NOVEMBER, 1960

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BROADCAST ENGINEERING

THE TECHNICAL JOURNAL OF THE BROADCAST INDUSTRY

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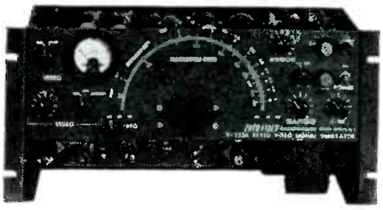

V-233 KEYED COMPOSITE VIDEO SIGNAL GENERATOR

- The Foto-Video V-233 Keyed-Video and Window Generator is a complete instrument, excellent for rapid studio, microwave and transmitter frequency response, and differential gain-phase measurements.
- Provides quick resolution and response data on monitors, both picture or waveform—checks TV receivers.
- Window signal covers extremely-low frequencies; phase-locked sine wave covers the 90 kc to 10 mc range.
- External RETMA or internal blanking and sync keyed-in forms composite output with video consisting of internal phase-locked sine wave or window, or externally-generated sweep, stairstep or sawtooth.
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- The V-24 Monoscope Camera is a quality instrument employing the latest techniques in the art.
- Standard Indian Head tube, EIA resolution or other pattern may be had on order. No change in circuitry is needed.
- Careful design assures high-definition picture over entire pattern.
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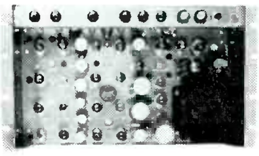
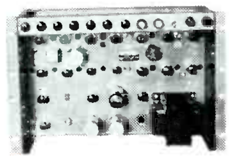


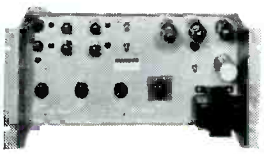
V-45 STAIR STEP LINEARITY CHECKER

- The V-45 Stairstep Linearity Checker may be used to test amplitude linearity or Gamma of an amplifier, camera chain, microwave link, a transmitter, or a whole system. • Stairstep signal is of 8 to 15 equal amplitude steps. • May be adjusted for logarithmic spacing.
- Sync provided from an internal 15.75 kc sync pulse generator or from an external 15.75 kc drive signal.
- Duty cycle or APL may be varied continuously—10% to 90%.
- Basic unit for 2 mc and 3.58 mc differential tests.
- Sensitive measurement of nonlinearity in amplitude and phase as a function of level through insertion of small sinusoidal signal at frequency of interest.



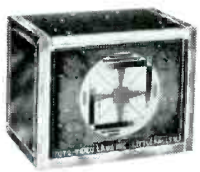
V-6 TV-RADIO BAR-DOT GENERATOR

- The Foto-Video V-6 TV-Radar Bar-Dot Generator produces black or white dot or bar patterns against contrasting backgrounds.
- Checks linearity of monitors or receivers; may be used to adjust convergence in color kineoscopes.
- Frequency and phase controls makes possible linearity adjustments of radar systems using scan conversion.
- Phase locks over wide range, providing for linearity tests in slow scan, EIA, or high resolutions from 405 to 1021 lines.
- Video and sync levels independently adjustable.
- Small or large dot-bar sizes (1/16" or 3/16" on 14" picture monitor).
- Built-in electronically-regulated power supply.
- Only unit with phase positioning both horizontally and vertically.



V-21 DIFFERENTIAL TEST SET

- The V-21 Differential Test Set is useful in checking gain and phase at color sideband frequencies, revealing picture defects causes.
- Knowledge of differential gain and phase throughout the band aids in localizing equipment responsible and in determining what safety factors exist in meeting specifications at 3.58 mc.
- Useful range (frequency) is 100 kc to 4.5 mc.
- Continuously variable delay line, 0 to 50 millimicroseconds.
- Step delay line, 250 millimicroseconds in 10 steps.
- Built-in DC regulated power supply.



F-101 TV LIGHT BOX

- The F-101 TV Light Box is useful in setting up and aligning or testing TV cameras, including image orthicons, vidicons and color, using 8" x 10" transparencies provided by Foto-Video.
- Built-in illumination uniform over entire pattern.
- Ideal color temperature for both color and monochrome models.
- Used by more than 200 TV stations and laboratories.
- Saves time in camera setup and insures uniform performance from all cameras.

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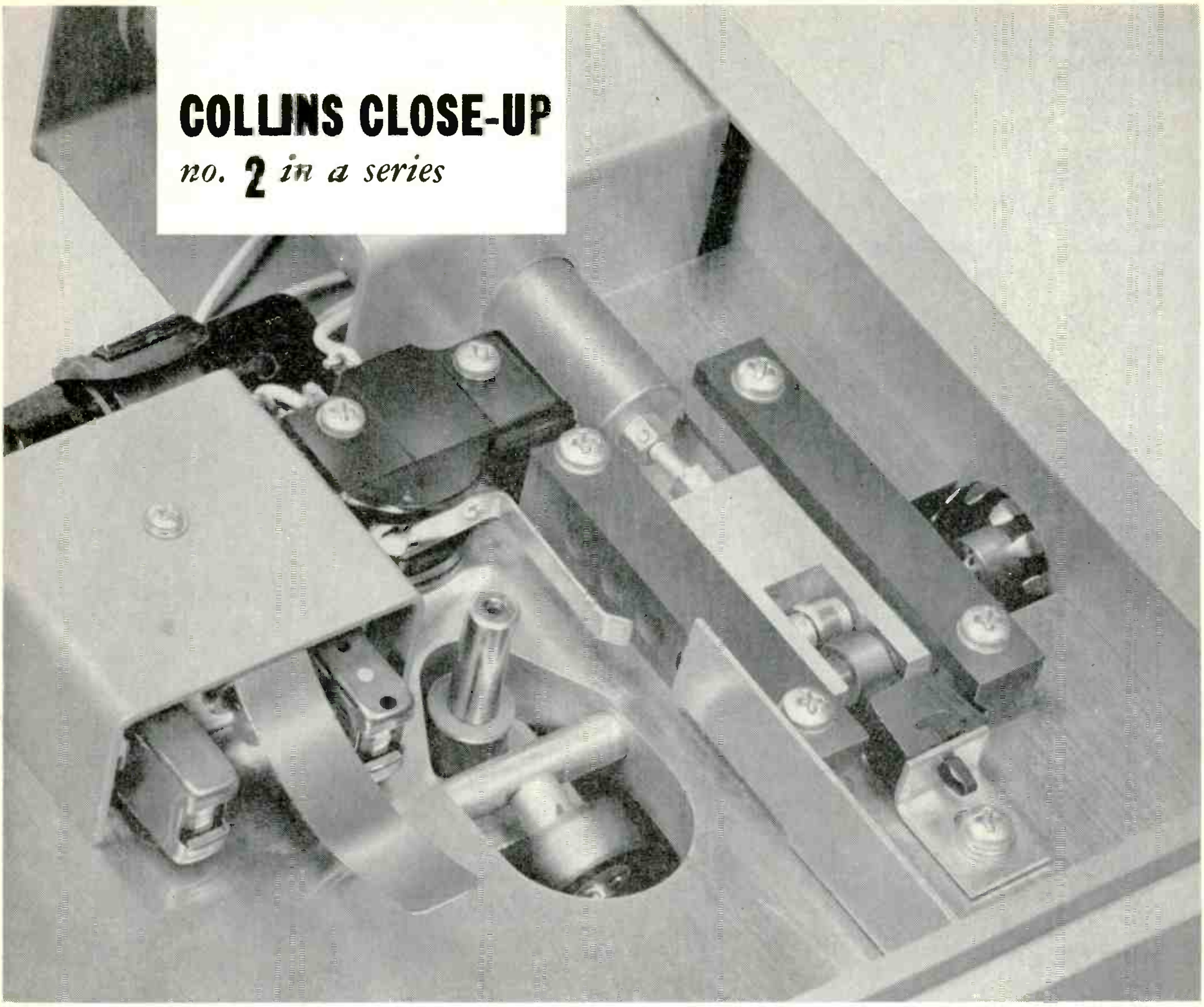
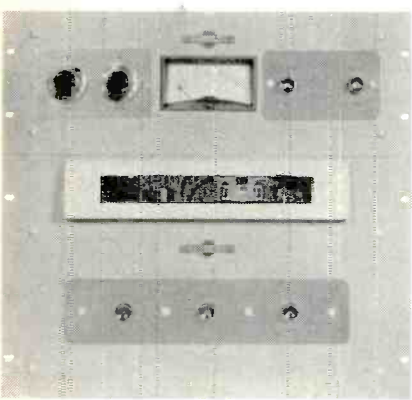
COLLINS CLOSE-UP

no. **2** *in a series*



COLLINS – UNMATCHED IN QUALITY AND PRECISION



This is a close-up of the action center in Collins automatic tape programming equipment. This assembly is representative of the entire system: its quality and precision are unmatched by any similar equipment on the market today. Collins was first with automatic tape programming equipment; Collins has installed more units than any other two manufacturers combined; and extensive experimentation and tests were made to produce the most advanced design available today.

Examine the above photograph of the record/playback assembly. Sturdy guides keep the endless tape cartridge firmly in place on the machined, cast aluminum deck. The tape moves through the pressure roller, which pivots from below the deck surface. The roller resists wear and does not stretch or ruffle the tape passing between it and the capstan.

A heavy duty solenoid, with a test history of 2-million activations without showing any appreciable wear, pulls the pressure roller linkage system smoothly along two highly polished nylon tracks.

The precision capstan and its balanced, solid brass flywheel assure quality reproduction. The tape moves through the unit at 7½ inches per second with 99.6% accuracy and with less than 0.2% wow and flutter.

Collins automatic tape programming equipment is designed with complete automation in mind. Sequencing of multiple playback units and remote operation are built-in features.

You are assured of unmatched quality with Collins automatic tape programming equipment. Ask your Collins broadcast sales engineer for a complete description and demonstration. See why Collins is the indisputable leader in automatic tape programming.

