results of his command.

The STL transmitter requirements at the studio location are rather straight forward. The STL transmitter modulation characteristics must exceed the minimum noise, distortion, and response required for the program channel of the main transmitter. If multiplex operation is desired, the STL transmitter must be capable of being multiplexed with a minimum of cross-talk.

The R. F. output of the STL transmitter should provide a signal fading margin of 40 db at the STL receiver for a 99.99% reliability factor. For a well designed system full attention must be given to antenna gain and orientation, transmission line and path attenuation losses, and first Fresnel zone clearance.

Figure 2 shows the Studio Control Unit of a radio remote control system. This unit is completely self-contained and provides all of the previously described functions. Main program is fed into the unit, and the composite control tone and program signal at the output is fed to the STL transmitter. Illuminated meters are employed in the design and are turned on in accordance with the position of the front panel selector switch.

Transmitter Equipment

The control equipment at the remote transmitter site essentially performs the inverse of the tasks done by the studio equipment. To minimize transmission line loss, the STL receiver should be located as near as possible to the STL antenna. Noise figure, band width, and adjacent channel rejection characteristics must be considered in the receiver design. The receiver output should be of sufficient level to fully modulate the main FM transmitter and should be capable of detecting any multiplex subcarriers with a minimum of phase distortion.

The main channel program should be passed through a low pass filter to prevent the control tones and multiplex subcarriers from being applied to the FM transmitter pre-emphasis network. In a similar fashion, the control and multiplex signals must be isolated and applied to their respective destinations. Generally, the multiplex signal will be fed directly into the transmitter multiplex input. In some cases it will be necessary to demodulate the STL subcarriers if they are not intended to be directly applied to the main FM transmitter. The control tones, once detected and converted to dc for relay operation, will control the transmitter in the same fashion as wire remote control equipment.

A photograph of a Transmitter Control Unit is shown in Figure 3. This unit contains the necessary fil-

(Continued on page 26)

unpack 'em



....install 'em



....depend on 'em



.... vidicons from **GEC**

It's as simple as that when you specify **GEC** Vidicons. You no longer need to bother with bulky, space consuming shipping cartons for your replacement stock since all **GEC** Vidicons are of special internal construction which allows the tube to be shipped, stored, and operated in **ANY** position, and after installation you can depend on their maximum performance the first time. ♦ For live pick-up in black & white, or color film pick-up, specify **GEC 7336**. This camera tube features high sensitivity, excellent lag characteristics at low light levels, and has provision for dynamic focus. ♦ For black & white film pick-up, specify **GEC 6326A**. This is a high resolution camera tube with particular flatness of field and freedom from blemishes. It also has provision for dynamic focus. Specify **GEC 7291** for the same quality features as **GEC 6326A**, but without the provision for dynamic focus. ♦ If your weather radar pick-up doesn't hold optical images long enough for optimum telecast advantage, you should investigate the **GEC 1326** storage vidicon. This tube is designed to store optical images for extended or delayed electrical readout, retaining the image after the scene is removed. ♦ For further information contact General Electrodynamics Corporation.

....where tube research begins



GENERAL ELECTRODYNAMICS CORPORATION

4430 FOREST LANE, GARLAND, TEXAS

Custom Built Studio Console

Special requirements often make a custom built audio console desirable.

Here is how WSTU solved their audio control problems.

By FRED CHAPMAN*

WHEN WSTU planned new studios the goal was to make the control room installation as simple and convenient to operate as possible. A custom control console was built and all equipment was installed in wall mounted racks within easy reach of the operator.

The first rack next to the console contains the switching panel for incoming and outgoing lines and the recording bridges, the cue amplifier, three tape recorders, two of which may be used for recording, and the intercom controls. As can be seen in the photograph one of the tape decks has been removed from the rack for repair.

The second rack which is still within convenient reach of the operator contains the FM and Conelrad receivers and the transmitter remote control unit. The monitor amplifier is also in this rack along with the AGC amplifier. Blank panels are provided for future expansion to stereo. These will be used for an additional AGC-Program amplifier, another monitor amplifier, and whatever associated units may be needed.

The third rack contains the frequency and modulation monitors and the console power supply. Note the meter tip jacks on the front of the power supply between the two switches. There is a meter tip-jack at every point in the console system where a voltage reading would be significant such as the cathodes of all tubes and the output of the plate, relay and de filament supplies. Space is provided in this third

rack for a Frequency-Modulation monitor for FM should one be needed.

Two 12-inch and one 16-inch turntables satisfy our requirements for playing records and transcriptions. We use the GE high impedance cartridges fed through GE UPX-003B preamps into UTC-A-11 transformers. (The input transformer was used here rather than the output to give a higher load impedance to the 6SC7's in the GE preamps.)

The gain control for the monitor speaker (a T-Pad in the voice coil circuit) is on the side of the console desk just below the telephone selector and dial unit.

The Console

A custom console was built for three principal reasons:

1. *Stereo*—In order to be ready for stereophonic broadcasts vertical attenuators are used in the console. Blank panels beside each of the turntable faders and the tape fader provide space for additional attenuators which can be ganged in order to ride gain on both stereo channels with one control. Wiring is already in place in the console and it is only necessary to make the connections. The blank panels can be seen in the photograph of the console.

2. *Costs*—Equipment was available which could be used in the new console such as an RCA AGC amplifier which is fed from the mixer buss and is used as the main program amplifier.

3. *Special features*—The most important consideration was that the console would provide facilities to fit the requirements of our operation. For example we use three turntables, three tape recorders, net, FM tuner and phone patch regularly and usually only require two mikes with three the maximum used.

Referring to the photos and the block diagram, the circuit has only a few unusual features. Note that the cue-amp has its own mute relay since the vertical attenuators have no stop before they slide into "cue" at the bottom of their travel. The output of the control mike preamp runs through a fixed 4-db pad through the relay network. This allows the engineer to set level on the control room mike to give the best signal to noise ratio without worry that an announcer-operator will turn the gain wide open "so he can be heard better." On the other hand the two studio mikes are fed through the cue/mix relays after the faders in order to allow the establishment of balance when both mikes are used.

Microphone/Speaker Relay System

The schematic of the push-button microphone system is shown in Fig. 1. Note that RY-1 and 2 are in the console proper while RY-3 and 4 are mounted on the monitor amplifier chassis.

When the "On-Air" pushbuttons for the studio or control room mikes are pushed momentarily the relays lock in the "on" position. When the

*Chief Engineer, WSTU, Stuart, Florida

"Cue-Talkback" pushbuttons are pressed, only the speaker mute relays are operated and the mike(s) are connected to the talkback input on the monitor amplifier only so long as the button is held down. The "Off" pushbutton for either channel just breaks the dc to that bank of relays. By the way, this system is feedback proof. I have operated (for test purposes) the monitor speaker within a couple of feet of the mike with all gain controls wide open and there is no howl, squeal or click when the mike is turned on or off.

Remote-Network Circuits

Channel Eight is the "line" input and handles seven inputs. From left to right on the switch panel; Telephones One and Two, FM Relay receiver, AM (Conelrad) receiver, Network (knob painted red for easy identification), Remote One and Two. A 10-db pad is inserted in the circuit between the remote lines and the other inputs. This is done because the remotes normally run about +8 dbm while the net is around 0 dbm and the telephones 0 dbm or below. Since

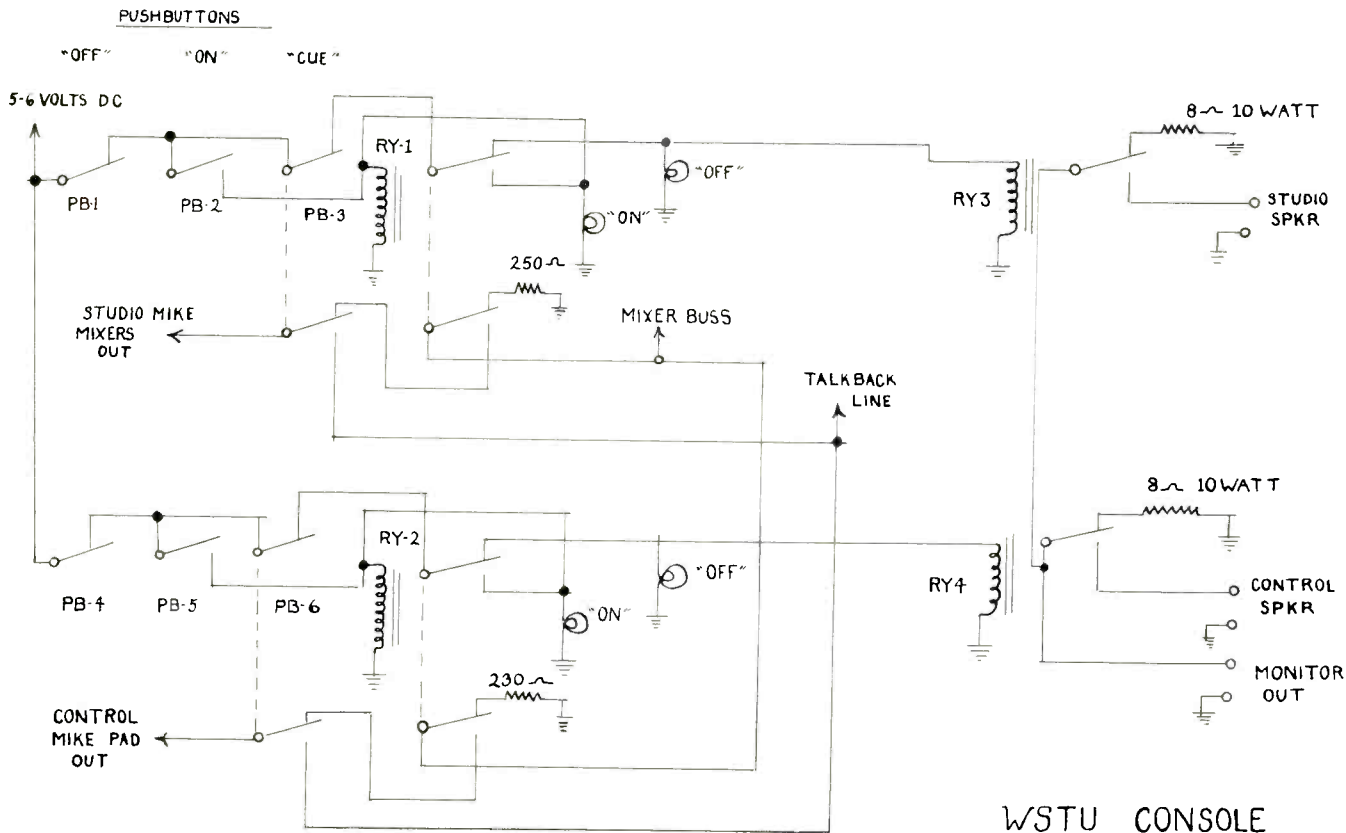
both the AM and FM receivers have volume controls built in, they were included in the "zero level" string. Note that the remote pad affects only the incoming signal to the mixer. It does not affect the level to the headphone circuit or to the remote cue output of the monitor amplifier. Incidentally, note that if the headphone switch is turned to the Program Monitor position and a remote is placed on cue (cue signal from the monitor amplifier being sent to the remote) the operator can hear the remote "calling-in," can talk back to the remote and can listen to his own on-air program at the same time.

Note the parallel resistor-capacitor network which is in series with the remote buss just ahead of the 10-db pad. This is the hum attenuator. It is effective on remote lines only. It must be placed ahead of a fixed resistor (i.e., the pad) in order to work properly. The pot is on the console panel and will go from zero to about 20 db attenuation at 100 cps. (Measured with the capacitor used, not calculated.) It is cheaper than the usual resistor-

capacitor-inductor network usually used and since it only affects the remote lines it is safer than the inter-stage equalizers sometimes used in program lines. The net key, FM and AM radio keys both connect to the cue-buss in the "up" position. Even though one side of the cue buss is grounded it does not affect the net line because of the telephone company repeat-coil installed at the phone company terminal board. The "up" position of the Remote keys feeds cue to that remote line.

The two telephone keys are wired to "mix" in either the up or down position. In the down position they trip the control room speaker relay to mute that speaker. In the up position they trip the studio speaker relay.

The headphones are switchable across Program Out (this is the monitor amplifier remote-cue line), Net, FM receiver, AM Receiver (useful for Conelrad checks if the warning comes on while you are reading a commercial), and either of the two remote circuits. The headphones have their own gain control.



WSTU CONSOLE
PUSH-BUTTON CONTROL

Figure 1. Schematic of push-button microphone system.

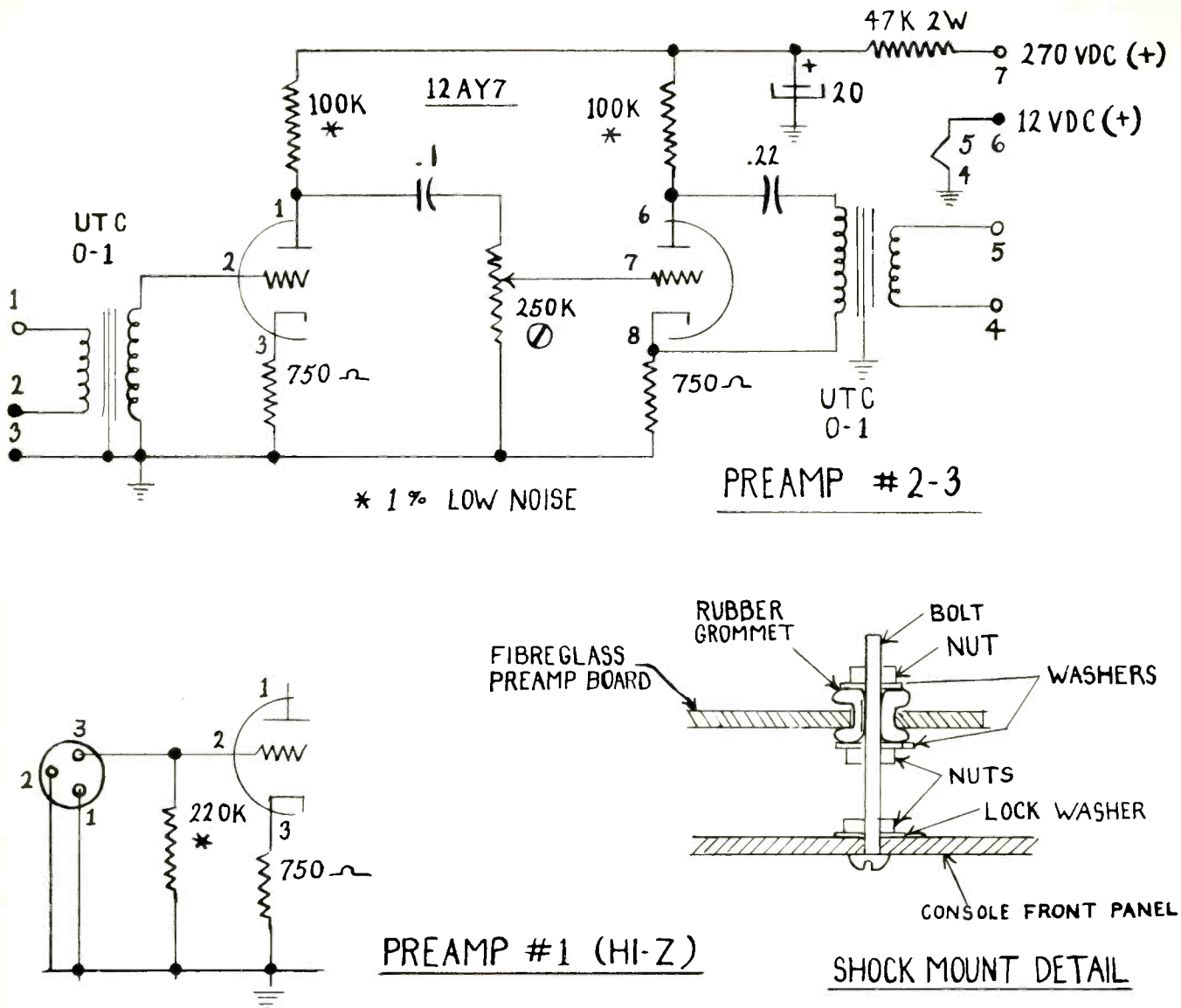


Figure 2. Circuit for microphone preamplifiers.