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BROADCAST ENGINEERING

THE TECHNICAL JOURNAL OF THE BROADCAST INDUSTRY

VOLUME 2 NOVEMBER, 1960 NUMBER 11

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Departments

Cover Story

In this issue the new facilities of WJXT, Jacksonville, Fla., are described. The station has expanded five times since its founding in 1949 and now occupies a building which incorporates the most modern design in construction and technical equipment.

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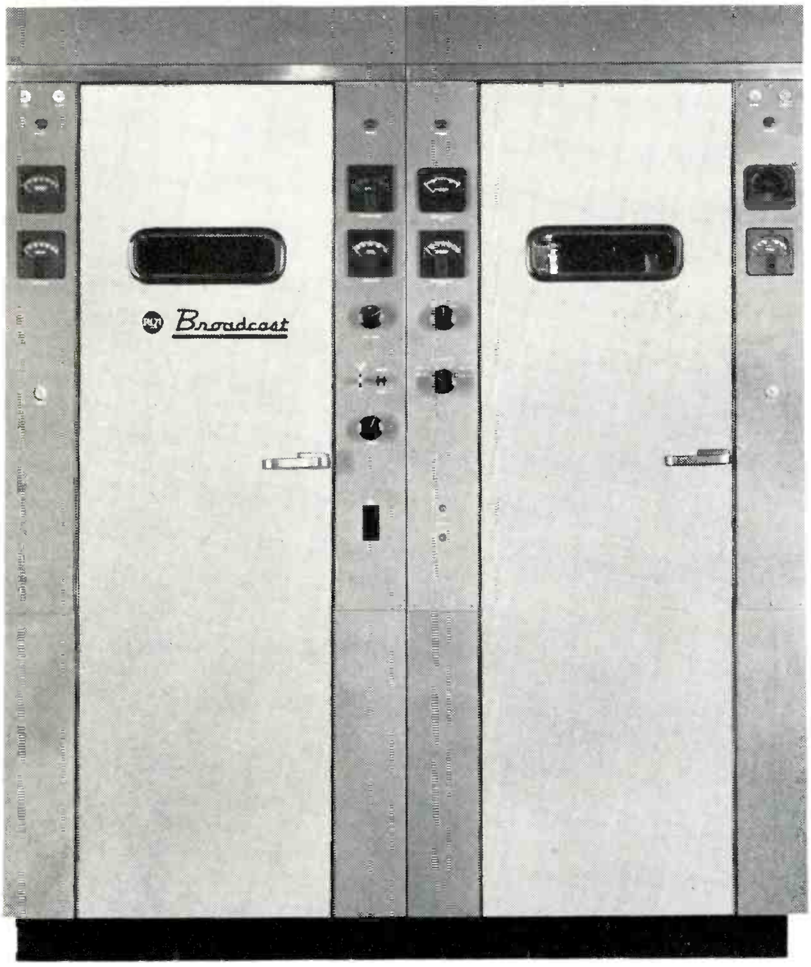

NEW BTA-5T

This new transmitter incorporates the only significant development in Class "C" power amplifier design in 20 years. A new circuit provides a plate efficiency of approximately 90%.

With continuous operation, savings of approximately 15,000 kilowatt hours per year are realized. Only 1 PA tube is needed.

Other improvements, including all silicon rectifiers and improved protection circuits, enhance performance and extend operating life.

Functional styling provides a choice of red or grey doors to suit station decor and add a harmonious note.

Your RCA Broadcast Representative will gladly provide further particulars about this new transmitter. Or write to RCA, Dept. N-367, Building 15-1, Camden, N.J. In Canada: RCA VICTOR Company Limited, Montreal.

Some of the fine features of the NEW BTA-5T

1. **FEWER TUBES**—a total of twelve—save on replacement cost. Only one 5762 PA Tube for lower operating cost.
2. **QUIET-OPERATING BLOWER**—Very low plate dissipation in the output stages reduces heat within the transmitter, and also permits use of a slow-speed blower for quiet operation.
3. **SILICON RECTIFIERS**—All silicon hermetically sealed rectifiers of proven reliability are ideal for remote control.
4. **OVERLOAD PROTECTION**—Complete overload protection is provided for all circuits. All line breakers carry an instantaneous over-current protection, while main breakers retain instantaneous and thermal protection. Remaining circuits are protected by fast-acting overload relays with provision for external indicators.
5. **REMOTE CONTROL PROVISION**—Built-in provision is made for remote control and conversion to Conelrad, power cut-back and a carrier off monitor.
6. **FCC OK**—Meets all new FCC Spurious Emission requirements.
7. **SPACE SAVING**—New style cabinets offer excellent accessibility to all components and allow a great saving in floor space.

RCA BROADCAST AND TELEVISION EQUIPMENT—CAMDEN, N.J.

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The Most Trusted Name in Radio

RADIO CORPORATION OF AMERICA

New WJXT Television Facilities

By E. R. VORDERMARK
Chief Engineer
of WJXT.

After over two years of planning WJXT, which operates channel 4 in Jacksonville, Fla., moves into new facilities which enable them to make the most efficient use of the latest TV developments.

Figure 1. Transmitter room of WJXT. Across the back is the main 35 KW transmitter. On the left side is the 5 KW auxiliary transmittter. A 10 KW FM transmitter is on the right. All transmitters are controlled from the engineer's control desk.

Figure 2. Studio A of WJXT measures 50 ft. square. Each studio has its own separate control rooms.

FROM a modest beginning, on Sept. 14, 1949, WJXT, then housed in a 40-ft. quonset hut, has risen to one of the most modern and influential television stations in the nation.

WJXT was this country's 56th television station (the call letters were changed from WMBR-TV in September of 1958) and was a true pioneer in the industry. It has grown in and out of four buildings and now occupies a fifth—the magnificent new "Broadcast House" that opened in 1960. The Washington Post Co. purchased WJXT in 1953 and began the first planning for the new "Broadcast House" in 1957.

Building

The two-story building, surrounded by tropical landscaping, is located on a seven-acre tract on Jacksonville's Southside only minutes from downtown Jacksonville. It is spectacularly visible from the new Jacksonville Expressway. It is constructed of masonry and curtain wall and contains 40,000 sq. ft. Parking area for 120 automobiles is provided.

Included in the building are two 50 x 50 ft. fully equipped studios, each with its own seperate video and audio control rooms, a master control room, telecine center, complete photographic laboratory, transmitter room, three conference rooms, film editing center, canteen, all WJXT offices and large working and storage areas.

Studios

Two 50 x 50 ft. studios are included each with separate audio and video lighting control rooms. The lighting grids consist of pipes at the 16-ft. level spaced on 5-ft. centers.

Figure 3. The Master Control room contains the microwave control for a 6-ft. parobolic antenna located 750 ft. up on the WJXT tower in addition to the preset switcher and monitors.

Figure 4. A view of the audio control for Studio B from the Master Control. The Audio Control Room is equipped with the latest all transistor two channel console, two turntables, video monitor, and remote controls for three automatic tape machines.

Custom built patching and fader panels are built into the walls of the video lighting booths and control all lighting and wall outlets. Each studio is designed for four studio cameras and eight microphones. A large glass partition between the studios directly adjacent to the booths makes for visual viewing of either studio from the control booths. Drapery tracks are permanently attached and completely surround each studio so that drapes may be used in any area. Studio A differs from B in that it incorporates a 12 ft. high 67 ft. long acoustical plaster cyclorama and a special window looking into the WJXT news room for use of studio cameras for special news events.

Control Rooms

All video and audio control booths are identical as to equipment and physical layout. Video switching is done with modified GE TS2A Switchers which can switch cameras from either studio or act as a submaster for the other. Individual monitors for all video sources are included in the video switching booths. Audio mixing is done through GE dual channel BC-21-A consoles. The integral intercom of the console is modified to be incorporated in the WJXT designed intercom-paging system. Each audio booth has two turntables and remote controls for three automatic Collins tape machines.

The Master Control Room contains all of the controls for video and audio and features two ten-by-ten video audio switchers designed and built by WJXT engineers. The main switching is done on a pre-set basis controlling eight video and audio sources to four lines in any combination by the actuation of one button. Two studio camera patch-cabinets are located in this room and through this method cameras may be utilized in the front, back and top of the new building by merely patching through to the desired location. Directly behind the switching position are two RCA video tape machines which can be remotely controlled from any switching position. Automatic switching of station breaks can be used through an automatic "panic pal" designed and built at WJXT. This switcher can perform any sequence desired using all video and audio sources available.

Telecine

The telecine center is a small control room of its own in which is lo-

Figure 5. The Telecine Center showing the complete vidicon film chains, film projectors, slide projectors, and engineer's control desk. Except for live programming all audio is controlled from this point. In the two racks can be seen the automatic tape machines and the automatic station break programmer designed and built at WJXT.

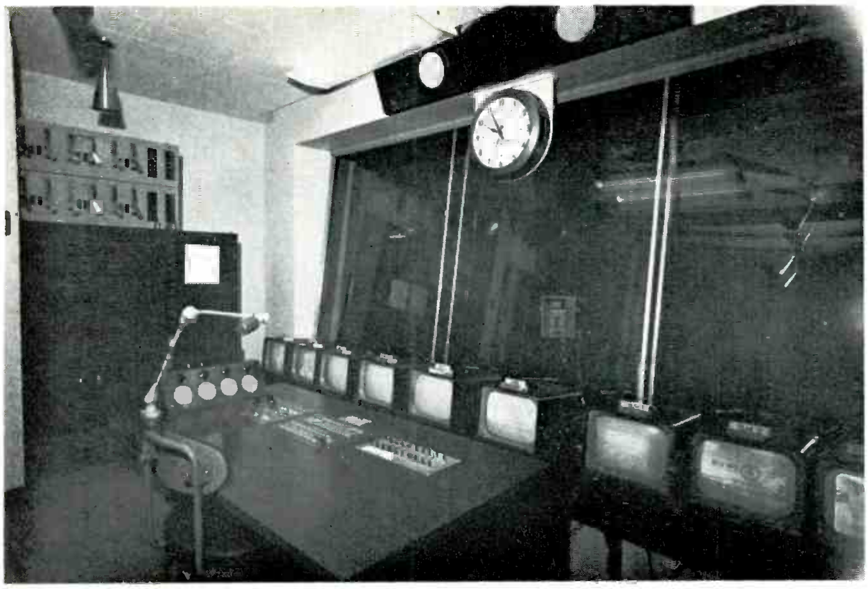


Figure 6. Video and Lighting Control Booth for Studio B showing the lighting and control panels for this studio. On the control desk can be seen the video switcher control, intercom switcher, remote control for two film projectors, two automatic slide projectors, and two RCA Video Tape Recorders. The Studio A control room is identical in physical and techhnical layout.