Console Monitor Amplifier

As can be seen from the block diagram of the speaker system only two speakers are fed at a time. Since about one watt into a 12-inch high-efficiency speaker produces almost ear-shattering sound in a small room, an amplifier capable of two watts total output will suffice nicely. In an AM station using AGC and limiter amplifiers very little dynamic range is encountered between "loud" and "loudest" passages. The amplifier shown will put out about four watts at very low distortion without feedback. If feedback is added, the required input signal level is raised proportionately to the amount of feedback in db. For example, if it takes 1/2 volt to provide four watts of output without feedback and you apply 6 db of

feedback it will then take one volt to provide the same output. If feedback is added use a resistor of 27K or over between the input cathode terminal and tap E (the 16-ohm tap) of the output transformer. A ground should then be made at the transformer common, tap D. 27K will give about 8.5db of feedback. Note that the tertiary winding on the Chicago PCO-150 transformer is not used in any feedback circuit but is designed to feed the "Remote Cue" circuit. Since this circuit is fed directly to remote phone lines without isolation transformers neither side of the winding may be grounded. The four resistor and pot network shown gives a solid signal to both the remote lines and the headphones. If higher output is required the 270-ohm resistors may be

reduced or eliminated. One of the two inputs is high-impedance and is fed from a tap in the modulation monitor. The other input uses a cheap surplus input transformer with a range of 300-3000 cps and is fed from the talkback circuit on the console allowing talkback to remotes without killing the air signal to either the remote line or the speaker. The talkback input gain control is set to put out a higher signal than the monitor input, one which will easily override the program signal. This input is fed through the patch panel and may also be switched to bridge the output of the program amplifier for testing and recording purposes. Since the primary impedance of the transformer used is around 200 ohms, "build-out" resistors of about

RAYTHEON

Microwave System Planning Kit

Prepared for: **MR. JOHN P. JONES**

COMMON DESIGNATION OF FREQUENCY BANDS

L Band	300 - 1,500 MHz	VLF	3 - 30 kHz
M Band	1,500 - 2,000 MHz	LF	30 - 300 kHz
N Band	2,000 - 3,000 MHz	MF	300 - 3,000 kHz
O Band	3,000 - 4,000 MHz	HF	3 - 30 MHz
P Band	4,000 - 7,000 MHz	VHF	30 - 300 MHz
Q Band	7,000 - 10,000 MHz	UHF	300 - 1,000 MHz
R Band	10,000 - 15,000 MHz	SHF	1,000 - 10,000 MHz
S Band	15,000 - 30,000 MHz	EHF	30,000 - 300,000 MHz

RAYTHEON EXCELLENCE IN ELECTRONICS

- Path Surveys & Site Selection Manual
- Profile Planning Charts
- Antenna System Calculator
- Graph Worksheets, Protractor
- System Planning Charts
- Frequency Band Designation Card
- Map Symbols Guide

Planning STL or Intercity Relay? Send for Raytheon's Free Planning Kit!

Raytheon's Microwave System Planning Kit helps you engineer initial requirements, carry out preliminary terrain and tower surveys. It also explains topographic maps, path clearance pitfalls, profile plotting, FAA and FCC regulations.

In designing this Planning Kit for TV Station Chief Engineers, Raytheon experts drew on their extensive experience in servicing over 1000 microwave installations throughout the world.

Raytheon KTR — for Intercity Relay network pick-up — is available in both 1/10-Watt and 1-Watt systems to meet individual needs. These systems have proven their reliability, operating unattended over extended

periods. Initial cost is low, and long-term financing is provided.

The world's largest manufacturer of microwave tubes and equipment, Raytheon also offers TV Stations complete, no-obligation System Engineering Service.

Mail Today for Free Planning Kit

Director of Sales,
Dept. 1-1, Raytheon Company
Lexington 73, Massachusetts

Please send free Microwave System Planning Kit

Planning a system. For reference only.
 Have Engineer call.

Name

Title

Company

Address

City & State

RAYTHEON

RAYTHEON COMPANY
EQUIPMENT DIVISION

4.7 K must be used when bridging the program line to avoid loading the line.

One more word about power output. Although I mentioned that about one watt was room-filling volume, we found in practice that this amount of sound would feed through the walls between the rooms. The gain control on the amplifier was finally set to provide about 250 milliwatts to each speaker. This was found to be plenty. The only precaution when using the 6BX7 as an output tube is that the plate to cathode voltage should not exceed 250 volts. Since the cathode is 20 volts about ground, about 270 volts is the maximum allowable B+.

The speakers are connected to the four-ohm tap on the output transformer. We use eight-ohm speakers, and replace them with eight-ohm resistors when the relays are switched to "mute."

Preamplifiers

The circuit for the three mike preamps is shown in Fig. 2. The cascade 12AY7 stage is simple and

uses few parts. The interstage gain control allows better setting of the signal-to-noise ratio and also compensates for tubes and parts differences. As an experiment, 12AU7's and 12AX7's have also been used in the same circuit with some change in gain but no other audible difference. To keep noise low 1 per cent deposited carbon resistors are used for the plate loads and for the grid resistor in the control mike preamp. The UTC-0-1 transformers are used for input and output to allow as large a signal load as possible to the second stage. No bypass capacitors are used on the cathodes although one may be used on the first stage cathode if desired. Returning the output transformer primary to the cathode rather than direct to ground seems to help the low frequency end of the response curve.

Since the mike is mounted directly on the console (using a rubber shock mount supplied with the mike shown) the lead to the preamp is short and a high impedance input was used to save the cost of an-

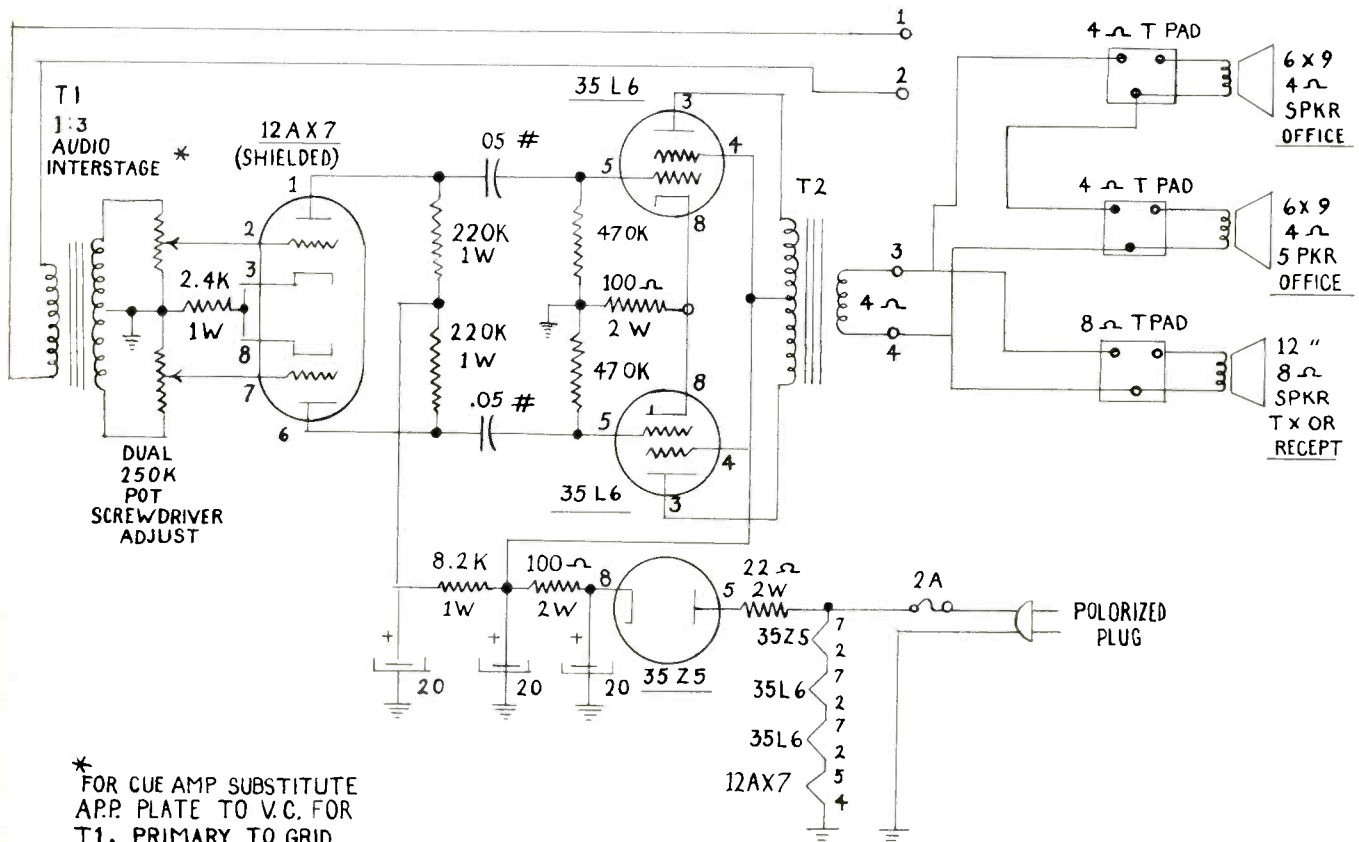
other transformer and to improve the response. The preamp is mounted on shock mounted standoffs directly behind the mike on the front panel. Note the shock mount details for the preamps.

House Monitor Amplifier

The simple ac-dc amplifier shown in Fig. 3 is used to feed speakers in the manager's office, advertising office and the transmitter room. The circuit shown provides more than ample volume for the three rooms even though the speakers are of unequal impedance.

The ac-dc configuration was chosen to save money, which it does quite well since the lack of a power transformer saves not only its own cost but also allows the use of low priced, unshielded input and output transformers without hum pickup worry.

One precaution that was used was to place the input transformer under the chassis and the output transformer above to eliminate coupling between the two. The push-pull input arrangement aids in can-



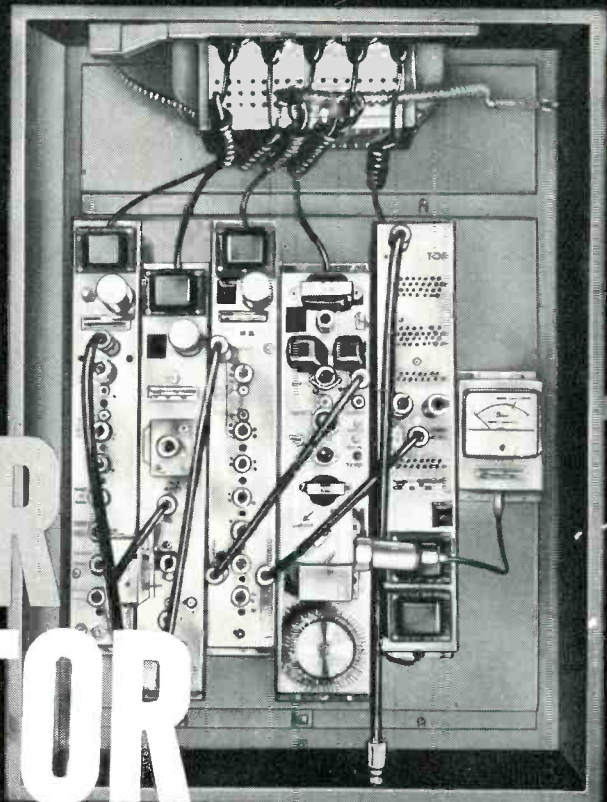
* FOR CUE AMP SUBSTITUTE APP. PLATE TO V.C. FOR T1, PRIMARY TO GRID.
FOR CUE AMP USE .001 TO ATTENUATE BASS.

HOUSE MONITOR AMPLIFIER

Figure 3. Schematic of house monitor amplifier.

AVAILABLE FROM BLONDER-TONGUE

NEW BENCO LOW POWER TRANSLATOR



MODEL T-1

(FCC TYPE ACCEPTED)

FEATURES STABLE OPERATION... MINIMIZES 'FALSE' SHUT-OFFS

The new Benco T-1 is the reliable way to increase coverage of existing TV signals. Engineered and manufactured by Benco (Canada) this new translator is now available through the Blonder-Tongue organization in the United States. The T-1 offers a host of advantages over other translators that can be summed up as long life and trouble-free operation, stable operation, foolproof automatic shut-off, and ease of maintenance. It is FCC type accepted.

MINIMIZES "FALSE SHUT-OFFS" CAUSED BY SIGNAL FADING — will not shut off unless the input signal from the remote master station falls below 10 microvolts for longer than 4 seconds.

FOOLPROOF AUTOMATIC SHUTOFF—When the master station goes off the air, this device turns off the transmitter. Ordinary shut-off systems work on the overall signal level. In weak signal areas, where a number of amplifiers must be used, noise generated in the amplifiers can be mistaken for the received signal and transmitted—even though the master station is off the air. The Benco Automatic Shut-Off can tell the difference between noise and the desired TV signal. It cuts off the transmitter anytime the 4.5 MC beat between the sound and picture carriers is missing. A time delay prevents cut off due to momentary signal fading.

PROVIDES STABLE OPERATION EVEN AT THE END OF POOR QUALITY POWER LINES — voltage regulating power transformer supplies the various units in T-1 with stable voltage. Eliminates stress on components caused by unstable supply voltages.

LONG LIFE AND TROUBLE-FREE OPERATION — full sized, underrated transmitting tube in output stage. Less stress on components due to stable operation.

EASY PERFORMANCE CHECKS — a built-in direct-reading power indicator checks power output; built-in test jacks for monitoring plate voltage and current of output tube.

RAPID SET UP OF CODING WHEEL OF IDENTIFICATION UNIT—The appropriate call letters for your area can be set up rapidly without need to cut copper contacts.

TECHNICAL SPECIFICATIONS

Translates input VHF channels to output VHF channels (2-13).

Primary power source	117 V ± 20% 60 c/s
Power Consumption	150W
Temperature Ambient	-30°C to +50°C
Input	75 Ohms
Output	75 Ohms
Recommended Input	50-2000 microvolts
Max. Permissible Power	1 Watt
Overall Noise Figure:	
Low Band	4 db ± 1 db
High Band	6 db ± 1 db
Frequency Stability	.02%
Gain:	
50 microvolts input to one (1) watt output	105 db
2000 microvolts input to one (1) watt output	73 db
Maximum gain	135 db
Band Width between Carriers	4.5 Mc (± .5 db)
Dimensions of Housing	35" x 28" x 10½"
Weight	130 lbs.

for further details contact—

engineered and manufactured by

BLONDER-TONGUE

9 Alling St., Newark, N. J.

Dept. BE-3

Canadian Division: Benco Television Assoc., Ltd., Toronto, Ontario. Export: Morhan Export Corp., New York 13, N. Y.
home TV accessories • UHF converters • master TV systems • industrial TV systems • FM-AM radio

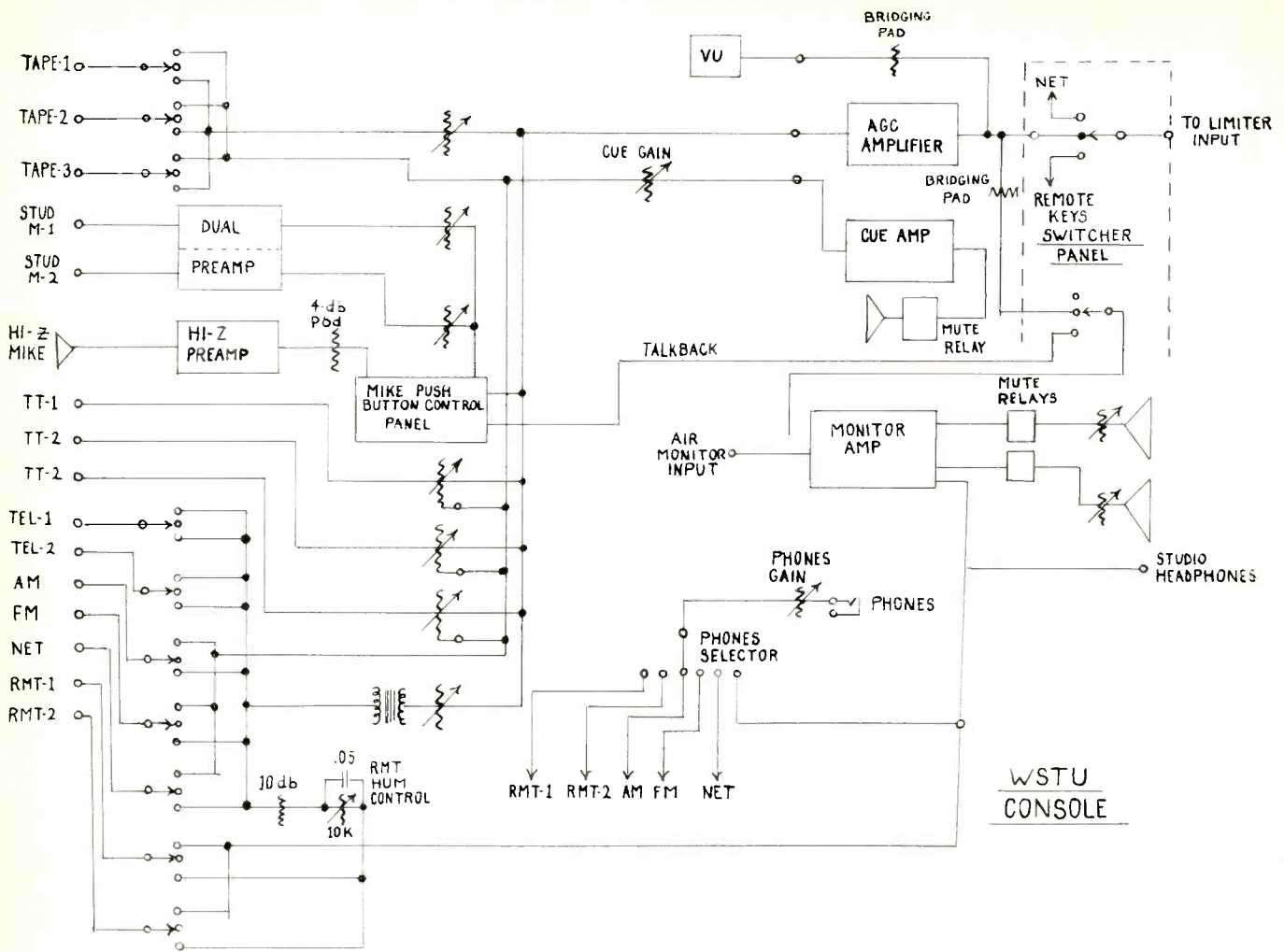


Figure 4. Block diagram of custom built console.