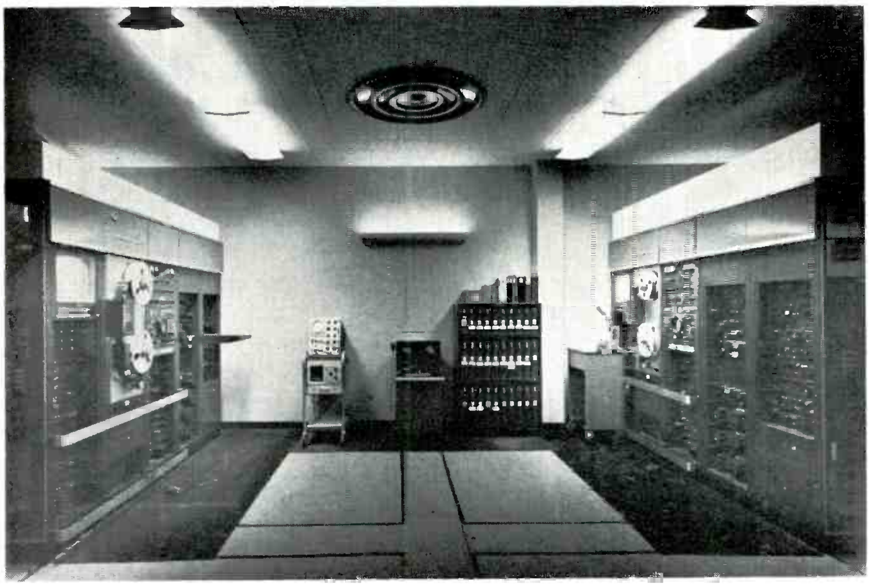


Figure 7. Two RCA television recorders are located in the Master Control Room directly behind the switching position. The machines are remotely controlled from any switching position.

Figure 8. The film developing room enables WJXT to rapidly develop its own news film.

cated two vidicon film cameras, two 16-mm film projectors, two slide projectors, three automatic tape machines, the automatic switcher for station breaks, and an audio control board. Adjacent to this room is the film editing room where all film is prepared for air.

Transmitter Room

The transmitter room actually takes up two stories. On the first floor are located two television transmitters, one FM transmitter and all associated terminal and monitoring equipment. On the second floor are located all the coaxial switches and microwave transmitters and receivers. The main television transmitter is a GE TT42A2 35 KW transmitter and the auxiliary transmitter is a GE TT65 5 KW transmitter. The FM is a 10 KW Western Electric and is operated by WJXT engineers for another station. The transmitters feed a GE TY60F antenna 931 feet above average terrain through two 3⅛-inch styroflex lines. Located at 551 ft. is a single bay batwing standby antenna built by WJXT and is fed with two 1⅝-inch styroflex lines. The transmitters are motor switched to the main antenna and manually patched to the standby antenna.

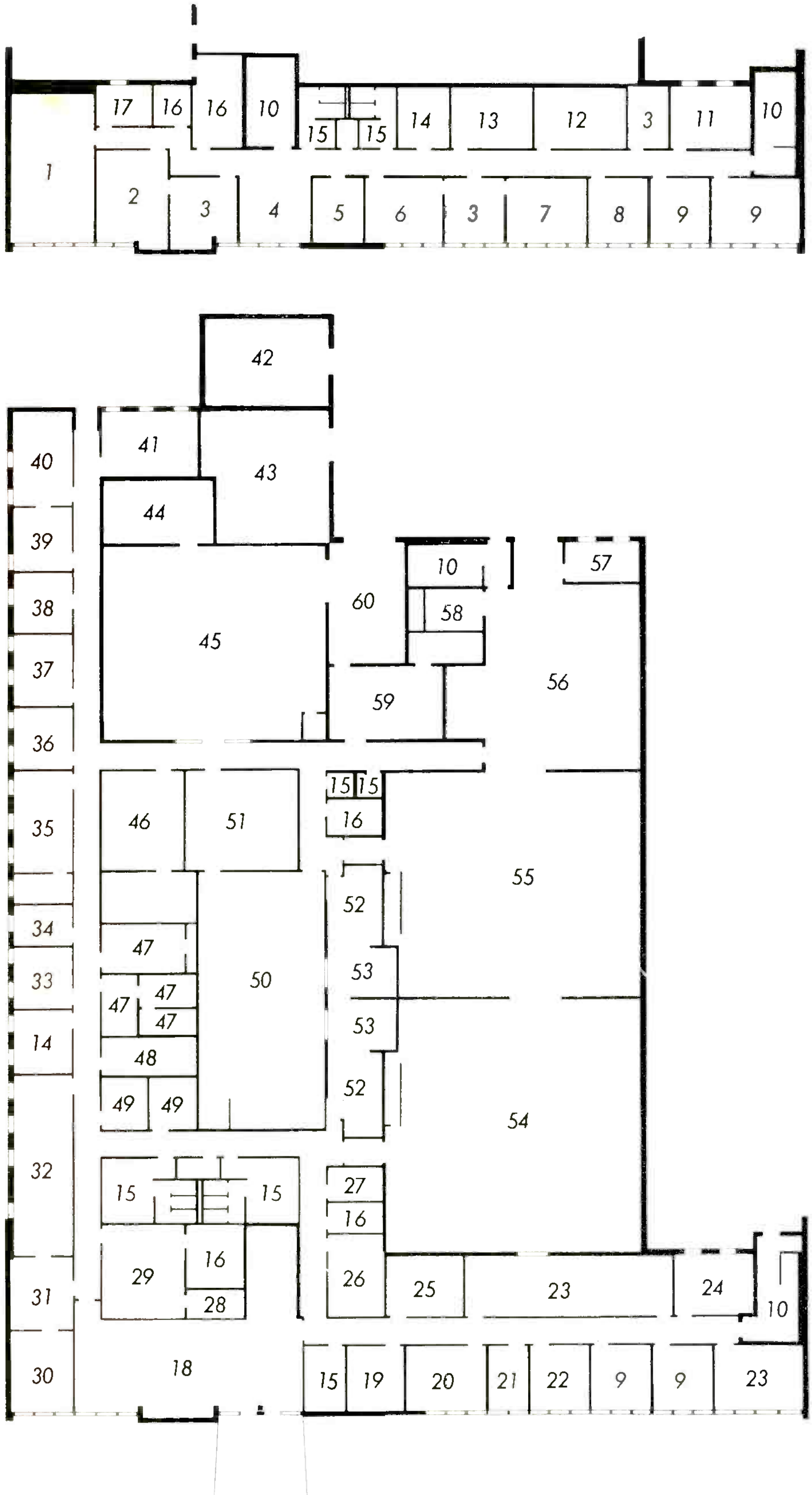
Intercom

Naturally in an operation such as this intercommunication and paging becomes a serious problem and at WJXT this was no exception. It was finally decided to build one for the present with adequate facilities for future expansion, WJXT's engineers designed and built a transistorized system that fully met these requirements. It is possible to operate from any position as a single system or tie in any other studio or room without interrupting the operation of any other unit.

Conclusion

After approximately six months of operation in the new "Broadcast House" no major flaws have been encountered and management feels that it has completed a facility for WJXT designed especially for its needs both present and future. It is fortunate that the station has been able to develop a plant so arranged that the main lobby is the focal point for all of the various operations. The traffic flow within each operation is so controlled that a minimum of steps are necessary.

Fig. 9. Complete Floor Plan and Office Layout of WJXT.



SECOND FLOOR

1 Conference Room
2 President's Office
3 Secretary
4 Lobby
5 Accounting
6 Program Director
7 Sales Manager
8 Sales Service
9 Unassigned
10 Stairs
11 Traffic
12 Sales
13 Continuity
14 Conference Room
15 Rest room
16 Storage
17 Kitchen

MAIN FLOOR

18 Main Lobby
19 Promotion Director
20 Promotion staff
21 Sports Director
22 Women's Director
23 News
24 News Director
25 Telephone equipment
26 Announcers
27 Lounge
28 Receptionist
29 Printing/Mail
30 Production Manager
31 Production
32 Directors
33 Talent
34 On-Air-Promotion
35 Art
36 Building Supt.
37 Recording room
38 Technician's lounge
39 Engineering planning
40 Chief Engineer
41 Canteen
42 Transformer vault
43 Mechanical equipment
44 Heat Exchanger
45 Transmitter room
46 Film Department
47 Photography
48 Houston Processor
49 Film preview
50 Master Control
51 Telecine
52 Audio Control
53 Video Control
54 Studio A
55 Studio B
56 Props/assembly area
57 Studio Manager
58 Locker room
59 Engineering shop
60 Garage

Harkins Auto-Level automatic level control amplifier.

An Automatic Audio Level Control

The design of an amplifier which controls audio levels in AM, FM or TV stations is described.

By DWIGHT HARKINS*

EARLY in the development of broadcasting, the need for automatic control of audio levels became apparent. In the case of AM it was necessary to maintain adequate levels to insure proper coverage and at the same time not exceed 100 per cent modulation lest severe distortion and sideband splatter be created.

To solve this problem, the peak limiting amplifier came into wide usage and along with it all the shortcomings of the earlier models. Unfortunately, the first of these units operated as peak clippers, thus modifying the audio waveform as well as its amplitude which formed serious distortion. As time went by this difficulty was overcome but the resulting unit became more complex as well as expensive.