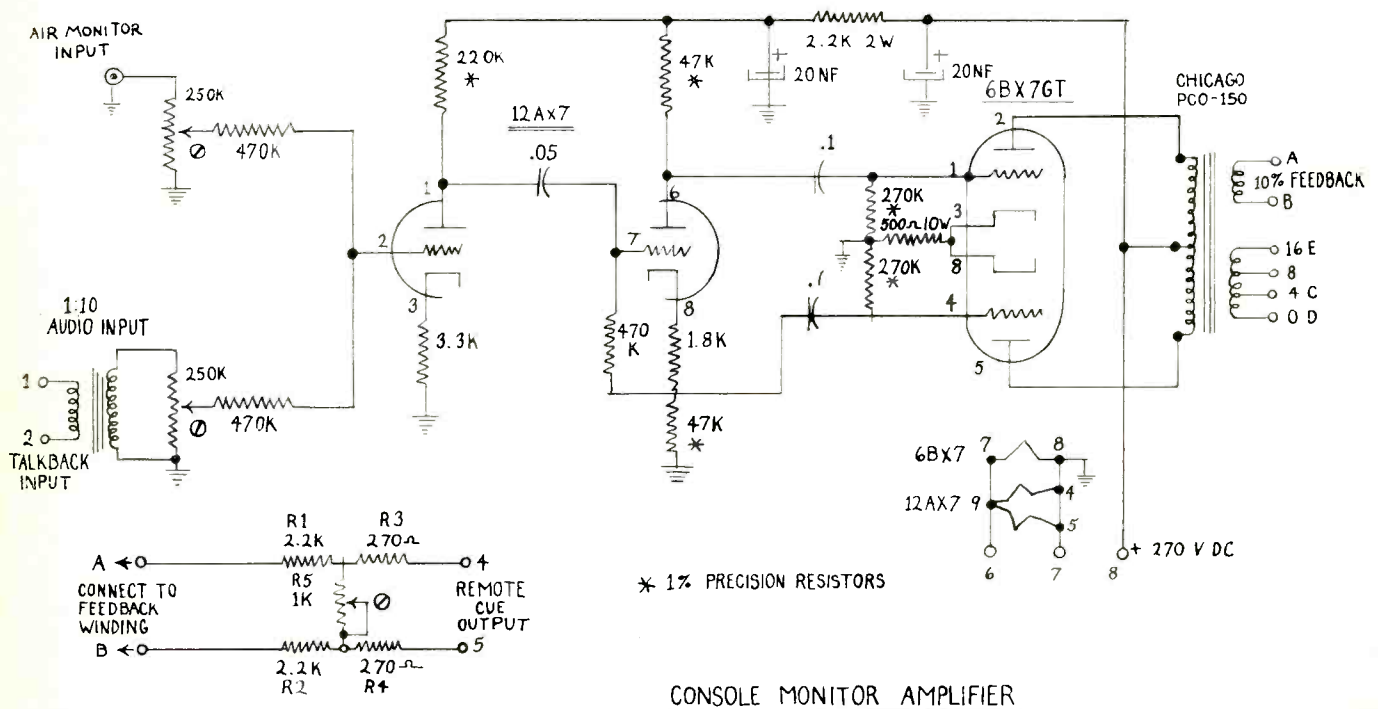


Figure 5. Console monitor amplifier.

celing hum in the first stage due to high ac potentials on the heater or in the input transformer windings. With the gain control on the amplifier at normal level and the control on the 12-inch speaker wide open, the hum is inaudible with no signal on the program line being bridged. No response curves or distortion measurements were taken on the unit; however, the "listening quality" is excellent. The gain control in the amplifier is set so that no audible distortion is present in the speakers at 100 per cent modulation of the transmitter using music programming.

35L6's and the 35Z5 were chosen over the miniature equivalents because, in actual service, these tubes seem to hold up better under the wide voltage swings of the ac power line due to the higher PIVR of the 35Z5 and the higher plate voltage rating of the 35L6's.

The ac-dc configuration with the direct chassis ground is not dangerous if the ac line plug is properly polarized and a plug and receptacle are used which eliminates the possibility of error. The chassis must also be grounded separately. The monitor amplifier is bridged across the input to the AM transmitter. The signal level on the 600-ohm line at this point is about +10 dbm. The audio interstage transformer used for T1 puts about a 15,000-ohm bridging load across the line. If a lower level line (below 0 VU) is to be monitored, it will probably be necessary to use a higher turns ratio than the 1:3 specified. If the amplifier is to be used for cueing purposes, a transformer designed to couple push-pull plates to voice-coil will work well turned back-to-front. Since both the primary of the input transformer and the secondary of the output transformer are isolated from chassis ground no danger from an ac voltage will exist on associated circuits.

Since most of the "35L6 to Voice Coil" output transformers are designed to work into a four ohm speaker a series parallel arrangement of two four ohm and one eight ohm speakers were used in our installation. You could also use three 16-ohm speakers in parallel, four four-ohm units in series-parallel or two eight-ohm in parallel as your needs dictate.

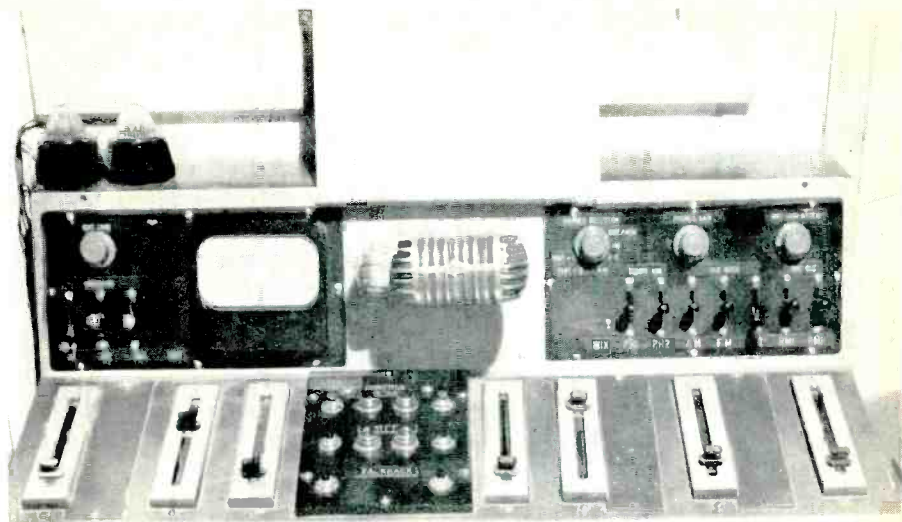


Figure 6. Front view of console. The front panel is hinged at the bottom and opens for servicing.

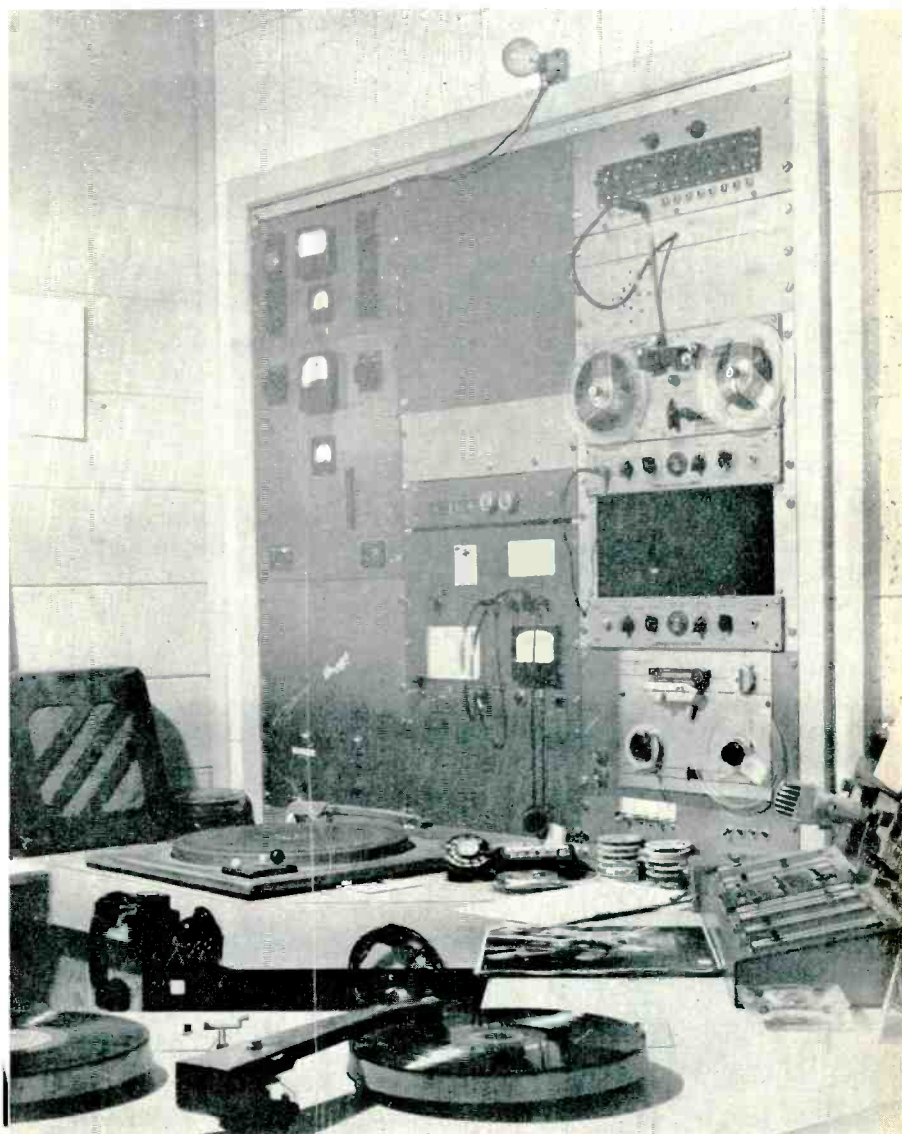
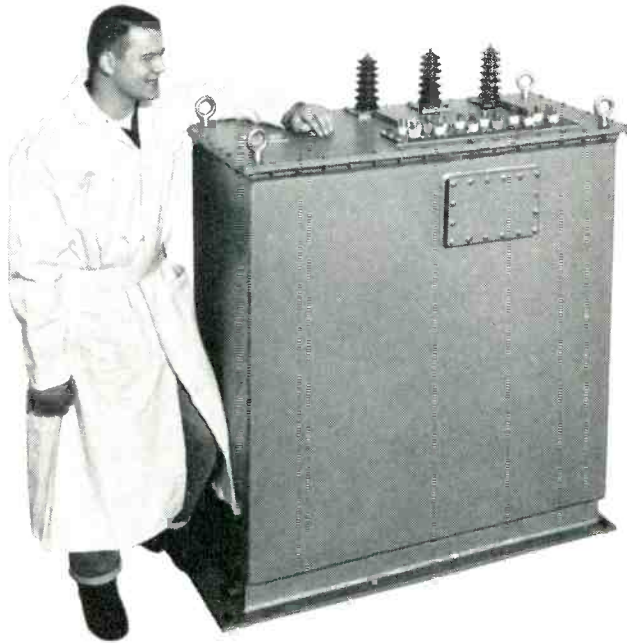


Figure 7. View of WSTU control room.

THE BIG AND THE SMALL—FOR THE BEST
IN ALL TYPES OF TRANSFORMERS, CALL



PEERLESS



**PLATE SUPPLY TRANSFORMERS, 3-PHASE, 60 CYCLE DRY TYPES,
rated from 7.5 to 250 KVA for Class A or B operation.**

Peerless 3-phase transformers of the type shown above are just one more reason Peerless has led the industry for 25 years. Like Peerless transformers of all types—including the specialized miniatures pioneered by the company—these high power plate supply transformers meet the most demanding operating requirements. To insure best possible flux distribution, cores are built of high quality grain-oriented silicon steel. The units exhibit high permeability and resistivity and extremely low hysteresis loss. Leakage reactance, once established by your application, is held to closest tolerance. Final testing covers voltage ratios, polarity, inductance, resistance, core loss, temperature rise under full power and all other important factors.

These units are just one more proof that whatever your transformer needs, the experienced Peerless experts can fill them best. Units range from 1/10 of a cubic inch to more than 20 cubic feet, from fractional voltages to 30,000, from 1 cycle to half a megacycle; 1, 2 and 3-phase; construction types covering the entire range.

Whatever your transformer needs, Peerless engineers can design to any military or commercial specification and manufacture in any quantity. See REM for complete standard line or write for information to Dept. B-3-P.



PEERLESS



ELECTRICAL PRODUCTS

A DIVISION OF ALTEC LANSING CORPORATION

6920 McKinley Avenue, Los Angeles 1, California

Transmitter Logging

Starts on page 6

this case 1½ minutes was selected), the power control will lock out and sound an alarm at the studio. Provision has been made in the existing remote control system to take manual control and/or to reset the automatic power control.

The automatic power control is automatically disabled while the carrier is being interrupted for a Conelrad test alarm, when the transmitter is shifted to the Conelrad operation, or when the transmitter is operated into the dummy load.

An alarm at the studio is provided in the event of a transmitter overload. Three additional alarm channels are available in case additional alarm functions become desirable.

The alarm system consists of a series of tone generators located at the transmitter. These tone generators are turned off in the event of an alarm. The tones are transmitted over the telephone line to the studio and fed into a series of selective tone detectors. Each of these detectors will sound an alarm if the tone to which it is tuned is removed. This alarm system is fail-safe in that a failure of any of the generators, any of the detectors, or the telephone line will sound an alarm at the studio.

An RCA MI-34654 negative peak limiter is provided in conjunction with an RCA BA6A limiter amplifier to prevent possible overmodulation of the negative peaks regardless of audio line level.

A check of this system proved that negative modulation peaks consistently exceeded 95% but did not exceed 98%.

A counting device is employed in conjunction with the station modulation monitor to determine the approximate number of times in a sampling period which the modulation exceeds a predetermined level. This device may be used selectively to indicate that the transmitter modulation has or has not exceeded a minimum modulation requirement. The output of this counter is one of the recorded parameters. The counter counts for a period of 2½ minutes, the total count is then recorded for the next 2½ minutes and following the recording period is au-



RELIABLE

THE ELECTRO-VOICE OMNIDIRECTIONAL 655C ... a long established institution

A crucial test of any precision instrument—whether it be a navigator's sextant or a broadcast microphone—is its ability to respond *accurately and predictably* to a given set of conditions. Judged by these standards alone, the Electro-Voice 655C has easily earned for itself such appellations as "old reliable" . . . "dependable workhorse" . . . "standard of the industry" and the many other tributes heaped upon it by grateful audio engineers in recording studios, independent stations, and radio and TV networks the world over.

The reasons for these compliments are not hard to find. Among them are its—

- time-proven ruggedness—far beyond normal requirements
- time-proven uniformity of response, from 40 to 20,000 cps., flat.

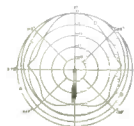
OTHER FEATURES: Output Level -57 db, 50, 150, and 250 ohm impedance. Impedance easily changed on internal connection. Acoustalloy diaphragm, shielded from dust and magnetic particles. High efficiency, non-welded magnetic circuit with Alnico V and Armco magnetic iron. Non-reflecting grey finish case. Has $\frac{5}{16}$ " 27 thread; 20-foot cable with UA-311 Cannon Connector. Size: $1\frac{1}{8}$ " dia. x $10\frac{3}{4}$ " length. Net weight: 7 oz., less cable. List Price \$200.00

- time-proven diaphragm of Accustalloy[®], a diaphragm material never successfully copied or equaled.
- time-proven dust and moisture filter that eliminated these problems years ago and still leads the field. (It will not corrode and has never been known to clog.)

These features combine to give the 655C the widest range and smoothest response of any professional microphone in common use.

Development of the 655C has never stopped. Whenever possible, improvements have been made to keep the 655C oriented to the needs of the times. This policy of upgrading a product, even after it is in production, means that you can depend on EV to have the answer first, to anticipate the need for new microphone types to fit changing demands.

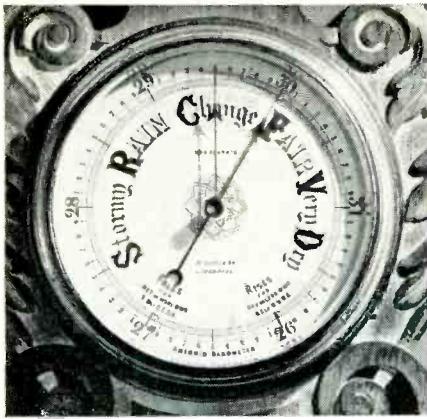
Polar
Patterns



Electro-Voice[®]

Commercial Products Division
ELECTRO-VOICE, INC.

Dept. 312V, Buchanan, Michigan



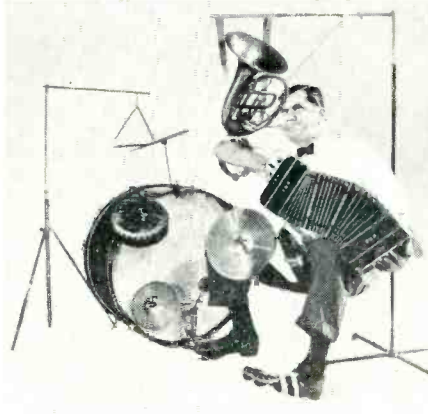
sensitive



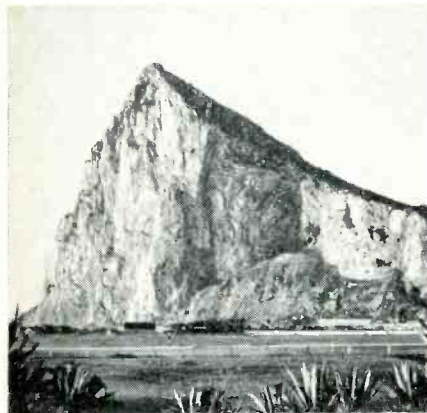
responsive



good-looking



versatile



dependable



rugged

That's a University Modular Microphone!