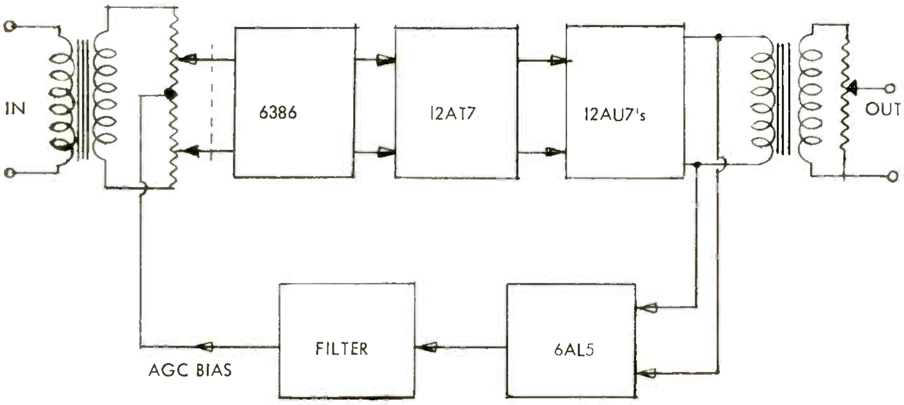


Figure 1. Block diagram of amplifier.

About ten years ago, General Electric offered to the industry a new type tube designated the type 6386 which is a remote cut-off dual triode. Since that time a wide variety of "level control" amplifiers have been developed that utilize the unique characteristics of this tube.

This article will describe in detail the design considerations of the circuitry used in the Harkins Auto-Level. This unit has as it heart, the variable gain stage made possible by the G. E. 6386 tube. Having almost complete linear amplification over the entire portion of its characteristic curve, it also is capable of high gain, low noise, and low distortion. The gain is controlled over a wide range by the applied negative grid bias. This bias may be varied over a wide range without causing distortion.

Referring to Fig. 1, it will be seen that the input audio passes through an input transformer and dual input level control to the grids of the 6386. The output of this variable gain stage is applied to a 12AT7 push pull voltage amplifier which in turn is fed to the push-pull parallel 12AU7 output tubes.

The audio voltage appearing at

*Harkins Radio, Inc.
4444 E. Washington St.
Phoenix, Ariz.

the plates of the output tubes is applied to the cathodes of a 6AL5 which causes the latter to develop a dc voltage that controls the gain of the input 6386 tube. A fixed dc positive voltage is also applied to the 6AL5 cathodes so that rectification of the audio voltage does not occur until it rises to a level above the applied "bucking" voltage.

After the audio voltage produced by the 12AU7's rises above this "threshold," the resulting negative dc voltage is fed through a resistance-capacitance filter network to the control grids of the variable gain 6386. The design of this filter permits almost instantaneous charging time and a slow discharge rate. As the rectified output voltage increases, the applied negative bias causes the gain of the 6386 to drop. As long as the input signal is sufficient to drive the output voltage over the "threshold," the gain will be regulated automatically by this closed loop arrangement.

If the input level is kept below the "threshold," the unit functions as an ordinary amplifier with the output level being directly proportional to the input level. By unplugging the 6AL5 tube, this mode of operation can be obtained at all times.

Fig. 2 shows the operating characteristics of the "Auto-Level." Note that as the input level is increased beyond the threshold, the output level rises only a small percentage of the increase in input. This function is described as the "compression ratio." If, for example, the input level is raised by 10 db and the output increases 2 db, the compression ratio would be 5:1.

In all automatic gain control devices, the operating time constants are important. In this unit, the attack time is 25 milliseconds. This is determined by R23 together with C10. The recovery time is controlled in two ways. R24 and C10 function on short audio peaks and the com-

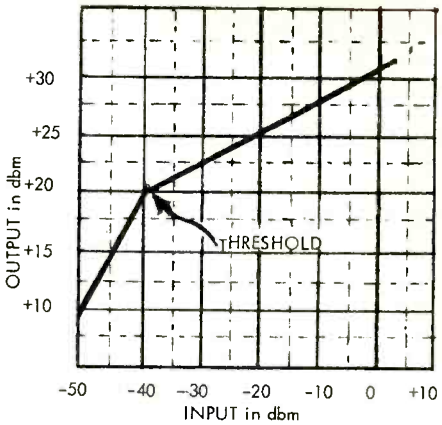


Figure 2. Operating characteristics of Auto-Level amplifier showing the gain reduction as the input level rises above the threshold point.

bination of C11 and R25 charge up on sustained program levels.

The purpose of this dual time circuit is to obtain full advantage of the unit on complex program material without aural awareness of the smooth changes in gain. The

(Continued on page 16)

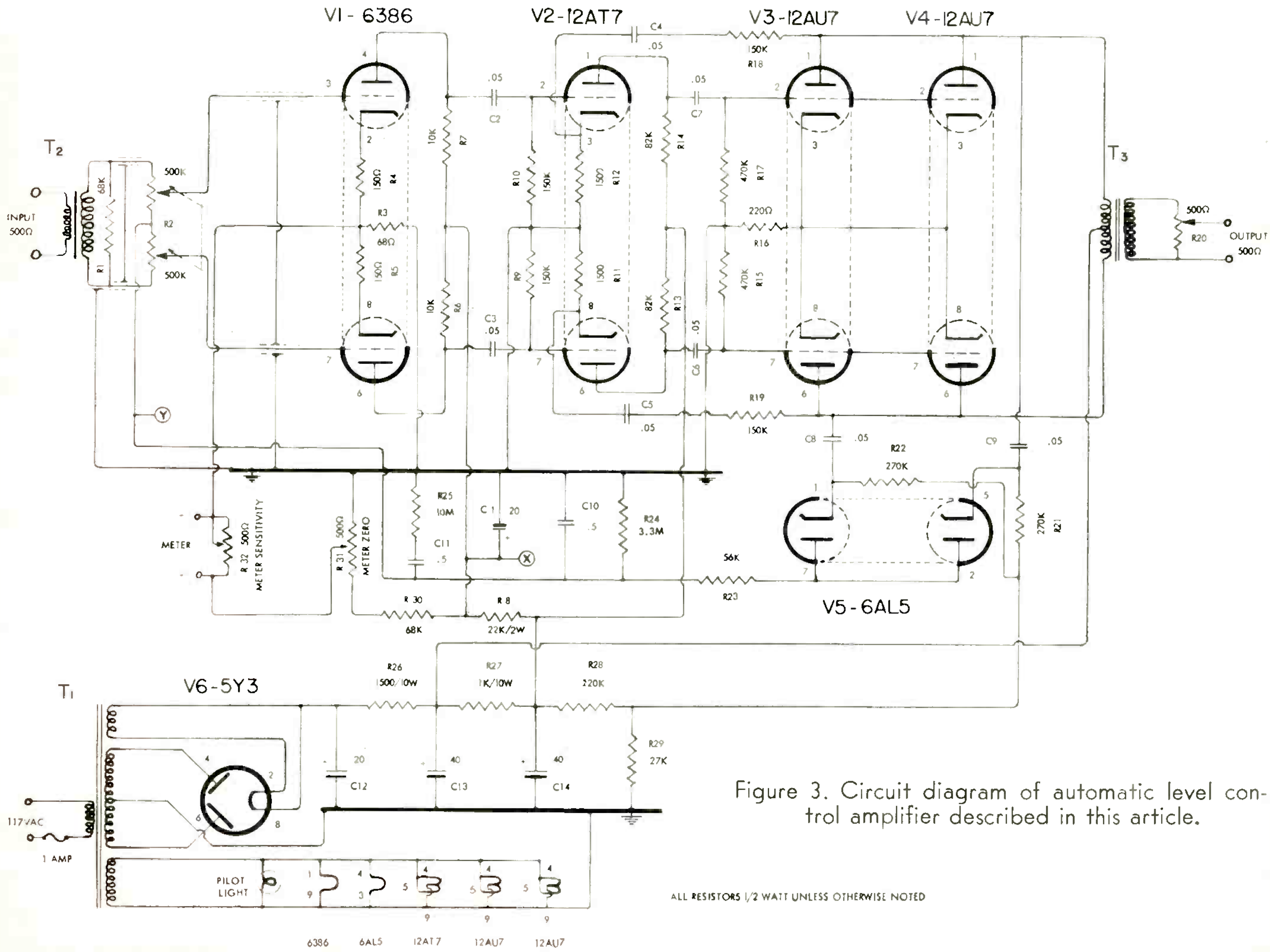


Figure 3. Circuit diagram of automatic level control amplifier described in this article.

TENTH ANNUAL IRE BROADCAST SYMPOSIUM

Papers covering automation and other subjects of top interest were heard by over 200 engineers at this year's meeting of the Professional Broadcast Group of the IRE.

On September 23rd and 24th the tenth annual meeting of the Professional Broadcasting Group of the Institute of Radio Engineers was held at the Willard Hotel in Washington, D. C. Over 200 engineers heard a variety of technical papers covering current developments in television broadcasting. The group was hosted by the officials of the Federal Communications Commission for a discussion of the F.C.C. functions and a tour of the Commission's offices. All of the administrative procedures of the F.C.C. were observed including a hearing being held before the Commissioners.

Among the subjects discussed during the symposium were TV automation, video recording, solid state rectifiers, UHF-TV, tower construction, directional TV antennas, new type image orthicons, airborne TV, a video processing amplifier, and sine squared pulse testing.

Automation in television stations was covered in papers prepared by Floyd R. McNicol of RCA, Adrian B. Ettlinger of CBS-TV, and James B. Tharpe of Visual Electronics. The application of automation to television station operation offers a range of possibilities from station break switching to automatic operation of the complete broadcast day. Automatic billing and accounting are also probable in the application of automation in broadcasting. Systems were described which use a punched tape for information storage and also the development of a computer was discussed.

James Tharpe of Visual Electronics demonstrated the operation of a storage and read-out automation system using a visual display which indicated the various program sources as they were started and stopped by the equipment. In this system the punched tape operates the preset equipment which displays twelve upcoming events for checking. The equipment is arranged to allow tape and film machines to be started and rolled a number of seconds before the program switch is made. One of the advantages claimed for the use of computers in TV automation is the ease of making corrections in the instructions and in verifying the program schedule as set up in the machine.

Engineers will become acquainted with a new set of terminology if they adopt electronic computers in broadcast operations. For example "programming" will mean setting up the computer for the various switching operations. An automatic program logging system which has been developed at WFBM in Indianapolis was described in a paper prepared by Robert Flanders and Robert Brockway. In an otherwise automatic broadcast operation personnel must still be available for logging the programs in order to comply with F.C.C. regulations. This is the problem which WFBM seeks to overcome with the logging equipment which they have devised. Basically the system uses an automatic time stamp which is actuated when a program segment is started and completed. The time stamp includes a code to indicate the type of program material. This record can then be used with a program schedule as verification and a record of aired material. The system must be approved by the F.C.C. before being placed in regular operation.

Several videotape developments described included an automatic time element compensator and the Intersync synchronizer. The automatic time element compensator eliminates geometric distortion in taped reproduction. The device is designed to eliminate skewing, scalloping and horizontal displacement of vertical lines. The device measures the arrival time of each successive picture line and automatically inserts or removes time delay as necessary in order to maintain perfect alignment. The synchronizer locks the TV recorder to other signal sources and makes it possible to mix the videotape output with other program sources without disruption of sync. The papers were prepared by Anthony Sverda and Harold Clark of Ampex.

Because the television systems of many nations operate on scanning standards which differ from the 525 line standard of the U. S. it has become necessary to design converters which can change the video signals from a foreign origination to U. S. standards for program transmission in this country. Mr. K. B. Benson described the equipment and techniques developed and used by CBS-TV to convert standards.

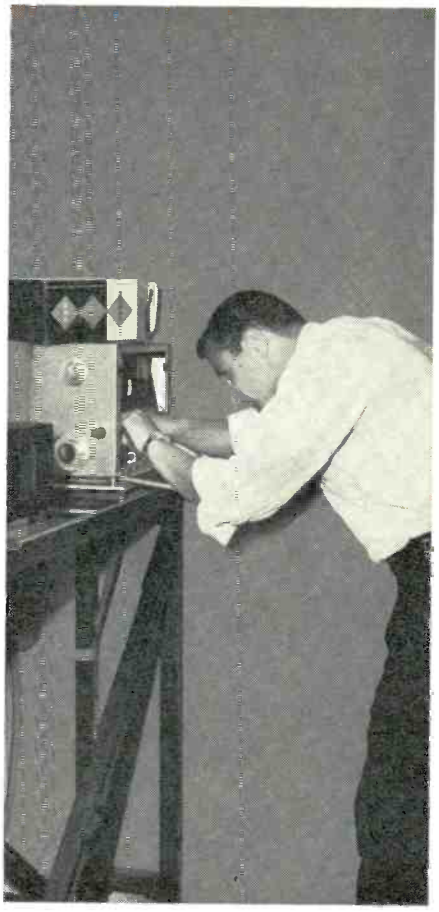
A report by Harry Fine of the F.C.C. described the analysis of the TASO data on UHF-TV performance and the development of formulae for the application of signal to interference ratios to a description of television service. The TASO data collected by Panel 6 used a six-point rating system whereby the viewers rated the pictures as excellent, fine, passable, marginal, inferior, or unusuable. The tests were made for various signal to interference ratios. From the further development and interpretation of the collected data the viewer reaction to any given type of interference can be described as a continuous variable by transformation to a new quality index M. A simple linear relationship has been developed between the average quality index M and the signal to interference ratio R. This relationship combined with the known variability of TV signals will provide useful analytic relationships which permit a fairly complete prediction of TV service.

Roger W. Hodgkins of WGAN-TV described the planning of the 1,619-ft. tower at WGAN-TV from site approval to final erection. The tower withstands winds of 150 miles per hour, requires over 100 acres of land for the tower and anchors and weighs 520,000 pounds.

G. W. Iler of the General Elec-

(Continued on page 22)

unpack 'em *....install 'em* *....depend on 'em*



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G E C

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More Multiplex Profits From Selective Muting

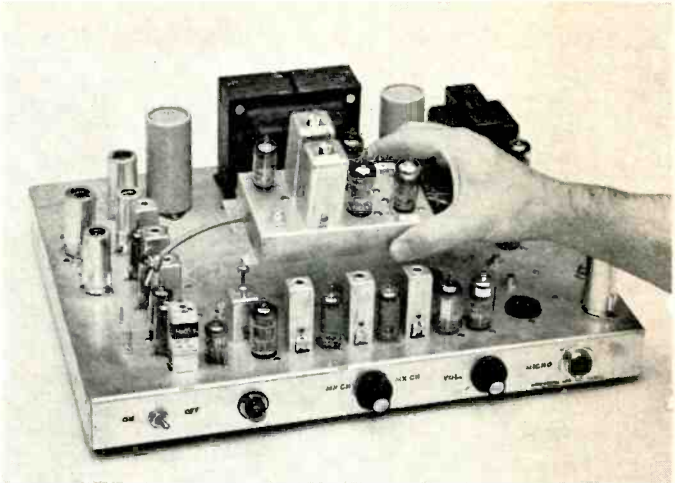


Figure 1. MT-12 selective muting unit before mounting on the McMartin multiplex receiver.

A system is described which permits the multiplex operator to transmit advertising to separate groups of receivers without interrupting the music on the background music channel.

By RAY B. McMARTIN*

OF FIRST and prime importance to all background music and storecast operators is the increase in profits which can be realized from the conversion of on-premise or telephone-line equipment to the more economical FM multiplex operation.

After the technical bugs have been ironed out and the new facilities have been in operation for awhile—in short, after the dust has settled a bit, it's time to give some serious thought to ways and means to improve this service and increase revenues accordingly.

About 15 per cent of the present multiplex operators have reached this point and have found the solution—*selective muting*. This is the key that will open many new customer doors and make available a wide variety of services that competitive operators are unable to provide. Let's look at this key. Let's find out how it works, *if* it works, and what it offers. Then I'll venture a recommendation.

How It Works

Selective muting is the principle which permits an FM station to control each individual multiplex receiver within its radius of operation, or net. This is accomplished by transmitting inaudible tones which are picked up by the receivers. Those receivers adapted for selective muting will respond to transmitted tones and will mute or restore the regular subcarrier program material.

More specifically, multiplex operators utilize selective muting in the following way. The normal program material is background music, a service offered to all accounts. A supplementary commercial service is offered to a specific chain of retail stores within the station's net. When it is time for the supplementary service, the background music service is interrupted by transmitting an inaudible tone, usually 20 kc. When this tone is picked up by those multiplex receivers equipped with selective muting subchassis, they automatically mute or become silent. The commercial is now transmitted by the station and will be picked up only by those receivers *not* equipped with selective muting subchassis. After the commercial, a second inaudible tone, this time at a different frequency (usually somewhere between 25 to 35 kc) is transmitted and the muted receivers are automatically restored. The background music service then continues.

That is the most common method. A modification of this procedure which is gaining in popularity is to have all multiplex receivers equipped with selective muting subchassis. All receivers are set to mute at 20 kc but those which are to pick up commercial No. 1 are set to restore at 25 kc, those which are to pick up commercial No. 2 are set for 27 kc, and so on up to 35 kc. Then after they have all been muted by the 20 kc tone, a 25 kc tone is transmitted and the desired receivers are restored to pick up their specific commercial. A 20 kc tone mutes them, and a 27 kc tone restores the next group for the second commercial. After all the commercials have been given, the complete range of restore frequencies are transmitted and the background music service resumes.

A wide range of variations to this procedure is available. As an example, the McMARTIN selective muting subchassis is designed so that the receivers can be set up for a muting frequency of either 18, 20 or 22 kc, thus increasing the number of available combinations. Another variation is for those customers who wish only uninterrupted background music without the occasional mutings needed to service the other customers. Most of the operators have transferred this type of customer to a second subcarrier which offers continuous background music.

Does It Work

As our customers will all confirm, selective muting is a successful, reliable operation. Furthermore, it's neither complicated nor expensive. The only piece of equipment re-

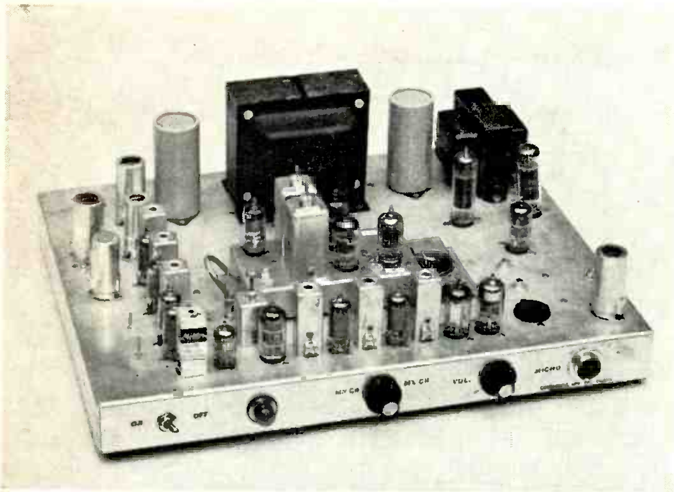


Figure 2. TN-88 Multiplex receiver and 15-watt amplifier with MT-12 mounted on chassis.

Figure 3. Complete Multiplex receiver including MT-12 selective muting unit.

*President, Continental Mfg. Inc., 1612 California St., Omaha, Neb.

quired at the transmitter is an accurate tone generator. The importance of a drift free oscillator is obvious. With a little planning, the entire service, including mute and restore tones and commercials, can be automatically programmed.