...the dynamic professional microphone with dynamic performance... dynamic features... dynamic styling.

And there's a dramatic story behind this new line of omnidirectional, cardioid and lavalier microphones... the complete inside story that every professional sound man should read. It's yours, free. Just write to Desk N-3, University Loudspeakers, Inc., 80 South Kensico Avenue, White Plains, New York.



tomatically reset and is ready for the next counting period.

Plate Voltage and Plate Current

Plate voltage and plate current in the transmitter are sampled by installing additional multipliers and shunts in the transmitter. Common point current is sampled for recording by an RCA MI-27966 Remote Pickup unit. This unit is a duplicate of the unit used to drive the automatic power control. A separate unit was used for metering to prevent any possible malfunction of the power control when the metering circuit was switched in and out.

Loop currents for the towers are sampled by means of pick-up loops installed at the towers. The outputs of these loops are fed to RF to dc transducers and calibrated against the stations RF ammeters. Separate pick-up loops were installed so that no possible errors would be injected into the station's existing measuring equipment.

A voltage representing frequency deviation is obtained for recording from the RCA BW-11-A Frequency Monitor which was designed for use with a remote control system.

Operation of the lights on each of the towers is monitored by the system. Current sampling devices in the tower lighting circuits feed rectifiers and integrating circuits providing a dc voltage for recording which will indicate a lamp failure or flasher failure.

System Operation

The parameters to be recorded are sequentially selected by a clock driven commutator. Each function is recorded for a period of 2½ minutes separated by a momentary dead spot which provides a separation line on the recorder chart. The commutator chassis also provides a standardizing voltage.

One recorded segment is a zero voltage providing a check of the lower limit of the recorder and two segments record the standardizing voltage providing a full scale calibration for the recorder as well as a starting point to identify the parameters recorded. The calibration feature provides a constant check on any possible changes in the telephone line characteristics which may affect the readings and allows correction of the absolute values if necessary.

Potentiometers are provided to facilitate calibration of all recorded parameters.

Each of the parameters are recorded sequentially for a 2½ minute period of each half-hour period.

Chart Identification and Calibration

A rubber stamp is provided to mark the chart for identification of the parameters and gives correction factors to be applied to the readings to convert them to absolute values. The stamp gives the following information:

- WIP—Philadelphia, Pa.
- Remote Automatic Logging
- 1,2—Full Scale Calibration
- 3—Chart X 50 Volts = Ep
- 4—Chart X.02 Amps = Ip
- 5—Chart X.1 Amps = Icom pt
- 6—Chart X.2 Amps = Ise loop
- 7—Chart X.2 Amps = Ise loop
- 8—Spare (Used for Zero Reference)
- 9—(Chart Deviation from 60) X.5 = Freq. Deviation in Cycles
- 10—So. Twr. Lights—Norm = 130
- 11—No. Twr. Lights—Norm = 130
- 12—Chart X.25 = Modulation Peak Count

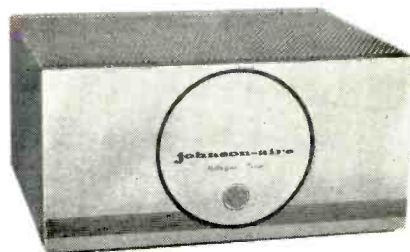
Date Time
Operator

The automatic logging and control system has been in operation at station WIP for the past several months without a significant failure or malfunction. This attests to the dependability of such a system of logging and control.

The stations who have spent time and money in pioneering new techniques such as described in this article and the manufacturers who develop equipment to make it possible make a substantial contribution to industry progress. These stations include WTOP, Washington, D. C., KFI, Los Angeles, WIP, Philadelphia, and WSJS in Winston-Salem. Studies and tests such as those involved in the development described here also require a tremendous amount of coordination. Before a petition for rule making can be submitted to the F. C. C., the substantiating data has to be assembled and placed in proper form for submittal. A hint as to the enormity of the task can be obtained by considering that the NAB petition to the F. C. C. in the automatic logging proposal consists of a book approximately three inches thick. The preparation of this document was done by the NAB engineering staff, namely A. Prose Walker and George Bartlett.

johnson-aire MULTIPLEX

TRANSISTORIZED TUNERS AND AMPLIFIERS

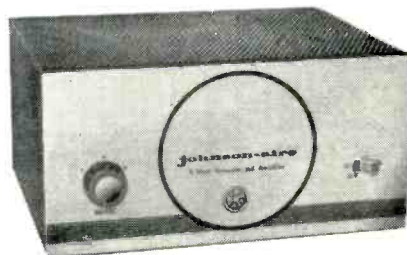


- JE 100 MT 1
crystal controlled
automatic muting

14 Transistor Tuner

All transistor construction and rugged reliability. Cuts service calls as much as 80%. Hum level reduced to absolute minimum—microphonics are completely eliminated. Cross talk of -60 db or better. Operates efficiently in high noise areas and at greater distances on less power than an electric clock.

Sensitivity—2 microvolt at 20 db quieting
Input..... 300 ohm balanced 70 ohm
Output..... 0.2 Volts RMS — 25000 ohms
Frequency Range 88 to 108 MC
Sub Carrier Frequencies 41 KC, 67 KC, etc.
117V - 60 cps ● 3½ lbs. ● 9"x7"x4½"



- JE 6 MA 1
universal — use
with any tuner
or telephone line

6 Watt Amplifier

Fully transistorized for infinite life expectancy and practically no maintenance. Power requirements are minimal for low cost operation. All Johnson-aire products are precision built of the finest American made components.

Frequency Response 20 to 7,500
cycles ± 3 db
Harmonic Distortion less than 2%
Tone Control... 0 to 35 db @ 7,500 cycles
Noise and Hum -62 db
Output Impedances ... 4, 8, 16, 400, 1600
117V - 60 cy ● 5¼ lbs ● 9"x7"x4½"



- JE 25 MA 1
for use with any tuner,
telephone line, Hi or
Lo Z microphones

25 Watt Amplifier

Rugged transistorized circuit completely eliminates microphonics — practically no hum. No tubes to replace—low maintenance cost—low power consumption—extremely long life. Separate treble and bass tone controls with boost and cut action.

Frequency Response 300-7,500 ± 3 db
Harmonic Distortion less than 1.5%
Bass Control -11 db to +12 db @ 50 cy
Treble Control -13 db to + 15 db
@ 7,500 cy
Output Impedances 4, 8, 50, -200
Gain (Minus 55 db)
(Hi Z micro 105 db)—(Lo Z micro 120 db)
117V 60 cy ● 12½ lbs. ● 14"x7"x4½"

Protected by 3 year warranty — 6 months free service guarantee.

johnson PRODUCTS DIVISION
electronics, inc.

62 so. Hiway 17-92 Casselberry, Florida (suburban Orlando) Terrace 8-2111

**WILL THE SONY C-37A
CONDENSER
MICROPHONE
EVER
BE EQUALLED?**

Probably. Within the next 5 to 6 years other manufacturers may learn the Sony technique of producing the remarkable gold membrane used in the C-37A diaphragm capsule.

Until then, the Sony must be considered the only perfect microphone in the industry. \$295 (Complete with power supply.)

For information or literature write: Superscope, Inc., Dept. E, Sun Valley, California.



SONY

SUPERSCOPE The Tapeway to Stereo

Remote Control

Starts on page 10

ters and detection circuits to recover the control tone pulses generated by the Studio Control Unit shown in Figure 2. Provision for local control is included directly beneath the front panel lamps which indicate reception of a control signal.

The data to be telemetered to the controlling location is applied to the input of a specialized multiplex subcarrier generator through a switch level on the stepper switch. Several FM modulation techniques are available for returning the metering data to the studio and will be considered in Part II of this article. The actual metering subcarrier frequency is relatively unimportant. In view of the response of the metering information to be telemetered, only a narrow band, low deviation subcarrier is required. It is wise, therefore, to use a frequency in the lower multiplex spectrum and reserve the remainder of the spectrum for wide band multiplex activities.

Of course, the metering subcarrier should be chosen with a view toward compatibility with the proposed methods of stereo broadcasting.

A voltage controlled subcarrier generator for transmitting metering information is displayed in Figure 4. Individual calibration controls appear on this panel. The detected stepper pulse tones operate a rotary stepper switch in this unit to simultaneously control and telemeter the selected transmitter function.

A squelch relay sensing the presence of the microwave carrier is a convenient means of providing fail-safe operation and at the same time applying primary power to the main FM transmitter. STL failure will then remove the controlled transmitter from the air. In higher powered transmitters, it may be necessary to place the squelch relay contacts in series with the door interlock circuit and to control the transmitter filament turn-on sequence over a separate control channel.

Other Considerations

Needless to say, both studio and

**OVER
500
Symmetra-peak
USERS**

Over 475 AM, FM and TV stations throughout the world have —

- Increased normal effective voice power up to 2½ times.
- Improved overall limiter and AGC amplifier performance.
- Symmetrized non-symmetrical audio peak excursions.

Symmetra-Peak is a special passive network and its function is not duplicated by limiters or AGC amplifiers. Thus, Symmetra-Peak gives up to 4 db additional boost in station coverage. Order today or get a first-hand report by writing for a list of Symmetra-Peak customers in your own area.



**ANOTHER FIRST BY THE DEVELOPER OF
CSSB AND FULL RANGE AM STEREO**

Price: \$295.00 FOB Freeport, New York.

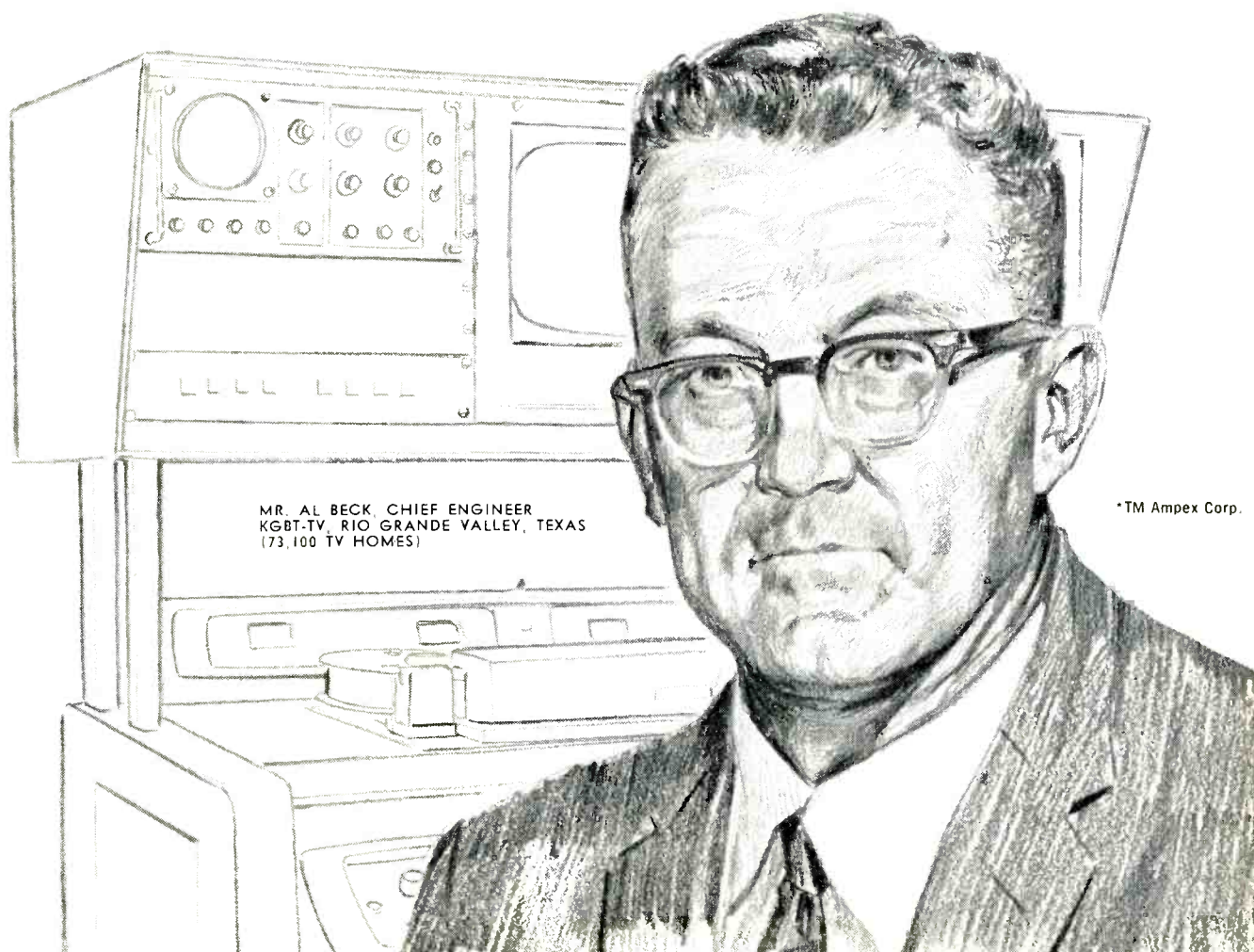
KAHN RESEARCH LABORATORIES, Inc.
81 South Bergen Place, Freeport, New York, Freeport 9-8800

World Wide Suppliers of Modern Communications Systems

“We Do More Jobs... Better with *Videotape** Recording. Business is better than it's ever been and we have a smoother, more efficient operation,” sums up Al Beck. “For us, Ampex VTR is a basic piece of equipment that fit into our operation right from the start. It's no ‘sacred cow’ to us; everyone here operates it. And essentially, it gives us a whole crew of operators plus announcers . . . a real problem-solver when it comes to scheduling personnel. From an operating standpoint, it's tremendous. Today, for instance, the boys are knocking out 15 1-minute commercials. And we have scheduled as many as 63 recordings in one operating day. I wouldn't want to go back to operating without an Ampex.” Ask Ampex today for specific station histories of the *Videotape* Television Recorder as a basic money-making component of any competitive TV facility. Ask, too, about Ampex financing and leasing arrangements. Write Department EB.

AMPEX

AMPEX PROFESSIONAL PRODUCTS COMPANY • 934 CHARTER ST., REDWOOD CITY, CALIF. • AMPEX OF CANADA LTD., REXDALE, ONTARIO



MR. AL BECK, CHIEF ENGINEER
KGBT-TV, RIO GRANDE VALLEY, TEXAS
(73,100 TV HOMES)

*TM Ampex Corp.

transmitter units should be designed for maximum accuracy, reliability, and ease of maintenance. All components should operate well below their normal ratings, circuits should not be critical of tube replacement, and construction techniques should follow good engineering practice. Ample test points should be provided, and there should be adequate visual indicators showing proper operation. A simple but accurate method of meter calibration is necessary to insure compli-

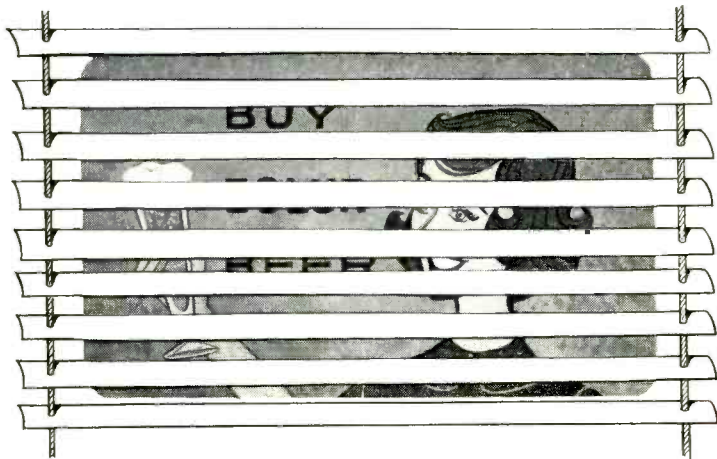
ance with F. C. C. regulations and to compensate for minor tube aging.

One of the first questions that may arise in radio remote operation deals with the number of control channels that are necessary to operate the remote transmitter. For example, it is not too uncommon to find wire systems employing up to 40 or 50 positions on the stepper switch. This can be done in a radio remote control system as well, but it must be remembered that multiple channel wire systems are fre-

quently intended for use with directional AM antennas, Conelrad transmitters, and other specialized operations. Such complexity is not required in the average FM or AM installation, and it only increases the equipment cost unnecessarily. Further, the technical skill of the operating personnel is to be considered. It has been found that simplicity of operation is a most important factor in any radio remote control system. With this in mind, good engineering practice dictates limiting the control and telemetering functions basically to those required for logging and to such circuits which have demonstrated a need for frequent adjustment. Here again, experience in the field indicates that 10 switching and control positions are more than adequate for the majority of FM installations.

DON'T Let Venetian Blinds Shut Out Fringe Area Viewer\$

Visit Us
IRE Show
Booth Nos. 3038 & 3039



Those "venetian blinds" caused by co-channel interference, can be reduced by *precision* offset carrier operation. Published reports indicate that by maintaining carrier offset frequency to an accuracy of ± 5 cps — rather than ± 1000 cps as required by the F.C.C. — a further reduction of 12 to 18 db in visibility of co-channel interference can be realized.

Such precision control of carrier frequencies is easily accomplished by using a Hermes Model 101C Ultra Stable Oscillator to drive your transmitter. The frequency drift rate of the Model 101C is *guaranteed* to be less than 5 parts in 10^{10} per day — which, at 100 mc would amount to less than 5 cps drift in 100 days!

Now in production over 5 years, the Model 101C Ultra Stable Oscillator has established an enviable performance record in television, standards laboratories and military systems throughout the world... where precision and reliability are a must. Write for Technical Bulletin USO-TV.



Ultra Stable Oscillator, Model 101C

Hermes



ELECTRONICS CO.

75 CAMBRIDGE PARKWAY, CAMBRIDGE 42, MASS.

A DIVISION OF

Itek

External Factors of Radio Remote Operation

In addition to the above generalities dealing with the equipment of a radio remote control system, there are other factors which must be dealt with. One of the most important factors is the establishment of a rigid and closely controlled maintenance schedule. While most broadcasters probably consider their maintenance program satisfactory, they should seriously evaluate their program in light of the time and expense involved in making unscheduled trips to the remote transmitter site. Certainly in the rugged areas most favorable to radio remote control systems, a failure can easily mean a two to six hour shut-down. Some of the subtle aspects of maintenance become significant when radio remote control systems are used. For example, the air interlocks or the centrifugal switch on the blower motor should be periodically checked for proper operation. Air ducts should be cleaned to prevent dust and grime from restricting the flow of the forced cooling air. The ionization potential of mercury vapor rectifier tubes can be easily checked and the tubes replaced before failure occurs. In short, it must be remembered that personnel will not be immediately available to ascertain the source of difficulty, and that by the time a repairman reaches the remote transmitter, the problem may require additional time to locate as

tell-tale fumes and other symptoms may have dissipated.

Besides a well-kept main transmitter maintenance schedule, a rather complete spare parts chest should be kept at the remote location. It is also desirable to keep a small but representative selection of resistors and capacitors on hand. This stock is certainly worth the investment if it saves an unnecessary trip from the mountain top to the parts distributor. A reliable VOM and perhaps, a VTVM and oscilloscope are quite valuable in servicing the transmitter. Assigning them to the transmitter building will avoid possible damage and calibration inaccuracies which could be caused by vehicular shock and vibration during trips to the transmitter.

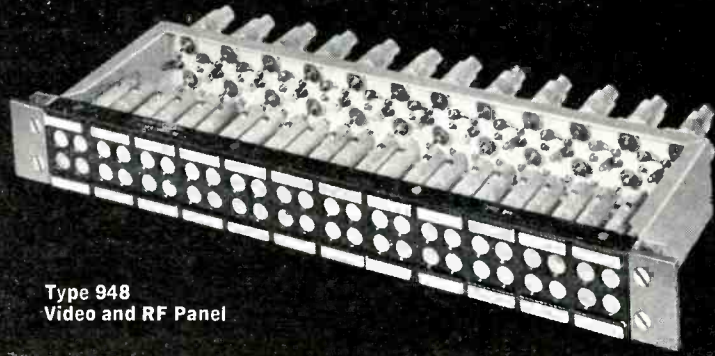
Primary power line regulation and the need for an emergency power source should also be considered in radio remote operation. These problems can perhaps be postponed until an adequate operating history is obtained.

The building containing the equipment, while certainly not associated with the radio remote control system, deserves attention with mountain top operation. Adequate drainage ditches should be placed around the building to prevent water from seeping into the electronic equipment and cable runs. Dust filters should be provided on air inlets, and thermostatically controlled cooling fans should be installed to prevent excessive heat build-up during the summer. These are relatively minor details, but they should be considered to achieve a reliable radio remote controlled transmitter.

The cost of radio remote control can be shown to be comparable to the average wire remote control system when the initial equipment and monthly wire charges of the wired system are considered. Besides spanning distances that are often impractical for a wire link, the STL is under the complete control of the broadcaster and is not subject to the many perils that the wire line faces.

For the broadcaster located near a suitable elevated site, radio remote control offers a reliable and economic solution for taking full advantage of the opportunity presented by the terrain.

NEMS-CLARKE AUDIO, VIDEO and RF JACK PANELS FOR 70 OHM AND 50 OHM LINES



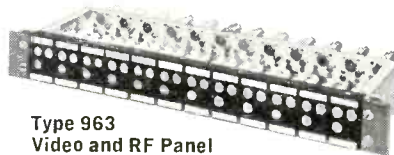
Type 948
Video and RF Panel



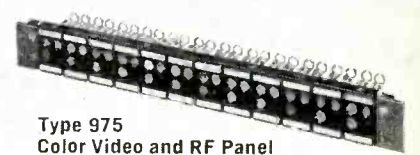
Type 924
Video and RF Panel



Type 921
Video and RF Panel



Type 963
Video and RF Panel



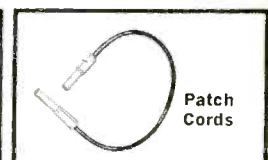
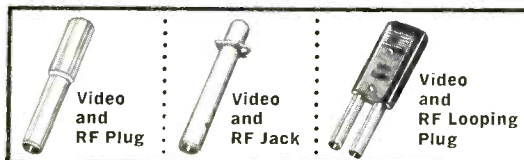
Type 975
Color Video and RF Panel

Featuring high quality construction and compact design to conserve rack space, Nems-Clarke Jack Panels can be supplied for use with either RCA or Western Electric equipment.

In Video and RF Jack Panels, sub-chassis can be furnished with provision for 12, 18 or 24 Amphenol connectors and plugs to permit disconnection of long lines when necessary. Heat-treated beryllium copper spring contacts assure long, maintenance-free service. Silver and gold flash types available.

Audio Jack Panel contacts are of coin silver, with nickel plated steel jacks spaced to eliminate possibility of splitting circuits.

Patch cords and looping plugs also available.



Send today for bulletin covering complete specifications on Nems-Clarke Jack Panels and Components. Booths 3917-3919. I.R.E. Show

Vitro ELECTRONICS A DIVISION OF VITRO CORPORATION OF AMERICA
PRODUCERS OF NEMS-CLARKE EQUIPMENT
919 JESUP-BLAIR DRIVE, SILVER SPRING, MARYLAND / 2301 PONTIUS AVENUE, LOS ANGELES 64, CALIFORNIA

A Simple Automatic Programmer

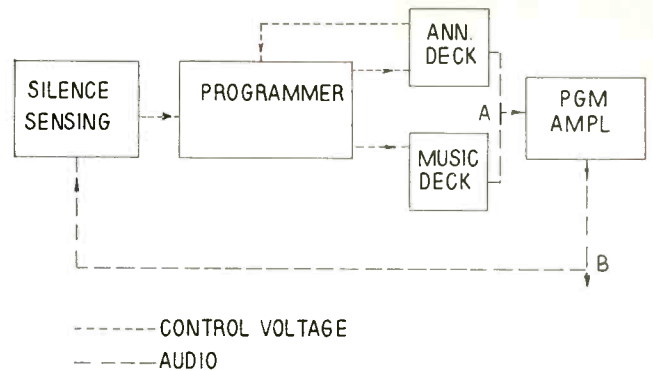


Fig. 1—Simplified block diagram of automatic programming layout.

With the growth of background music systems via broadcast channels and other requirements for automated program systems the need for an economical programmer is obvious. This article describes a system which will appeal to those who are looking for a useful construction project.

By A. G. SWAN*

WHEN it was decided to establish the first independent FM broadcast station in its market, the need for an economical operation was apparent. Automatic programming was the obvious answer. But capital was limited. The net result was a composite programmer. The automation circuits described here are relatively simple, but have proven very reliable. They were devised to fit the particular type of programming to be done. The circuit is aided by conventional sensing and beep amplifier circuits.

This programmer was not designed to meet a time deadline. Rather it permits the insertion of an announcement into the musical program once every ten minutes, (or other suitable time interval). However, the announcement will not interrupt a musical number, but will wait until it is finished.

In Fig. 1 a sample of the program audio is taken from the output of

the compressing program amplifier. This audio must be of a reasonably constant average level. This sample is fed to a bridging input of a silence-sensing amplifier. The control relay of the sensing amplifier allows the programmer to operate, provided the right time interval has arrived. The programmer will then start the proper tape transport. The 25 cycle control signal is obtained from an automatic control unit which is part of the Ampex 450 tape playback equipment.

There are two points where some caution must be exercised in this layout. The first is that if 25 cycle tones are also used to reverse the music playback transports, there must be some sort of isolation at point A in Fig. 1, to prevent the reversing tone from feeding back to the programmer through the announce deck amplifier output. This can be accomplished by pads of 6 db or so following the outputs of the announce and music amplifiers.

The second point of caution is to have sufficient isolation between the program feed at point B in Fig. 1 and the bridging input to the silence sensing amplifier. The silence sensing amplifier must be driven at sufficient level to make its first stage limit, but carrying this too far will cause the input grid to draw current, decreasing the bridging impedance. This will load the audio line on peaks, and may cause a measurable increase in distortion. A bridging amplifier between the audio feed and the silence-sensing amplifier would give ample level without loading should this difficulty arise.

Fig. 2 shows the silence-sensing circuit. T1 is a bridging transformer feeding sufficient level to the grid of the 6AV6 to cause it to limit on average program level. This limiting is necessary to allow low passages in the program to still drive the circuit the same as loud passages. The condensers on the input grid confine the sampling audio to the middle fre-

*WKLS, Marietta, Georgia

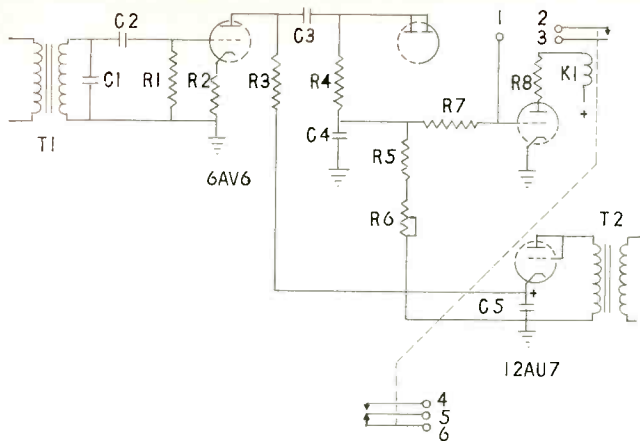


Fig. 2—Silence sensing circuit, relays shown de-energized.

PARTS LIST

C1 .002 mfd.	R1 100 K	T1 1/1 Bridging
C2 .002	R2 5 K	T2 115V/125V 50 ma.
C3 .01	R3 1 M	
C4 .5	R4 330 K	Connect: 2 and 3 and 1 and 2 on Pgmmer.
C5 40	R5 4.7 M	4, 5, 6, see text
	R6 5 M	
	R7 560 K	K1 Potter & Brumfield Type LM 11
	R8 1 K	

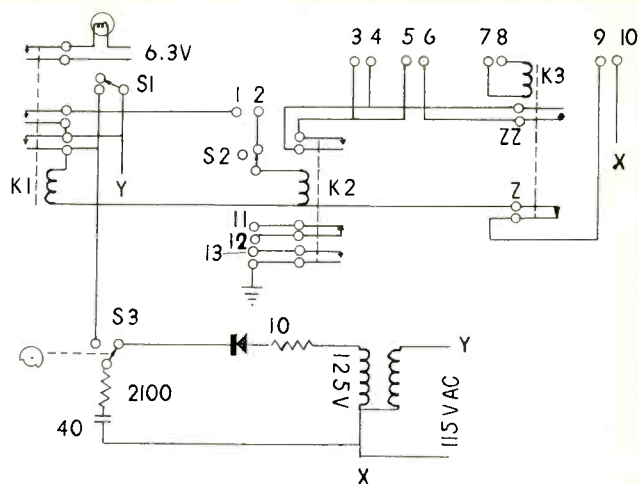


Fig. 3—Circuit diagram of programmer, relays shown de-energized

K1, K2 Potter & Brumfield Type KRP14A
 K3 Potter & Brumfield Type LM 11
 Connect: 1 & 2 to Silence Sensing
 3 & 4 in series with Ann. Deck start switch
 5 & 6, 9 & 10 to Man.-Auto. switch (see text)
 7 & 8 to 25 cycle amplifier out
 11 & 12 to Music Deck start switch
 13 to 1 on Silence Sensing

quencies. This is to prevent the circuit from mistaking any noise that may feed through for program. The diodes of the 6AV6 keep the grid of the 12AU7 blocked during program. When program ceases, the negative charge on this grid leaks off through R5 and R6, and the 12AU7 conducts. K1 then pulls in. The time interval between cessation of program and pulling in of K1 is variable from one to ten seconds by varying R6.

Fig. 3 shows the programmer circuit. The cam is driven by an electric clock motor. The unit used here is an Industrial Timer Series CM. Once every ten minutes the snap-action contacts discharge the 40 mfd. condenser through the solenoid of K1. K1 holds through its holding contacts. These keep K1 pulled in, even though the condenser has completely discharged. K1 also picks up 115 volts and feeds it to terminal 1. The relay contacts of the silence-sensing amplifier are across termi-

nals 1 and 2. Therefore nothing further happens until these contacts close on a pause in program. When they close, 115 volts is fed to the solenoid of K2. K2 pulls in starting the announce transport, and stopping the music transport. Contact 13 of K2 is connected back to terminal 1 of the silence-sensing amplifier, and holds its grid at zero. This is necessary to prevent the announce audio from opening K1 on the silence-sensing amplifier. At the end of the announcement, a 25 cycle tone recorded on the announce tape pulls in K3. Contacts Z on K3 open, releasing K1 and K2 to their normal (de-energized) condition. This starts the music transport. But the announce transport keeps running because contacts ZZ of K3 are across its start contacts. When the 25 cycle tone has run out, K3 returns to normal (de-energized), and the announce transport stops. The entire circuit is now back to the beginning of its cycle.

Contacts 5 and 6, and 9 and 10 in Fig. 3 are connected to a manual-automatic switch. They are normally closed for automatic operation. Opening them disables the automatic equipment, so the transports can be started and stopped manually. This is chiefly a precaution, in case the programmer should develop trouble, but so far this feature has been used only for convenience.

S1 is a momentary contact push button switch used to ready the circuit ahead of time if desired. S2 is a toggle switch which may be opened if it is desired to delay an announcement.

Where more than one music deck is used, with an intersperser to select the desired deck to be played, additional contacts on the silence-sensing relay can be used to key the intersperser. These are shown in Fig. 2 as contacts 4, 5, and 6, which may be used to operate the relays of an intersperser.

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

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

ROHN SYSTEMS, INC.
6716 W. Plank Road Peoria, Illinois



Model B-800

"SUPRA" PROFESSIONAL BROADCAST RECORDER

Standard rack mount — 19" x 14".
Engineered for broadcast usage.

CROWN Guaranteed Performance

Frequency Response	IPS Speed	Flutter & WOW	Noise Ratio
±2 db 30 to 30,000 CPS	15	.06%	58 db
±2 db 20 to 22,000 CPS	7 1/2	.09%	55 db
±3 db 30 to 15,000 CPS	3 3/4	.18%	51 db

Write Dept. BE-3 for catalog and prices.

CROWN INTERNATIONAL
Division of
INTERNATIONAL RADIO & ELECTRONICS CORP.
ELKHART, INDIANA

Technical Hints

Transformer Matching Method

One transformer will serve any matching problem and provide for the isolation of Circuits.

From the accompanying diagram it can be seen that by changing the jumper wires in the Jones S-318 FHT socket and referring to the data sheet provided by the transformer manufacturer most possible impedance can be made.

By having several Jones sockets pre-wired for each impedance match that you will ever possibly use, it is a simple matter to change the socket and presto the impedance is changed.

We have three of these transformers mounted on a 7-inch rack panel and permanently wired to the jack panel. They have saved time, money in that a separate matching or iso-

lation transformer is not needed for each special job.