The secret to dependable service lies in the design of the selective muting subchassis. Since most receiver manufacturers don't as yet provide such a unit, a resume of various models and an analysis of what to look for cannot be presented. As a substitute, let me describe the McMARTIN selective muting subchassis (model MT-12) as illustrated in figures No. 1 and No. 2, and explain the reasoning behind its unique and exclusive design.

The first thing a receiver manufacturer must take into consideration is the fact that when a multiplex operator decides to add a selective muting service, chances are the operator already has a quantity of receivers in operation in the field and these receivers will have to be modified. This modification can be quite costly, if wiring and circuit changes must be performed, particularly if the receiver must be returned to the shop. Since it is desirable to accommodate the selective muting subchassis within the cover of the multiplex receiver, the receiver must be large enough to meet this possibility. Also the receiver's power transformer must be heavy enough to take the increased load of the selective muting.

These problems are met on the McMartin receivers in the following ways: As figure No. 3 illustrates, the receiver has been designed with a physical size large enough to accommodate a selective muting subchassis (and other subchassis should the need ever arise). Ventilation is adequate to compensate for the increase in heat from the tubes. All receivers are wired for the MT-12, and the only modification required is to purchase the subchassis and plug it in to an octal socket on the top of the receiver chassis. The power transformers have been greatly overrated to accept the increased loads of subchassis such as the MT-12.

Figure 4 presents a block diagram of the MT-12. You will note that the output from the main channel discriminator, before de-emphasis, is fed to a 6BH6 wide band amplifier. The weak tone signals are amplified approximately 10 times and then fed into an extremely sharp tunable mute filter and tunable restore filter. The filter which accepts the tone then amplifies the signal. The output is then fed to a detector which will produce a control voltage, either negative or positive. This voltage is fed to a control tube which will either block the multiplex program or permit it to pass through. In essence, what you see is an electronic switch which turns the receiver off when a certain tone is transmitted, and turns it back on when a second tone is transmitted.

The two most important technical characteristics to consider in the design of such a device are *sensitivity* and *selectivity*. The sensitivity of the selective muting circuit determines the amount of tone injection necessary at the transmitter. If this injection requirement can be kept very small, it will not be necessary to decrease the modulation level of the subcarrier program material while the tone is transmitted. Selectivity indicates the versatility of the system by determining the number of different control frequencies which can be used. This in turn determines the number of different types of commercials (and hence customers) which can be incorporated with reliability.

A Recommendation

While present methods of selective muting have proven acceptable-both from an operational and a financial viewpoint—it would be to the operator's advantage if a way could be found to increase the number of different commercials to be offered, and thus increase the in-

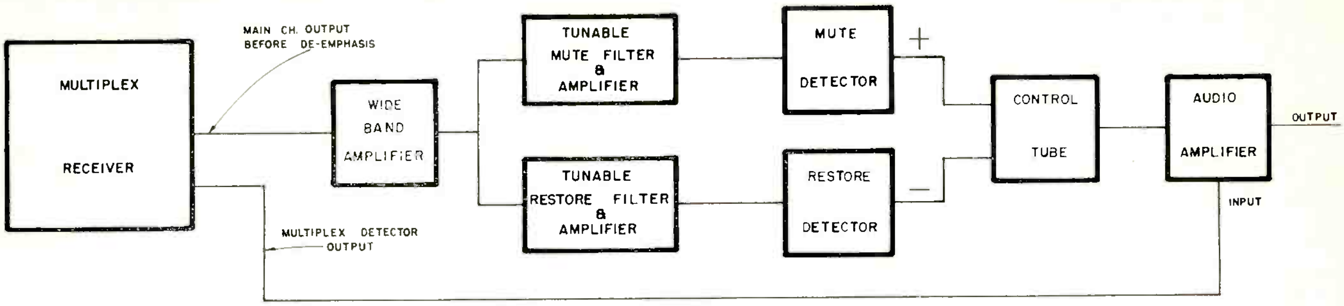


Figure 4. Block diagram of MT-12 selective muting sub-chassis.

come from this supplemental service.

In addition, it would be well to eliminate the need to mute customers who don't want the supplemental commercial service.

Finally, it would be advantageous to eliminate the additional exxpense of a selective muting subchassis which must be added to those receivers not involved in the supplementary commercial service. At present, allocation of this expense complicates price quotations and bookkeeping.

Now for the recommendation: Actually it's an idea which has been successfully field tested but to my knowledge not as yet put into commercial use. Primarily, I suspect, because station engineers aren't aware of the simplicity of the idea and the ease with which receivers can be modified.

Establish a continuous background music program on one subcarrier, preferably 67 kc, and use a second subcarrier, say 42 kc, for a supplemental commercial service. Then modify the receivers to switch from one subcarrier to the other by selective muting.

Let's run through that again. Your normal background music service would be on one subcarrier. You would not need selective muting subchassis for those customers who wish only your music service. Furthermore, their program would not be interrupted at any time.

Consider the supplemental commercial service. Here you could sell time just as you do main carrier time—the difference being that your commercial would go thru specific receivers to a particular audience. As an example let's suppose that a retail chain wants a 3 minute spot at 15 minute intervals during store hours for a week. Each time the commercial is to be given the station transmits a tone which flips only the receivers at the retail chain's stores to the other subcarrier. The commercial is then given on the second subcarrier, and afterwards a second transmitted tone switches these receivers back to the background music channel.

There are many advantages of this procedure over present selective muting operations. No further equipment is needed at the transmitter, the overall costs of the multiplexing service can be significantly reduced, since those receivers on background music operation alone (by far the bulk of your accounts) won't require facilities for selective muting. Only the receivers for the supplementary commercial accounts will have to be modified. Each manufacturer's models differ, but the only alteration needed on a McMartin receiver, for instance, would be the addition of a second oscillator coil. At the most a $10.00 charge if done at the factory. Add to this the nominal cost of a selective muting subchassis, and your investment is complete.

The service could be worked with the same selective muting subchassis now available with the addition of an electro-mechanical switch. However it would be a fairly simple matter to modify the subchassis (without any appreciable increase in cost) to increase the range of combinations and permit a wider variety of customers to be approached. As an example, 20 kc could be the tone that restores all receivers to the background music subchannel. If no other subcarrier service is offered and an optimum variety of combinations is desired you could set specific customers on 22 kc, 24 kc, and so on every 2 kc's apart as far as 50 or 55 kc.

In regular selective muting operations this variety of combinations is not possible, because tones must be chosen which are not within the bands of the two subcarriers.

In our recommended procedure, however, the second subcarrier (42 kc) is dormant until a tone switches over to it. Thus you can use tones within the band of the second subcarrier. Your only caution is to choose a restoring tone not within either band.

There is another advantage that should be pointed out. There is no possibility of false operation causing customers on only the background music service to inadvertently receive a commercial, since all commercials would be on the second subcarrier.

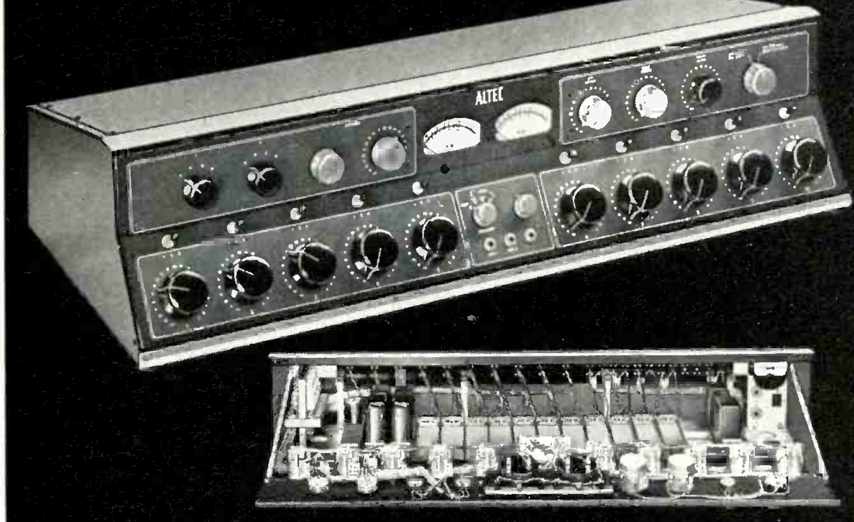
One final point—the FCC and stereo. At this writing no one knows what the FCC will reveal. However it is highly unlikely that a plan will be adopted which would jeopardize present commercial operations. Thus the background music and supplemental commercial service could be established without delay. If the FCC exercises intelligence and a little far-sighted thinking, it is possible that a two subchannel arrangement such as I have recommended could be used in conjunction with stereocasting. In this case a different method of selective muting would be needed, but enough engineering talent is available to develop this.

Conclusion

While selective muting is now a reliable and profitable selling feature for FM stations, these recommendations would greatly improve the service with an overall reduction in cost.

A tremendous range of combinations is available which can enhance the service and broaden its flexibility.

Even with anticipated FCC rulings, the service will continue to strengthen the FM industry with increased profits, additional unique selling features and a larger variety of potential customers.



Plug-in reliability with ALTEC professional audio equipment

250 SU CONSOLE Combining compact simplicity with maximum flexibility through Altec advanced design, the new 250 SU Altec has proven to be the ultimate in control consoles for TV, AM, FM, recording studio or sound system use. Newly designed miniature plug-in preamplifiers, and utility input devices of uniform size and interchangeability permit free range in number and type of amplifiers used per console.

Characterized by single unit construction for simplicity (amplifiers and controls within same housing) and economical installation, Altec's 250 SU features an externally mounted power supply for cool operation and isolation of strong magnetic fields.

Providing complete circuitry for all stereo or universal operating functions, there is no finer, more reliable control console serving the audio industry. Individual components are available complete with plug-in trays for custom and rack installation.

THE 250 SU FEATURES:

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- "Plug-in" units completely interchangeable
- Low impedance mixing
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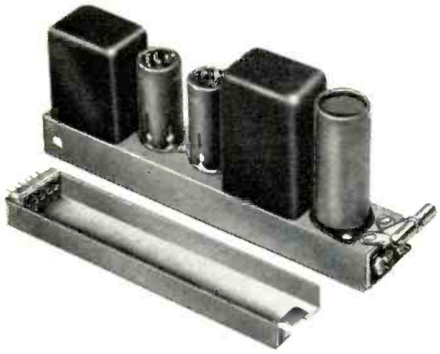
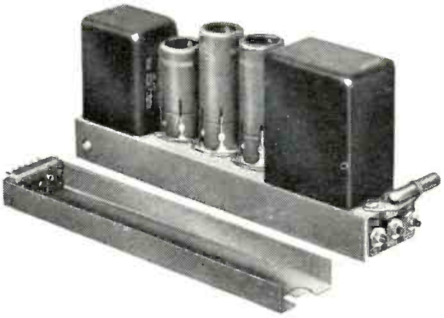
- Tube testing provisions
- Expandable to jack fields, equalizers, etc.
- Up to 10 mixing channels
- Single channel operation
- Two channel operation
- Two channel/three channel operation
- "Stereo" operation
- Illuminated meters
- Color coded controls
- 16 connected inputs
- Microphone level or "high level" on any input



458A "PLUG-IN" PREAMPLIFIER An extemely simple, highly reliable, low noise preamplifier, the 458A incorporates a single stage push-pull cross-neutralized vacuum tube circuit, transformer coupled to source and load. Maximum reliability with unfailing performance are achieved through simplified design featuring fewer components, extremely accurate balance of input and output transformers, and premium quality pre-aged, shielded tubes. The failure of either tube will not cause loss of program.

SPECIFICATIONS GAIN: 40db unterminated input, 34 db terminated. **POWER OUTPUT:** +20 dbm at less than .5% THD 50 to 15,000 cps. +25 dbm at less than 1% THD at 1 KC. **FREQUENCY RESPONSE:** ± 1 db 20 to 20,000 cps. **SOURCE IMPEDANCE:** 150 or 600 ohms (centertap for 600 ohms). **LOAD IMPEDANCE:** 150 to 600 ohms (centertap for 600 ohms). **OUTPUT IMPEDANCE:** Equal to load impedance. **NOISE LEVEL:** Equivalent input noise: −126 dbm. **POWER SUPPLY:** 15ma at 275vdc and .7a at 6.3vdc. **TUBES:** 2—6072/12AY7. **DIMENSIONS:** 1 3/4" W x 3 15/16" H and 9 11/16" L. **COLOR:** Cad plate, dichromate dip. **WEIGHT:** 3 1/2 lbs. (including tray). **SPECIAL FEATURES:** Push buttons for individual tube test. 40ma dc can be applied to center taps for simplexing. **ACCESSORIES:** 13225 Rack Mounting Assembly (for 9 units). 13401 Mounting Tray Assembly. 5981 Tube Test Meter. 535A Power Supply.



459A "PLUG-IN" PROGRAM AMPLIFIER A highly reliable, low noise program amplifier with exceptionally large power capability, the 459A consists of a 2-stage push-pull circuit with a balanced negative feedback loop. Push-pull operation of all stages provides reliability, interchangeability with preamplifiers for added gain and power. Superior overall performance results from special input and output transformer design of ultrafine balance combined with premium quality pre-aged shielded tubes. Program transmission is not interrupted by failure of either output tube.

SPECIFICATIONS GAIN: 56 db unterminated input, 50 db terminated. **POWER OUTPUT:** +30 dbm at less than .5% THD 30 to 20,000 cps. +35 dbm at less than 1% THD at 1 KC. **FREQUENCY RESPONSE:** ±1 db. 20 to 20,000 cps. **SOURCE IMPEDANCE:** 150 or 600 ohms (centertap for 600 ohms). **LOAD IMPEDANCE:** 150 or 600 ohms (centertap for 600 ohms). **NOISE LEVEL:** Equivalent input noise: −126 dbm. **POWER SUPPLY:** 40ma at 275 vdc and 1.6a at 6.3vdc. **TUBES:** 1—6072/12AY7, 2—12BH7. **DIMENSIONS:** 1 ¾" W x 3 15/16" H x 9 11/16" L. **COLOR:** Cad plate, dichromate dip. **WEIGHT:** 3 1/2 lbs. (including tray). **SPECIAL FEATURES:** Push buttons for individual tube test. 40ma dc can be applied to center taps for simplexing. **ACCESSORIES:** 13225 Rack Mounting Assembly (for 9 units). 13401 Mounting Tray Assembly. 5981 Tube Test Meter. 535A Power Supply.

535A POWER SUPPLY Compact, highly reliable, the 535A is the DC power supply for furnishing the operating voltages to the Altec 458A and 459A amplifiers used together with the Altec 250 SU Console. Externally mounted to preclude hum, the 535A employs silicon rectifiers in both the filament and "B" supplies. The 535A connects to the 250 SU by means of a 4-foot multiple conductor cable terminated in a type P306CCT Jones plug which "mates" with a Jones receptacle in the 250 SU Console. A single screw frees the power supply unit from its mounting bracket for inspection.

SPECIFICATIONS POWER OUTPUT: 275vdc at 275ma. At 275ma ripple is .02v peak to peak max. 6.3vdc at 13a. At 13a evc ripple is 1.5v peak to peak max. **POWER INPUT:** 117v 50-60 cps 245 watts at full load. **RECTIFIERS:** Silicon. **CONTROLS:** 1. Power Switch. 2. Circuit Breaker (Push to reset). 3. 4 Position tap switch (provides adjustment of voltage by autoformer action to accommodate 2 to 1 range of loads). **COLOR:** Dark Green. **WEIGHT:** 16 pounds. **SIZE AND MOUNTING:** 7 3/16" W x 9 5/8" H x 7" D overall.

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ALTEC LANSING CORPORATION

". . . a variety of recovery times can be obtained . . ."

AUDIO LEVEL starts on page 8

standard units using the values shown deliver time constants of 2 seconds for 63 per cent recovery and 9 seconds for 90 per cent recovery. Simply by changing R23, a wide variety of recovery times can be obtained.

Probably the most important feature however is the capability of this unit to compress the audio levels without introducing distortion. For example, the measured distortion of an output level of plus 25 dbm with compression of 20 db is only .9 per cent at any frequency within the 30 to 15,000 cps range.

With compression of 10 db the introduced distortion is .4 per cent. Frequency response is flat within 1 db from 15 to 15,000 cps at all times.

The circuit also includes provision for connecting a 0-1 Ma. for continuous indication of limiting action. The meter will read zero when no limiting is taking place and the needle indicates upward as the unit begins to function. This is made possible by the special bridge type circuit as shown on the schematic. The meter sensitivity and zero adjust controls are located on the rear of the chassis. The meter may be placed at any distance from the unit itself.

The noise level of this unit is 70 db. below 25 dbm. output level. This is made possible by the careful placement of the component parts as well as the avoidance of ground loops. The unit is also capable of operation in the strongest of R. F. fields since it is often necessary to place it immediately adjacent to a transmitter.

Typical Applications

The "Auto-Level" is valuable for use between the audio console and the line feeding the transmitter. This insures the proper operating level is feeding the telephone line at all times.

It makes an ideal companion to an automatic peak limiting amplifier for maximum AM transmitter coverage. In this application, it is suggested to be used just ahead of the peak limiter.

The "Auto-Level" will function as an automatic fader on a multiple input console. If the microphone level is adjusted higher than the turntables, opening the mike will cause the music to fade to the background automatically and the music will return to normal level after the announcement.

For background music services, it insures uniform reproduction volume regardless of changes in tape or record changer levels. Excellent for feeding 'phone lines.

For television audio purposes, it is needed for use with reproduction of sound on film where high variations are often encountered betweeen reels and commercials. It is also of extreme advantage for use in live "interview" type shows where sudden changes in audio cannot be anticipated.

Some stations have found an extra "Auto-Level" to be useful in the handling of remote pickup lines. The individual incoming remote is "patched" into the input of the "Auto-Level" while the output feeds the remote channel of the console. This application is most desirable for sport broadcasts and similar "grainriding" headaches.

Here's what some of the top TV audio engineers told us this dramatic new microphone can do:

reach* two to six times the distance of cardioid types

reach with ambient noise and reverberation pickup reduced to one third that of cardioid types

reach that greatly improves audio "Presence"

reach that allows the use of wider-angle camera shots

reach that frequently eliminates the necessity of pre-recording

separation of vocalist and band, controlled to a degree never before possible

reduction of critical audio feedback problems

substitution of the 642 for bulky parabolic microphones, with better band pickup on football remotes

improved signal-to-noise ratio due to extremely high level output

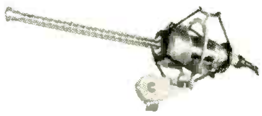
*Microphone Working Distance

For the first time extreme directivity, and wide range and highest output have been combined in one microphone. Unlike any other microphone available, the new E-V Model 642 allows new camera and sound techniques to improve production quality and lower production costs.

The 642 is so different we urge you to try it yourself in *your* studio. If you have problems with sound, this new working tool may well provide the answer. Your franchised E-V Broadcast distributor will soon be stocking this amazing new microphone. Why not arrange *TODAY* for your own test of the new Electro-Voice 642?