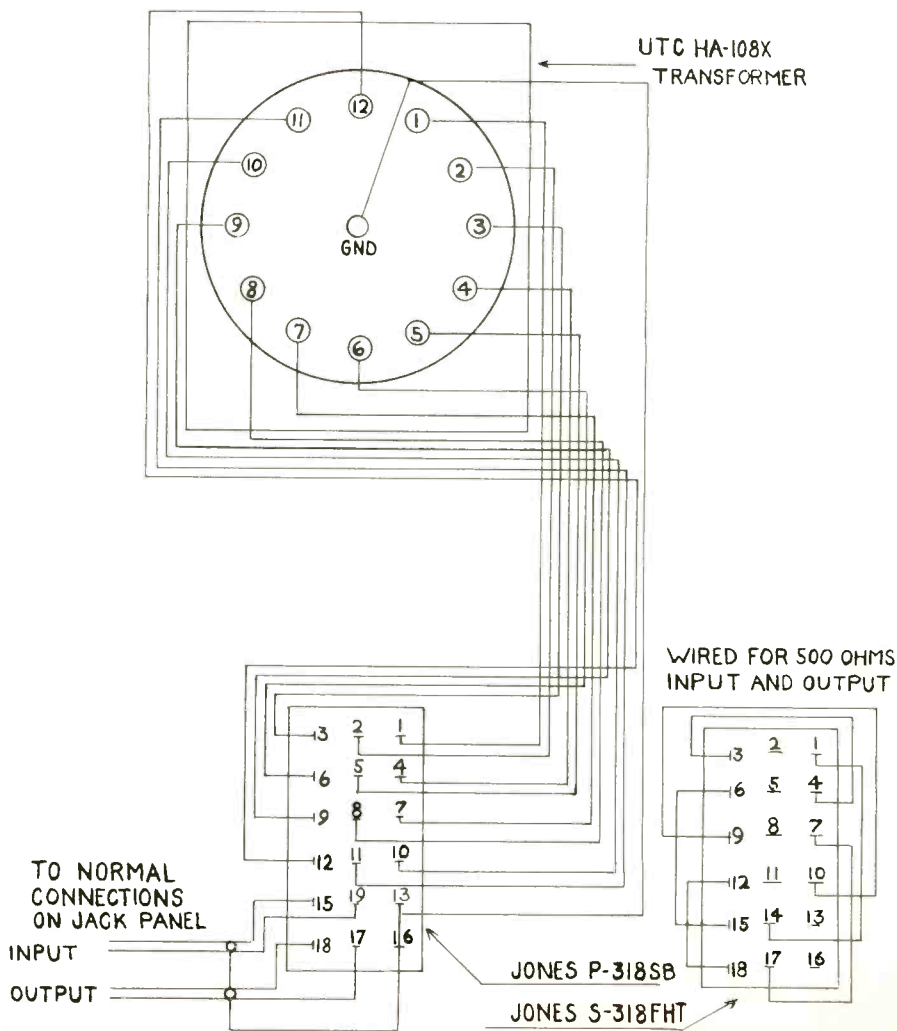
C. G. SUNDERLAND
Chief Engineer WTTM
Trenton, New Jersey

Field Strength Meter Calibration Check

Here is an easy and inexpensive way to check the calibration of a standard broadcast field intensity meter.

When the question of meter accuracy arises most often the only answer is to pack the instrument and ship it back to the factory. Doing this may take valuable time and cause an unnecessary expense. If however, a little time is spent now this problem may take neither time nor money later.

In a nutshell, the suggestion is to



check the meter calibration by checking several signals of known strength. Here are a few pointers on how to do this.

First, a test site should be selected that is clear of power and telephone lines and other metallic obstructions. This may be a back yard, a near-by park or some other place that is likely to remain unobstructed. When the test site is selected, some sort of permanent marker should be used; a heavy stone, an old tree stump or even better, an iron stake driven into the ground. Doing this will insure that the exact spot is used each time the instrument is to be checked. If an unobstructed spot is not easily found care should be used in selecting a less desirable place. Here, be on guard to avoid reradiation and possible future changes in the obstructions.

After the test site is selected, all stations within ground wave distance should be measured and their call letters, frequency and signal strength recorded. From this data, several stations should be chosen as references or standards. When making this selection avoid stations using directional antennas. Also avoid taking initial data and later checks in the early morning or late afternoon. The stations selected should be separated in frequency and signal intensity as much as possible. Select stations whose signals fall within the most often used ranges of the field meter, *i.e.*, signals between .1 MV/M and 1000 MV/M. Using the reference stations, collect data for a period of time by checking the signal of each station daily, weekly or monthly and carefully log and date all measurements. After this has been done, the signal values for

each station may be averaged or plotted on graph paper. The larger the sample the more accurate the average or curve will be; collect at least 20 measurements on each station using five or six stations before figuring the first average.

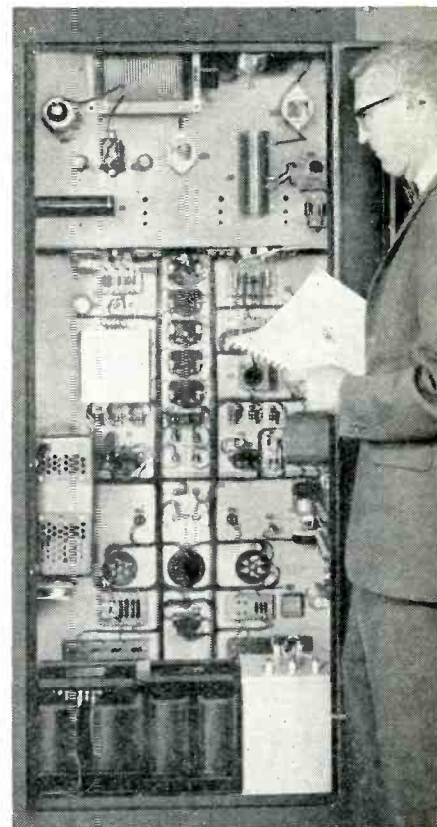
Once the average signals of the reference stations are established, it is a simple matter to compare past readings with a present reading to gain a reasonably accurate check of the field meter. It must be kept in mind that broadcast signals will vary slightly since the F. C. C. allows power variations from -5 to +10 per cent of the station's rated power. This is likely to show up as a signal variation of about 5 per cent or less. If however, a larger number of reference stations is used this error is minimized. In making the comparison it will be found that some signals will be above their average and some below if the field meter is working properly. Should all measurements be low or all high, the meter may be out of order and should be checked for faulty tubes, weak batteries, or other trouble. If all tubes, batteries, etc. are alright and the readings are still out of line, then the instrument may need factory calibration.

The procedure described here is intended only as a good approximation and no attempt should be made at calibration adjustments on this basis. Doing so will invalidate the manufacturer's calibration certificate and make the instrument unacceptable for F. C. C. required measurements. Best results are obtained when this method is started with an instrument that has been recently calibrated by the factory.

—ELTON B. CHICK



1 Kw TRANSMITTER*



*From an Engineers' Viewpoint

The "Bauer Kit" Model 707 is the only 1000/250 watt AM transmitter with *Silicon Rectifiers* in all power supplies, a *Variable Vacuum Capacitor* and a *Constant Voltage Transformer*. Your assurance of maximum reliability and optimum performance. Note the simplicity of design with easy accessibility to all components, too. All components are standard items available at local sources.

Assembly of the "Bauer Kit" is actually easier than many consumer audio kits — the wiring harness is furnished completely pre-fabricated and coded. And when you complete the transmitter it will be fully inspected, tested and *guaranteed* by the Bauer Electronics Corporation.

Bauer 1 Kw Transmitter
(In Kit Form) \$3495.00*

Bauer 1 Kw Transmitter \$4495.00*
*FOB San Carlos, California

**WRITE FOR THE COMPLETE
ENGINEERING STORY TODAY!**

BE-115

Bauer

ELECTRONICS CORPORATION

1663 Industrial Rd. • San Carlos, California

JAMPRO FM ANTENNAS

Sold Under U.S. Patent
2,637,533

JAMPRO ANTENNA CO.

7500 - 14th Ave., Sacramento 20, California

**TRY
Broadcast
Engineering's
Classified
Ads—**

**They Get
Results!**

Industry News

Bailey Elected Treasurer of IRE

Stuart L. Bailey, president of Jansky & Bailey, has been elected treasurer of the Institute of Radio Engineers, the largest professional engineering society in the world. Mr. Bailey's election fills the vacancy created by the recent death of Dr. W. R. G. Baker of General Electric, who had served as treasurer of the IRE for the past 10 years.

Mr. Bailey has been an active member of the IRE since 1928 and served as president of the Institute in 1949.

Mr. Bailey is one of the founders of Jansky & Bailey, the oldest private research and development firm in Washington. He was a student of C. M. Jansky, Jr., at the University

of Minnesota in 1928. The two men organized Jansky & Bailey as one of the nation's first consulting radio engineering firms in 1930. Mr. Bailey was recently elected a vice-president of Atlantic Research Corp. which merged with Jansky & Bailey in 1959.

A. Prose Walker Joins Collins Radio

The appointment of A. Prose Walker to the Cedar Rapids (Iowa) Division of Collins Radio Co. was announced by R. T. Cox, vice-president of Collins and general manager of the Division.

Walker, presently manager of engineering for the National Assn. of Broadcasters (NAB), will be responsible for the development activities of Collins commercial broad-

casting and amateur radio product lines effective May 16.

Prior to his association with NAB, Walker served with the Federal Communications Commission, joining that government agency in 1940. While with F.C.C. he served in the Radio Intelligence Division and held various other posts including Supervisor of technical operations in Hawaii during World War II. He also was chief of technical operations of the General Engineering Broadcast Division and Television Division, and was chief of the allocations branch of F.C.C. He served, too, as eastern supervisor of the Conelrad project.

Educated at Denison University, Granville, Ohio, and Ohio State University, Walker is a former professor of physics and mathematics.

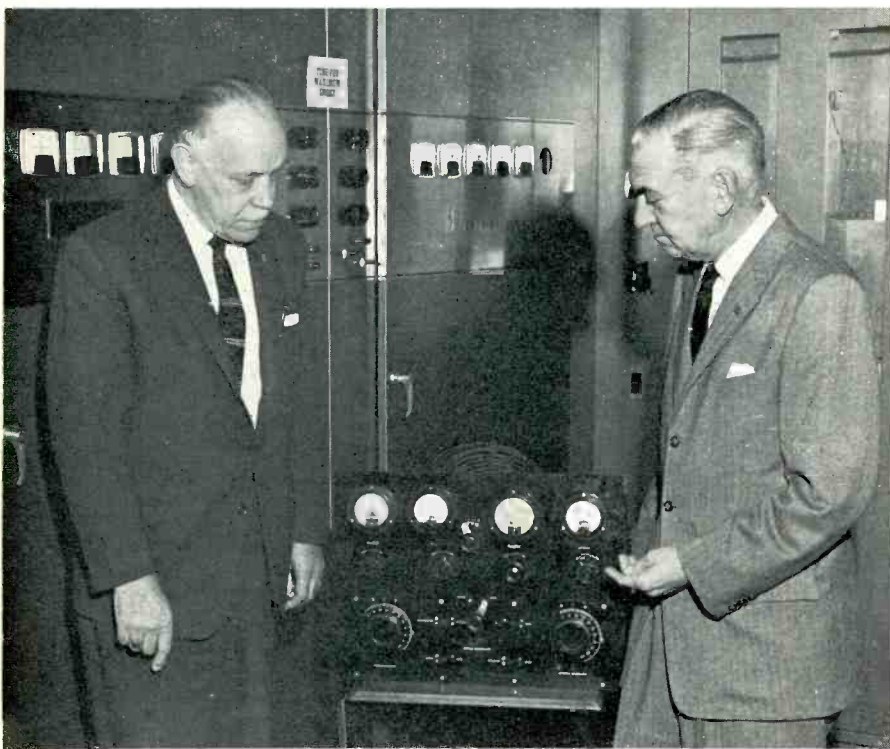
A licensed radio amateur operator for 36 years, Walker is a registered professional engineer in the District of Columbia, a senior member of the Institute of Radio Engineers, a member of the American Institute of Electrical Engineers, a member of the Society of Motion Picture and Television Engineers and an associate member of the Assn. of Federal Communications Consulting Engineers.

Boom in FM Radio Seen Continuing in 1961

Sales of FM radio sets in 1961 will be the greatest in history, exceeding by 30 to 40 per cent the estimated one million sold in 1960, Henry Fogel, president of Granco Products, Inc., predicts. Granco, located in Kew Gardens, N. Y., is a major manufacturer of American-made FM sets.

"FM radio production rose in 1960 by about 80 per cent over 1959, compared with a 10 per cent increase for all radios," Mr. Fogel said. "As more and more persons turn to high fidelity, static-free reception, we expect a big surge in the FM auto radio field. Inexpensive FM receivers now enable motorists to tune in FM as well as AM programs, and this mobile market can soon reach 100,000 sets a year.

"In addition, the industry expects the Federal Communications Commission to permit FM stereophonic broadcasting, which will certainly be one of the most significant advances in the coming year."



Bernard H. Linden, Engineer-in-Charge, Federal Communications Commission, Eleventh District, reminisces with Harold G. Peery, Engineer in Charge of the KNX-CBS Radio transmitter, on the occasion of the inspection of the new KNX transmitter plant in Torrance, Calif. They are examining the second transmitter used by KNX in 1924. Behind them is a portion of the new ultra-modern 50,000-watt General Electric transmitter installed by KNX and which went into operation Dec. 12.

NAB Committee Schedules Presiding Officers, Coordinators

The Broadcast Engineering Conference Committee of the National Assn. of Broadcasters has agreed on assignments for presiding officers and coordinators at sessions of the Conference to be held May 7-10.

The Conference is a part of the annual NAB Convention. Its sessions feature presentation of papers on technical developments in radio and television.

Presiding officers and coordinators will be:

Monday morning, May 8, session—A. Prose Walker, NAB manager of engineering, presiding officer; Warren L. Braun, assistant general manager and director of engineering, WSAV (AM-FM-TV), Harrisonburg, Va., coordinator.

Monday luncheon—Frank Marx, vice-president, American Broadcasting Co., New York, presiding.

Monday afternoon session—George W. Bartlett, NAB assistant manager of engineering, presiding officer; Benjamin E. Windle, chief engineer, WCLT (AM-FM), Newark, Ohio, coordinator.

Tuesday morning television session—J. D. Bloom, chief engineer, WWL, New Orleans, La., presiding officer; Jack Petrik, chief engineer, KETV, Omaha, Neb., coordinator.

Tuesday morning radio session—Leslie S. Learned, director of engineering, Mutual Broadcasting System, New York, presiding officer; Clure Owen, assistant to the ABC vice-president for engineering, coordinator.

Tuesday luncheon — James D. Parker, director, radio frequency engineering, CBS Television Network, New York, presiding.

Tuesday afternoon—Open to visit exhibits and hospitality suites.

Wednesday morning—Joint Engineering-Management Session.

Wednesday luncheon — Virgil Duncan, chairman of the Broadcast Engineering Conference Committee and chief engineer of Station WRAL-TV, Raleigh, presiding.

Wednesday afternoon—Andrew L. Hammerschmidt, vice-president of

engineering and facilities administration, NBC, New York, presiding; William S. Duttera, manager of allocations and engineering, NBC, New York, coordinator.

The first day of the Conference, Sunday, May 7, is open for registration and viewing of exhibits.

Crosby Urges FCC to Adopt "Inexpensive" Stereo System



Murray G. Crosby, broadcasting industry pioneer and president of Crosby-Teletronics Corp., has urged the Federal Communications Commission to adopt a system which would allow for the "inexpensive" conversion of approximately 15 million FM ra-

dios now in American homes for stereo reception.

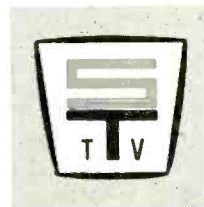
Crosby-Teletronics' stake in the matter is based upon the development by Mr. Crosby of the Crosby Compatible FM Multiplex System, which would allow the owner of an FM radio to either convert to stereo reception through the addition of an inexpensive adapter, or, if he chose not to add a multiplex stereo adapter, he would continue to receive a complete, full-range monophonic program.

The broadcasting industry veteran laid out three essentials to be considered by the FCC:

1. Will the approved system provide a range of stereophonic reception which is as close as possible to the present range of monophonic transmission?

2. Will the more than 15 million existing FM receiver owners be able to convert to stereophonic reception with the least amount of difficulty and with the most satisfactory, highest quality, results?

3. Finally, will the resultant stereophonic reception be equal to or



Let This Emblem Be Your
Assurance of

QUALITY

We invite you to compare the COST and QUALITY of other studio equipment with the complete TARZIAN line.

You, too, will see why so many station operators select TARZIAN equipment . . . known for QUALITY . . . EXCELLENT PERFORMANCE . . . AND LOW COST.

We'll welcome your inquiry. Write or call



SARKES TARZIAN INC

east hillside drive • bloomington, indiana
edison 2-7251

better than the *best* stereophonic source material now available or likely to be available in the foreseeable future?

He urged the FCC to allow the broadcaster to choose between an all-stereo operation of his station, or an all background music operation.

"With such a choice being available," Mr. Crosby said, "the broadcaster can choose the service which he feels will give him the best economic position. Natural laws will take effect such that if the public acceptance of stereo by FM is not great, the broadcaster may well decide to go to the SCA (background music or storecast) type of operation."

Bergmann Up at Collins

Glenn M. Bergmann, formerly sales director of the eastern region of Collins Radio Co., has been promoted to director of marketing of the company's Cedar Rapids division.

As director of marketing, Bergmann will be responsible for all sales and marketing aspects of Collins Cedar Rapids division. This division of Collins is primarily engaged in the design, development, manufacture and sales of aviation electronic equipment, broadcast and amateur radio equipment, industrial, military and special space communication equipment.

Bergmann has been with Collins five years and during that period has held various sales positions with the company including the management of the company's central region sales office.

Prior to joining Collins, Bergmann was associated with the Boeing Aircraft Co. During World War II he served with the Army Air Force and with the Signal Corps. The new director of marketing holds an electrical engineering degree from Kansas State University, class of 1950.

Canadian Station Increases Power

Radio Station CHVC in Niagara Falls has relocated its transmitter site and purchased a new 10,000-watt General Electric transmitter. The transmitter is remotely controlled. The new location is 10 miles south of Niagara Falls at the junction of four Welland County townships.

AMENDMENTS AND PROPOSED CHANGES OF F.C.C. REGULATIONS

PART 1—PRACTICE AND PROCEDURE Miscellaneous Amendments

1. The Commission has under consideration its notice of proposed rule making (FCC 58-619) issued in this proceeding on June 30, 1958, proposing to amend §§ 1.311, 1.312, and 1.363 of the Commission's rules to provide that whenever consideration (including an agreement for consolidation of interests) is paid or promised in connection with the default, dismissal or amendment of a broadcast application in hearing status, the applications of all parties to the agreement will be dismissed with prejudice.

2. Comments in response to the Commission's notice of proposed rule making have been filed by the Federal Communications Bar Association (FCBA); Harry J. Daley and Lenore G. Ehrig, Attorneys (Daley & Ehrig); Radio Orange County, Inc. (Radio Orange); American Broadcasting - Paramount Theatres, Inc. (ABC); the law firm of Pierson, Ball and Dowd (Pierson); and joint comments filed by KTAG Associates, Supreme Broadcasting Company, Inc., Tampa-Telecasters, Inc., Telecasting, Inc., Television Broadcasters, Inc., Tele-Views News Company, Inc., and WJPB-TV, Inc. (KTAG Group).

3. On September 13, 1960, the President signed Public Law No. 86-752, 86th Congress, 2d Session, which, inter alia, amends the Communications Act by adding a new subsection providing:

Sec. 311.

* * * * *

(c) (1) If there are pending before the Commission two or more applications for a permit for construction of a broadcasting station, only one of which can be granted, it shall be unlawful,

without approval of the Commission, for the applicants or any of them to effectuate an agreement whereby one or more of such applicants withdraws his or their application or applications.


(2) The request for Commission approval in any such case shall be made in writing jointly by all the parties to the agreement. Such request shall contain or be accompanied by full information with respect to the agreement, set forth in such detail, form, and manner as the Commission shall by rule require.

(3) The Commission shall approve the agreement only if it determines that the agreement is consistent with the public interest, convenience, or necessity. If the agreement does not contemplate a merger, but contemplates the making of any direct or indirect payment to any party thereto in consideration of his withdrawal of his application, the Commission may determine the agreement to be consistent with the public interest, convenience, or necessity only if the amount or value of such payment, as determined by the Commission, is not in excess of the aggregate amount determined by the Commission to have been legitimately and prudently expended and to be expended by such applicant in connection with preparing, filing, and advocating the granting of his application.

(4) For the purposes of this subsection an application shall be deemed to be "pending" before the Commission from the time such application is filed with the Commission until an order of the Commission granting or denying it is no longer subject to rehearing by the Commission or to review by any court.

4. The new provisions of the Act indi-

MULTIPLEX SUBCARRIER GENERATORS



High Performance
Low Cost

WRITE for complete engineering data and price information

MOSELEY ASSOCIATES

REMOTE CONTROL SYSTEMS • MULTIPLEX EQUIPMENT

P.O. BOX 3192
Santa Barbara, Calif.
WOODLAND 7-1469

cate Congressional concern with the possible abuses which may stem from agreements designed to eliminate conflicts between applicants for broadcast facilities. It is clearly the Congressional intent that the Commission examine such agreements on a case-by-case basis to determine whether or not their effectuation would serve the public interest.

5. We are therefore adopting rules which are designed (a) to insure that the Commission is apprised of all agreements between applicants whereby it is proposed to remove a conflict between mutually exclusive applications for broadcast facilities, and (b) to elicit full information concerning any such agreements, so as to enable the Commission to determine whether their effectuation would serve the public interest. Specifically, we are adopting a new section of the rules (§ 1.316)² which will require that:

(a) Applicants entering into an agreement which would result in removing a conflict between two or more pending² applications for a broadcast facility must file with the Commission a joint request for approval of such agreement. Each applicant party to the agreement shall also file an affidavit setting forth full factual details concerning the agreement and any consideration which has been paid or promised in connection therewith; and

(b) In those cases where a joint request for approval of an agreement has not been filed:

(1) Any applicant for broadcast facilities seeking to amend or dismiss a pending application must file an affidavit as to whether or not he has received or been promised consideration where the effect of the amendment or dismissal would be to remove a conflict with another application.

(2) Any applicant in a hearing concerning whose application a conflict would be removed by the requested amendment or dismissal of another application, or by dismissal of another application for failure to prosecute, must file an affidavit stating whether or not he has paid or promised to pay consideration for such amendment or dismissal.

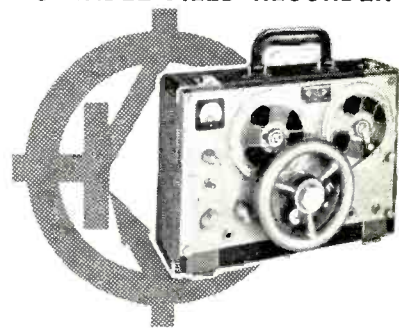
6. In addition, § 1.316 retains the existing requirements of the rules that, after designation for hearing, an applicant seeking to amend an application, the granting of which would permit a grant of the amended application, or seeking to dismiss an application without prejudice, must, regardless of whether the amendment or dismissal would remove a conflict with another application, file an affidavit stating whether or not he has received or been promised consideration. Retention of those requirements is considered desir-

able since the payment of consideration in such circumstances may raise serious public interest considerations despite the fact that conflicting applications are not involved.

7. We are of the opinion that in cases of agreements resolving conflicts while applications are in hearing status, the initial consideration of such agreements should be made by the Chief Hearing Examiner, who will be in a position to adduce such further evidence as may be necessary to determine whether they are consistent with the public interest. We are therefore amending § 1.363 of the rules to provide for such initial consideration of compromise agreements by the Chief Hearing Examiner.

8. The amended § 1.363 also provides that where further hearing is not required on other issues the Chief Hearing Examiner will prepare an opinion terminating the proceeding, setting forth his ruling on the agreement and making appropriate disposition of all applications. We believe such a procedure will expedite the disposition of such cases, and is consistent with the requirement of section 409(b) of the Act that the officer conducting an adjudicatory hearing shall prepare and file an initial decision. This procedure will apply only when it is evident that approval of the agreement will render moot the issues specified by the Commission for the hearing examiner to determine. Moreover, the question of whether an agreement between the parties meets the requirements of section 311(c) of the Act would not be within the scope of the issues originally specified, and we are specifically delegating to the Chief Hearing Examiner the authority to determine that question. In addition, we are specifically delegating to the Chief Examiner the authority to terminate the proceeding and to make appropriate disposition of all applications. (The Commission is today adopting an Order delegating this authority to the Chief Hearing Examiner.) However, if further hearing on other issues is required, the Chief Hearing Examiner will prepare a Memorandum Opinion limited to setting forth his ruling on the agreement. In any case, the ruling of the Chief Hearing Examiner will become final unless one of the parties takes an appeal to the Commission or the Commission reviews the ruling on its own motion. To avoid undue delay, the rules provide that where further hearing is required on issues unrelated to the agreement, the hearing will continue on such other issues before the hearing examiner designated while the agreement is being reviewed. However, the hearing examiner is directed not to close the record until final action is taken on the agreement.

New TransMagnetite[®] Professional Transistorized Battery-Operated Spring-Motor PORTABLE FIELD RECORDER



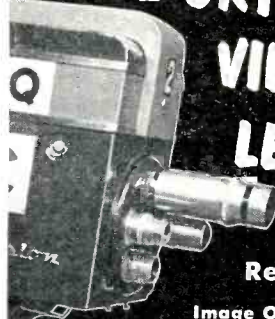
Check These Unusual Features:

- ✓ Low noise input stage (0.25 microvolts).
- ✓ Overall Gain 110 db.
- ✓ No Microphonics or motor noises.
- ✓ Uses Dry Rechargeable batteries.
- ✓ Batteries last 125 hours.
- ✓ Modular plug-in construction.
- ✓ Exceeds NARTB Broadcast standards.
- ✓ Size: 11 x 10 x 7 inches—Weight: 15 lbs.
- ✓ Full unconditional Two Year Guarantee.

Write for complete information and direct factory prices to Dept. BE:

AMPLIFIER CORP. of AMERICA
398 Broadway, N. Y. 13, N. Y.

Off-The-Shelf Delivery! IMAGE-ORTHICON, VIDICON LENSES



Rent or Buy

Image Orthicon Lenses from World's Greatest Selection . . . choose from 28mm focal length to 60" . . . delivered right "Off-The-Shelf" at B & J World's Lens Headquarters!

Here, you'll find the lens you need for practically ALL T.V. Cameras, R.C.A. (TK-41, TK-11); G. E. Black and white or color; Du Mont, etc.! Rely on the Industry's Prime Optics-Source . . . Pioneers in T.V. Optics Since 1936 and currently serving such stations as WGN, WNBQ, ETC.

Our Instrument Shops and "Know-how" offer you Special Mountings, Calibration and Custom Fittings! (Also Cine & Slide Equipment for your News Dept.!)

Write for New T.V. Optics Catalog.

BURKE & JAMES, INC.
321 S. Wabash, Chicago 4, Ill.

9. The amended § 1.363 also takes specific note of those cases where a conflict between applications would be removed by an agreement to file an engineering amendment to an application. Where such an agreement is approved and the amendment is accepted, the new rule specifically provides that the amended application will be removed from hearing status and returned to the processing line. This is in accord with past Commission procedure in such cases.

10. We are of the opinion that the rules we are now promulgating will provide the Commission with the information needed to determine whether agreements between parties which resolve conflicts will, in fact, serve the public interest. In particular, we believe the rules will be of significant assistance in curbing so-called "strike applications" and other abuses of the Commission's processes. We have also considered the various other proposals and suggestions advanced by the parties in this proceeding and have concluded that the public interest would not be served by their adoption at this time. However, we shall continue to review the operation of the rules we are adopting, as well as the possible need for additional rules to curb abuses not within the scope of these rules.

11. In view of the foregoing: *It is ordered*, Pursuant to the authority of sections 4(i), 303 (r), 308 and 311(e) of the Communications Act of 1934, as amended, that effective February 20, 1961, Part 1 of the Commission's rules and regulations is amended as set forth below.

1. Section 1.311 of the Commission's rules is amended to read as follows:

§ 1.311 Amendment of applications.

(a) Subject to the provisions of §§ 1.316 and 1.359, any application may be amended as a matter of right prior to the adoption date of an order designating such application for hearing, merely by filing the appropriate number of copies of the amendments in question duly executed in accordance with § 1.303. However, see § 1.354 (h) for the effect of certain amendments to standard broadcast applications.

(b) Requests to amend an application after it has been designated for hearing will be considered only upon written petition properly served upon the parties of record in accordance with § 1.56 and, where applicable, compliance with the provisions of § 1.316, and will be granted only for good cause shown. In the case of requests to amend the engineering proposal in standard broadcast applications (other than to make changes with respect to the type of equipment specified), good cause will be considered to have been shown only

if, in addition to the usual good cause considerations, it is demonstrated that (1) the amendment is necessitated by events which the applicant could not reasonably have foreseen (e.g., notification of a new foreign station or loss of transmitter site by condemnation); (2) the amendment could not reasonably have been made prior to designation for hearing; and (3) the amendment does not require an enlargement of issues or the addition of new parties to the proceeding.

(c) Notwithstanding the provisions of paragraph (b) of this section, and subject to compliance with the provisions of § 1.316, a petition for leave to amend may be granted provided it is requested that the application as amended be removed from the hearing docket and returned to the processing line. See § 1.354 (g).

2. Section 1.312 is amended to read as follows:

§ 1.312 Dismissal of applications.

(a) Subject to the provisions of § 1.316, any application may, upon request of the applicant, be dismissed without prejudice as a matter of right prior to the designation of such application for hearing. An applicant's request for the return of an application that has been accepted for filing will be regarded as a request for dismissal.

(b) Failure to prosecute an application, or failure to respond to official correspondence or request for additional information, will be cause for dismissal. Subject to the provisions of § 1.316, such dismissal will be without prejudice where an application has not yet been designated for hearing, but may be made with prejudice after designation for hearing.

(c) Requests to dismiss an application without prejudice after it has been designated for hearing will be considered only upon written petition properly served upon all parties of record and, where applicable, compliance with the provisions of § 1.316, and will be granted only for good cause shown.

3. New § 1.316 is added as follows:

§ 1.316 Agreements between parties for amendment or dismissal of, or failure to prosecute broadcast applications.

(a) Whenever applicants for a construction permit for a broadcast station enter into an agreement to procure the removal of a conflict between applications pending before the Commission by withdrawal or amendment of an application or by its dismissal pursuant to § 1.312, all parties thereto shall, within five days after entering into the agreement, file with the Commission a joint request for approval of such agreement. The joint request shall be accompanied by a copy of the agreement and an affidavit of each party to the agreement setting forth in full all relevant facts

including, but not limited to: (1) The exact nature of any consideration (including an agreement for merger of interests) promised or paid; (2) information as to who initiated the negotiations; (3) summary of the history of the negotiations; (4) the reasons why it is considered that the arrangement is in the public interest; and (5) a statement fully explaining and justifying any consideration paid or promised. The affidavit of any applicant to whom consideration is paid or promised shall, in addition, include an itemized accounting of the expenses incurred in connection with preparing, filing and advocating his application, and such factual information as the parties rely upon for the requisite showing that such reported expenses represent legitimate and prudent outlays. No such agreement between applicants shall become effective or be carried out unless and until the Commission has approved it, or until the time for Commission review of the agreement has expired.

(b) (1) Except where a joint request is filed pursuant to paragraph (a) of this section, any applicant filing (i) an amendment pursuant to § 1.311 (a) or a request for dismissal pursuant to § 1.312 (a) which would remove a conflict with another pending application; (ii) a petition for leave to amend pursuant to § 1.311 (b) or § 1.311 (c) which would permit a grant of the amended application or an application theretofore in conflict with the amended application; or (iii) a request for dismissal pursuant to § 1.312 (c), shall file with it an affidavit as to whether or not consideration (including an agreement for merger of interests) has been promised to or received by such applicant, directly or indirectly, in connection with the amendment, petition or request. Upon the filing of a petition for leave to amend or to dismiss an application for broadcast facilities which has been designated for hearing or upon the dismissal of such application on the Commission's own motion pursuant to § 1.312 (b), each applicant or party remaining in hearing, as to whom a conflict would be removed by the amendment or dismissal shall submit for inclusion in the record of that proceeding an affidavit stating whether or not he has directly or indirectly paid or promised consideration (including an agreement for merger of interests) in connection with the removal of such conflict.

(2) Where an affidavit filed pursuant to this paragraph states that consideration has been paid or promised, the affidavit shall set forth in full all relevant facts, including, but not limited to, the material listed in paragraph (a) of this section for inclusion in affidavits.

(c) (1) Affidavits filed pursuant to this section shall be executed by the applicant, permittee or licensee, if an individual; a partner having personal knowledge of the facts, if a partnership; or an officer having personal knowledge of the facts, if a corporation or association.

(2) Requests and affidavits which relate to an application which has not been designated for hearing shall bear the file number of such application. If the affiant is also an applicant, the affidavit shall also bear the number of affiant's pending application(s). Affidavits which relate to an application which is designated for hearing shall bear the file number of that application and the hearing docket number.

(d) For the purposes of this section an application shall be deemed to be "pending" before the Commission and a party shall be considered to have the status of an "applicant" from the time an application is filed with the Commission until an order of the Commis-

sion granting or denying it is no longer subject to rehearing by the Commission or to review by any court.

4. Delete paragraphs (b) and (c), redesignate paragraph (d) as paragraph (c), and add a new paragraph (b) to § 1.363, as follows:

§ 1.363 Retention of applications in hearing status after designation for hearing.

* * * * *

(b) Where any applicants for a broadcast facility file a request pursuant to § 1.316 (a) for approval of an agreement to remove a conflict between their applications, the applications will be retained in hearing status and the Chief Hearing Examiner shall determine, after taking such further evidence as may be necessary, whether the agreement is consistent with the public interest, convenience, or necessity. The Chief Hearing Examiner shall prepare a Memorandum Opinion and Order setting forth his ruling on the Agreement and the reasons therefor.

(1) If further hearing is not required

on issues other than those arising out of the agreement, the Chief Hearing Examiner should, in the Memorandum Opinion and Order, terminate the proceeding and make appropriate disposition of all applications.

(2) Any Memorandum Opinion and Order issued pursuant to this paragraph shall become final unless any of the parties takes an appeal to the Commission within 10 days after its public release or unless the Commission, by order issued within 20 days after the time for filing an appeal expires, provides that the Memorandum Opinion and Order shall not become final, and that it shall be further reviewed or considered by the Commission.

(3) Where further hearing is required on issues unrelated to the agreement, the hearing examiner shall continue to conduct the hearing on such other issues pending final action on the agreement, but the record in the proceeding shall not be closed until such final action on the agreement has been taken.

(4) In any case where a conflict between applications will be removed by an agreement for an engineering amendment to an application, the amended application shall be removed from hearing status upon final approval of the agreement and acceptance of the amendment.

Product News



TWIN EIGHT-INCH MONITOR

Miratel, Inc., 1080 Dionne St., St. Paul, Minn., is offering a twin TV monitor which fits a standard 19-inch rack mounting. It is 8¾ inches high.

AMPEREX ANNOUNCES NEW CONDENSED TUBE CATALOG

Amperex Electronic Corp. announces a new, 25-page, condensed tube catalog. Free copies may be obtained by writing on company stationery to: Amperex Electronic Corp., Advertising Department, 230 Duffy Ave., Hicksville, Long Island, N. Y.

The catalog contains descriptions and basic specs on the full line of Amperex Tubes, consisting of: cold cathode trigger tubes, entertainment and audio tubes, ignitrons, indicator tubes, klystrons, magnetrons, noise diodes, power tubes, photomultiplier tubes, "Premium Quality" (PQ) tubes, radiation counter tubes, rectifier diodes, subminiature tubes, thyratrons (hydrogen, mercury vapor and inert gas types), traveling wave tubes, UHF special purpose tubes, and voltage reference and regulator tubes.

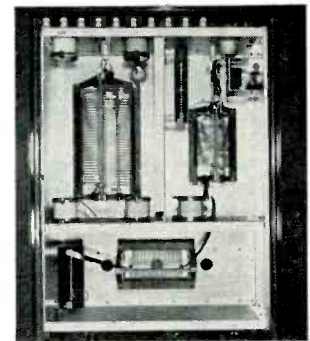
GPL OFFERS TAPE TO FILM TRANSFER INFORMATION

A four-page illustrated brochure offered by GPL Division, 63 Bedford Road, Pleasantville, N. Y., outlines new developments in video recording technique. It covers tape to film transfer and other features.

Advertisers' Index

Altec Lansing Corp.	22
Ampex Professional Products Co.	
Audio Div.	9
Video Div.	27
Amplifier Corp. of America	37
Bauer Electronics Corp.	33
Blonder-Tongue Laboratories	19
Burke & James, Inc.	37
Commercial Radio Monitoring Co.	40
Continental Electronics Mfg. Co. ...	39
Continental Mfg. Co.	3
Crown International Div.	32
Electro-Voice, Inc.	23
Ford, Paul Dean	40
Foto-Video Electronics, Inc.	IFC
General Electric Co.	4-5
General Electrodynamics Corp. ...	13
Haskett & Volkman	40
Hermes Electronic Co.	28
Johnson Electronics	25
James, Vir N.	40
Jampro Antenna Co.	33
Kahn Research Laboratories, Inc. ...	26
Moseley Associates	36
Peerless Electrical Products Div. ...	22
Radio Corp. of America	1, BC
Raytheon Co.	17
Rohn Systems, Inc.	32
Sarkes Tarzian, Inc.	35
Superscope, Inc.	26
Telechrome Mfg. Corp.	IBC
University Loudspeakers	24
Visual Electronics Corp.	40
Vitro Electronics, Inc.	29

Continental's TYPE 314D 1 KW AM TRANSMITTER COMPLETELY SHIELDED RF COMPONENTS



Maximum accessibility with front and rear doors. RF Components are completely shielded in aluminum enclosure. Built-in phantom antenna and transmission line RF ammeter.

write for details and competitive pricing

Continental Electronics

MANUFACTURING COMPANY

4212 South Buckner Blvd. Dallas 27, Texas

Ⓜ SUBSIDIARY OF LING-TEMCO ELECTRONICS, INC.

Product News



BROADCAST STUDIO LINE AMPLIFIER

Alma Engineering, San Diego, has introduced Model 200 Line Amplifier, offering impressive response and distortion characteristics. This unit has frequency response within ± 0.5 db from 20 to 20,000 cps. Total harmonic distortion does not exceed 0.080 per cent at any test frequency from 20 to 20,000 cps, measured at +28 dbm output. Hum and noise are 70 db below +8 dbm.

Designed primarily for the FM broadcasting and recording industries, Model 200 exceeds all NAB specifications. The amplifier uses silicon diode rectifiers, Mylar capacitors and features modular construction.

For further information write Alma Engineering, 901 West Washington St., San Diego 3, Calif.

TOWER ERECTION SERVICE

Rohn Systems, Inc., announces a new tower erection service for companies and organizations that need the erection of complete towers and tower systems for com-

munication and industrial purposes. The company has assembled a nationwide network of local, independent tower erector specialists.

Further details on the new tower erection service may be had by contacting Rohn Systems, Inc., 6718 West Plank Road, Peoria, Ill.

NEW INSTRUMENT TUBES BROCHURE

A new Instrument Tubes brochure has just been announced by CBS Electronics, manufacturing division of the Columbia Broadcasting System. The eight-page booklet describes characteristics and uses for CBS Instrument Tubes which are manufactured specifically for instrument manufacturers.

The brochure also describes CBS frame grid tubes and CBS secondary emission tubes which are a part of the new Instrument Tube line.

Identified as bulletin PA-391, it can be obtained by writing on your company letterhead to CBS Electronics, Technical Information Services, 100 Endicott St., Danvers, Mass.

AUTOMATIC TIME ELEMENT COMPENSATOR

Ampex has recently announced the Autotec which automatically eliminates geometrical distortion in television recording. The Autotec measures the arrival time of each successive picture line and automatically inserts ore, removes time delay as necessary so that the picture elements on the viewing monitor are transmitted in perfect alignment. Without the unit long vertical objects could occasionally appear slightly distorted. Intersplicing of tapes is improved by the device since it will no longer be necessary during playback for an operator to readjust guide heights or tip penetration when passing from one tape to another at a splice joint, according to Ampex officials. The Autotec was developed by Charles H. Coleman, a Columbia Broadcasting System engineer.

Classified

Advertising rates in the Classified Section are ten cents per word. Minimum charge is \$2.00. Blind box number is 50 cents extra. Check or money order must be enclosed with ad.

EQUIPMENT FOR SALE

Brand new dehydrators, with spare parts kit. Take your pick of Dielectric Products Model 22 for \$150 or Andrews 1910 for \$135. P & O Sales, 1236 - 40th Avenue, Sacramento 20, California. 1-61 3t

Commercial Crystals and new or replacement crystals for RCA, Gates, W. E. Bliley and J-K holders; regrounding, repair, etc. BC-604 crystals. Also A.M. monitor service. Nation-wide unsolicited testimonials praise our products and fast service. Eidson Electronic Company, Box 31, Temple, Texas. 12-60 tf

Gates turn-table, studio console, over-head center drive lead screw for cutting records, RCA cutting-head. Also, Presto 1C cutting-head. Universal Recording Service, Osceola Indiana. 3-61 1t

Presto RC-7(2) decks with 900-A3 pre-amp and p/s with switch for continuous or selective recording-playback. Excellent condition, \$550 complete. Also, R-11 deck, \$200; 10-24 deck \$300. Custom Sound Studios, 1563 Sherman, Evanston, Illinois. 3-61 1t

FOR SALE—EQUIPMENT Harkins Multiplex Equipment: FME-50 exciter with full frequency output. SCT-2 dual-subchannel generator for 49 kc and 67 kc. In good operating condition. Sub-channel generators have modulation and frequency monitors with each. \$1500 FOB. Charles Balthrope, KEEZ, Tower Life Building, San Antonio, Texas. 3-61 2t

New TV camera tubes—6198 or 5527—\$50.00. Alfred C. Denson WIBYX, P. O. Box No. 122, Rockville, Conn. 3-61 3t

HELP WANTED

Major TV and FM Transmitter Manufacturer seeking representatives to sell TV and FM Transmitters to the Broadcast Industry. Only those selling to the Broadcast Industry with companion items need apply. Good opportunity! Broadcast Engineering, Dept. 76, Kansas City 5, Mo. 2-61 2t

BUY, SELL OR TRADE

BUY — SELL — TRADE — Cameras, Lenses, Telescopes, Amateur Radio Equipment. Denson Electronics, Box No. 85, Rockville, Conn. 3-61 3t

BROADCAST ENGINEERING

TELEVISION AND BROADCAST EQUIPMENT MARKETING

Career opportunity with International Division of a major electronics company located in northern New Jersey.

Marketing and sales experience including preparation of technical proposals, determination of product requirements and coordination with distributor and field personnel plus strong technical background essential.

For a confidential interview submit resume to:

BROADCAST ENGINEERING
Dept. BE-78 Kansas City 5, Missouri

Professional Services

PAUL DEAN FORD

Broadcast Engineering Consultant

4341 South 8th Street Wabash 2643
TERRE HAUTE, INDIANA

VIR N. JAMES

Specialty
Directional Antennas

232 S. JASMINE DEExt 3-5562
DENVER 22, COLORADO

HASKETT & VOLKMAN

BROADCAST CONSULTANTS

7265 Memory Lane, Cincinnati 39, Ohio
WEBster 1-0307

Precision Frequency Measurements
AM-FM-TV

COMMERCIAL RADIO MONITORING CO.

103 S. MARKET ST. LEE'S SUMMIT, MO.
Phone Kansas City, LA. 4-3777

Spotmaster

NO. 1

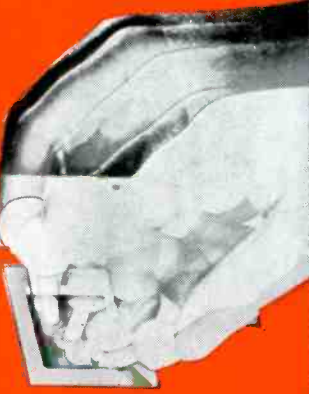
In Cartridge Tape Equipment
SEE THE NEW SPOTMASTER 500
A complete Tape Cartridge Self-cuing,
Record Playback Combo Unit.
For Details or Demonstration, Write

VISUAL ELECTRONICS, CORP.

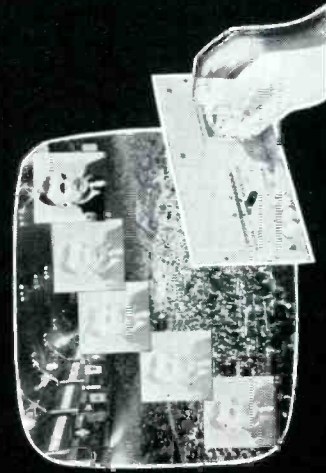
356 W. 40th St., New York 18, N. Y.

NEW-FOR YOUR VIEWERS AND ADVERTISERS

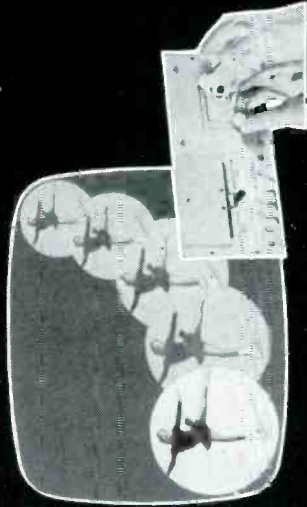
**The Only
Special Effects
Generator...**



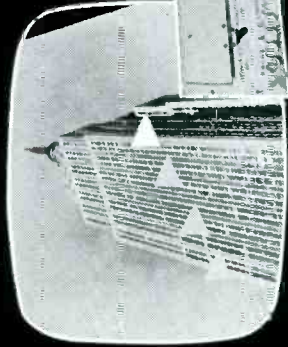
**...with "Joy-Stick"
Positioner and
Built-In Fader**



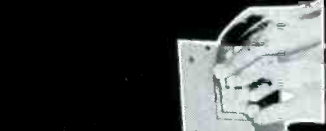
Insert May be Placed at Any Position on Raster



Electronic Spotlight



Electronic Pointer



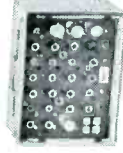
Add Motion to Standard Wipes

Now, You Can Offer Your Advertisers the Newest Facilities and Your Viewers the Most Varied Programming

First Telechrome provided broadcasters with a vastly improved system for producing a wider variety of dramatic wipes, inserts, keying and other special effects. Now Telechrome engineering introduces the "Joy-Stick" Positioner and built-in fader. It is now possible to create many hundreds more effects and to move wipes, inserts, keying or other special effects to any place on the TV screen for truly dramatic programming. And the added versatility provided by the built-in fader gives you a complete Special Effects Center in one integrated system. Now Telechrome puts right at your fingertips extra audience and advertiser impact. Ask for a demonstration today!



490WA1 Waveform generator. Generates keying signals for the 72 different plotted keying waveform.



490SA1 Switching Amplifier. Combines two picture signals in accordance with applied keying waveform.



490RA1 Remote Control Unit. Selects and controls desired effect. Designed for console or desk mounting. Easily modified for integration into existing studio facilities. Complete with power supply—Model 512C1.

Available Portable or Rack Mounted

COLOR TV • INDUSTRIAL INSTRUMENTATION • TELEMETRY



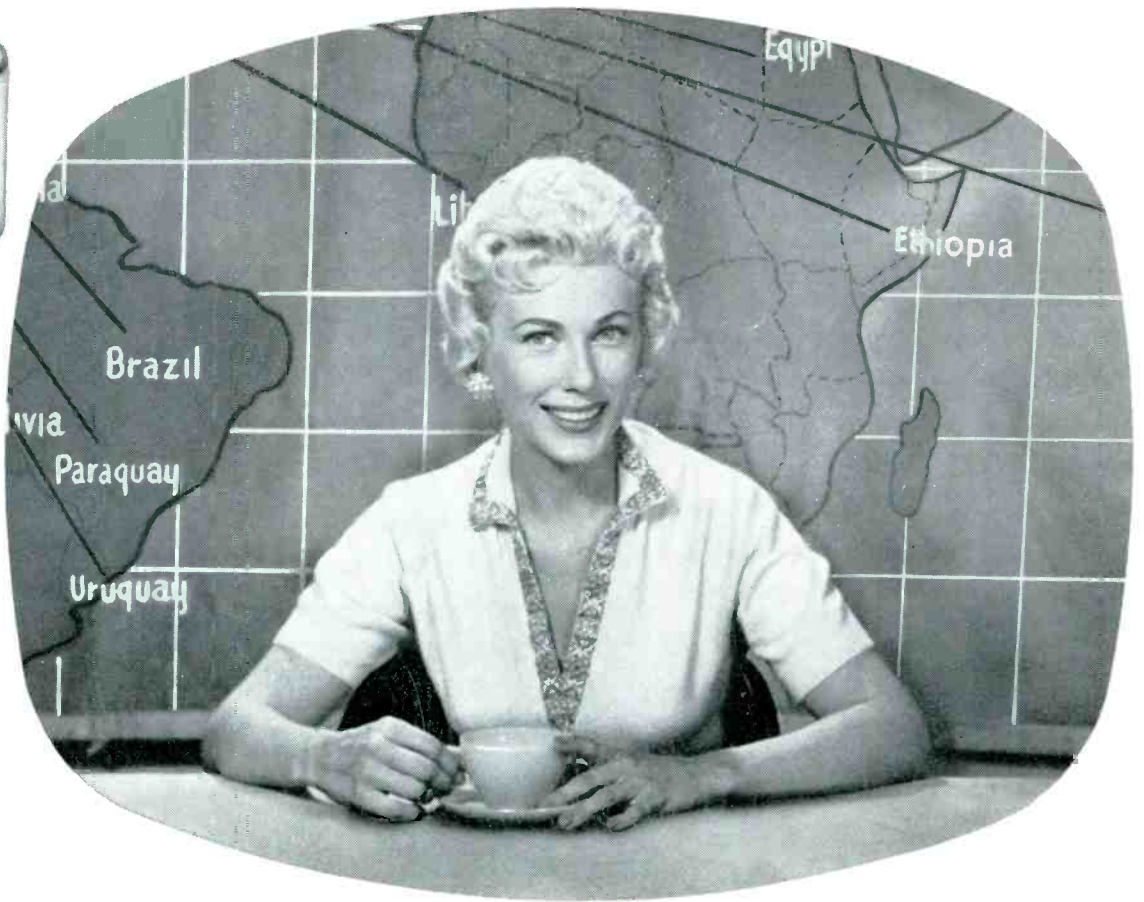
TELECHROME MANUFACTURING CORP.
28 RANICK DRIVE • AMITYVILLE, N.Y.
Lincoln 1-3600

Cable Address: COLORTV
TWX: AMITYVILLE NY2314

AT THE FRONTIERS OF ELECTRONICS

WESTERN ENGINEERING DIVISION • 13635 Victory Blvd., Van Nuys, Calif., State 2-7479
MIDWESTERN ENGINEERING DIVISION • 106 W. St. Charles Rd., Lombard, Ill., Mayfair 7-6026
SOUTHWESTERN ENGINEERING DIVISION • 4207 Gaston Ave., Dallas, Tex., Taylor 3-3291

TELECHROME



NEW RCA 7293-A FIELD-MESH IMAGE ORTHICON

*prevents
highlight "ghost"
and "portholing"*



You'll be amazed at the picture quality you get with the new RCA 7293-A! A unique combination of design features provides a picture that is essentially free of distortion and free of shading at the sides and corners of the screen. In addition, the tube effectively suppresses objectionable "highlight ghost"—an effect usually encountered when a light subject is televised against a dark background.

The 7293-A offers many design advantages:

ANTI-GHOST DESIGN. "Ghost" (or highlight flare) is prevented when the tube is operated well "above the knee" in black-and-white cameras.

ANTI-PORTRHOLE DESIGN. Tube provides uniform background right to edge and corners of picture! Suppressor grid in electron gun re-shapes focusing field to produce a blemish-free background.

EXTREME PHOTOSENSITIVITY. Equivalent to film rated ASA 8,000! Only 10 foot-candles of incident light are required to produce commercially acceptable pictures!

HIGH SIGNAL-TO-NOISE RATIO. Low noise component—another benefit of the suppressor grid.

HIGH RESOLUTION AND CONTRAST. Inherent high resolution and high contrast enhanced by use of field mesh resulting in razor-sharp transition from black to white and improved corner focus.

HIGH SIGNAL-CURRENT OUTPUT. Due to extremely high photosensitivity and high-gain multiplier. For full information on the RCA 7293-A—the camera tube that represents a major step forward in camera pick-up—write Commercial Engineering, RCA Electron Tube Division, Harrison, N. J. For prompt tube delivery for your station operation, call your RCA Industrial Tube Distributor.



The Most Trusted Name in Electronics
RADIO CORPORATION OF AMERICA