Write Dept. 110-V, Buchanan, Michigan, for complete literature.

better products for better sound



Electro-Voice® ELECTRO-VOICE, INC., Buchanan, Michigan

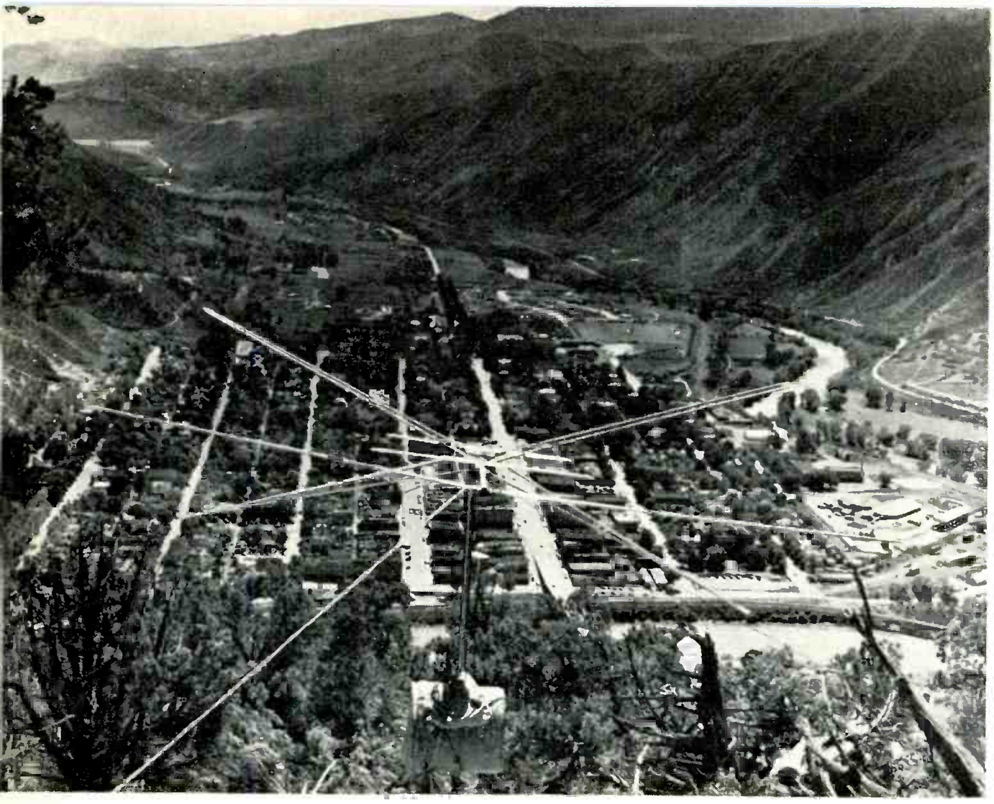


Figure 1. View of a typical community served by a VHF TV translator taken from the transmitter site.

Figure 2. Calculated area coverage of typical translator. Satisfactory coverage is expected at points A (20 miles from transmitter) and points B where the antenna pattern is 6 db lower in signal strength from the node. This coverage would consider that all-channel receiving antennas are used. Somewhat greater coverage would be available if higher gain cut-to-channel Yagi antennas were used for receiving.

VHF TV Translators

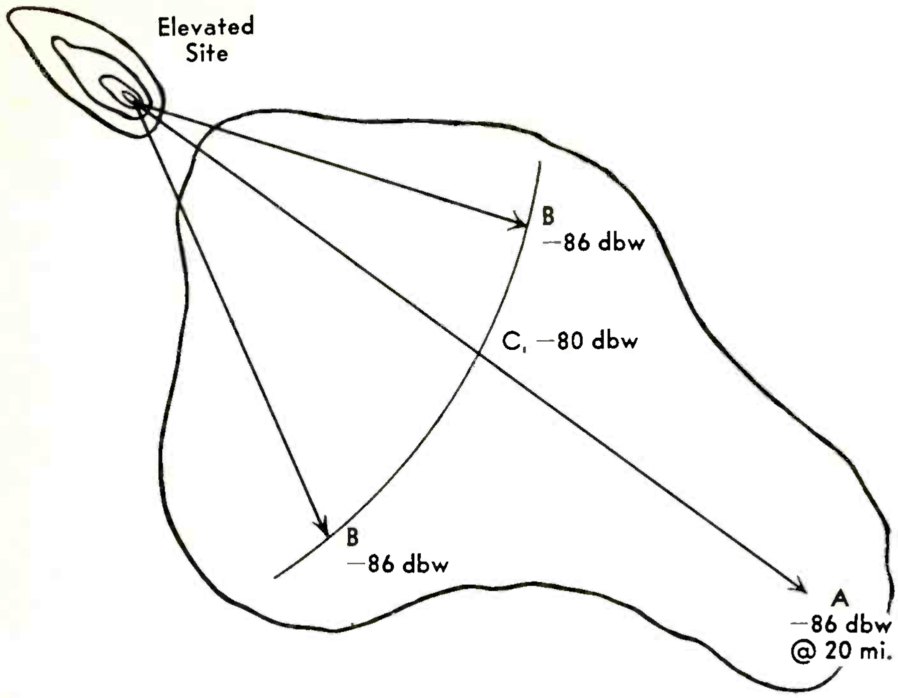
Many VHF TV Translators will be installed under the new regulations adopted by the F.C.C. This article describes the considerations which must be understood in planning this type of installation.

By Byron W. St. Clair*

*President, Electronics, Missiles and Communications, Inc. 85 Harbor Lane, New Rochelle, N. Y.

A NEED for the expansion of coverage beyond that which can be provided by high power television stations located in metropolitan areas has long been felt. Fill-in type coverage has been accomplished by cable systems and UHF Translators. The availability of these two methods has not, however, been considered the whole answer to the problems, especially by the segment of the population with the reception problem. There has been an insistent demand for a system which would be an economical solution not requiring extensive cable installations on the one hand or the technical complexity and home converters associated with UHF Translators on the other. The demand has resulted in a considerable number of unlicensed VHF Translators and on-channel repeater installations, some of doubtful technical standards.

As a result of the demand for this service the FCC has modified Subpart G of Part 4 of the rules to permit the licensing of VHF output translators and setting technical standards for them. Regular TV licensees may own and operate these devices without regard to the multiple ownership limits applicable to regular broadcast stations. VHF and UHF Translators are now both governed by this Subpart but are subject to somewhat different restrictions. In particular the VHF Translators are limited to a one-watt peak



visual output with responsibility for not interfering with an existing utilized signal resting with the licensee. UHF Translators may have power outputs up to 100 watts but they must observe the separation requirements for regular UHF stations. Both types of translators are permitted to operate with directional antennas without restriction as to gain, and both types are permitted to use, if desired, vertical or circular polarization as well as the conventional horizontal polarization.

Applications

Many factors must be considered in determining whether a VHF Translator can be expected to give satisfactory service to a particular area. A clean reliable input signal is essential. Experience has shown that an average signal strength of at least 500 microvolts on a 75-ohm line is essential. With a signal of this average magnitude the inevitable fading of the input signal below the average level will rarely carry the instantaneous signal below the point where the translator can produce an output with a satisfactory signal-to-noise ratio. It must be possible to so locate the transmitting antenna that it can deliver a signal to the required coverage area. The transmitting antenna is usually found at one side of the area to be covered permitting a directional pattern to be used.

It is, of course, also desirable to find an elevated location. In such a case the transmitting antenna may be directed down to have its maximum gain below the horizon. The site for the translator must be chosen so that the transmission line to the transmitting antenna is not excessively long. If the length exceeds 50 ft. either the attenuation will be significant or the cost of the cable will loom large in the over-all budget. The transmitting antenna must be chosen to have sufficient gain without restricting the horizontal coverage angle below that required by the boundaries of the area to be covered. The low limit on output power makes it desirable to achieve considerable gain in the transmitting antenna. A convenient method of calculating the coverage is illustrated in Fig. 2. From this figure it may be seen that coverage is satisfactory out to a distance of 20 miles at the center. At a distance half this far out, the coverage is good over a lateral arc of 50 deg. or about 10 miles.

Another requirement which must be carefully considered before a translator is installed is the probability of interfering with another signal. The FCC rules are explicit on this point. The output from a VHF Translator must not interfere with a signal which was previously in regular use no matter how weak. The elimination of interference to a signal in prior use is the responsibility of the translator operator. However, a person who feels that he is the victim of interference from a translator must permit the translator operator to install corrective measures at the equipment where the interference occurs. Careful selection of the output channel is the first means of preventing interference. As more VHF Translators come on the air, however, the selection of available output channels in any area will become more limited. It will become necessary to depend more upon the directional characteristics of the transmitting antenna to prevent the radiation of a signal into an undesired area and upon vertical polarization to permit discrimination at the reception point.

Translator Features

The salient requirements which the FCC rules impose upon VHF Translators are:

(1) The translator must not alter the signal except with respect to frequency and amplitude. The response curve must be within 4 db maximum

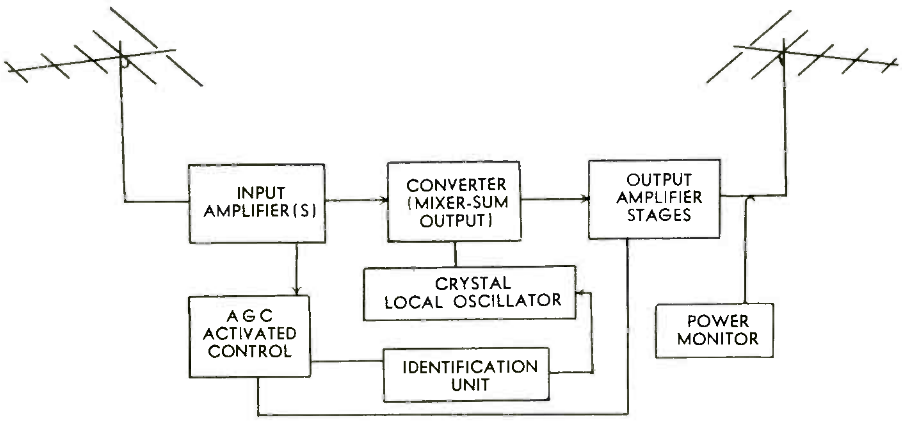


Figure 3. Block diagram of single conversion translator.

to minimum over the band, except that the response may dip at the aural carrier if it is required to reduce this carrier.

(2) The RF harmonics of the visual and aural carriers must not exceed a level 60 db below the peak visual carrier. All other emissions on frequencies more than 3 mc away from the assigned channel must be smaller than a level 30 db below the peak visual carrier.

(3) The oscillator which provides the frequency conversion must be within 0.02 per cent of the rated value from 30 deg. to + 50 deg. and for input power variations from 85 to 115 per cent of normal.

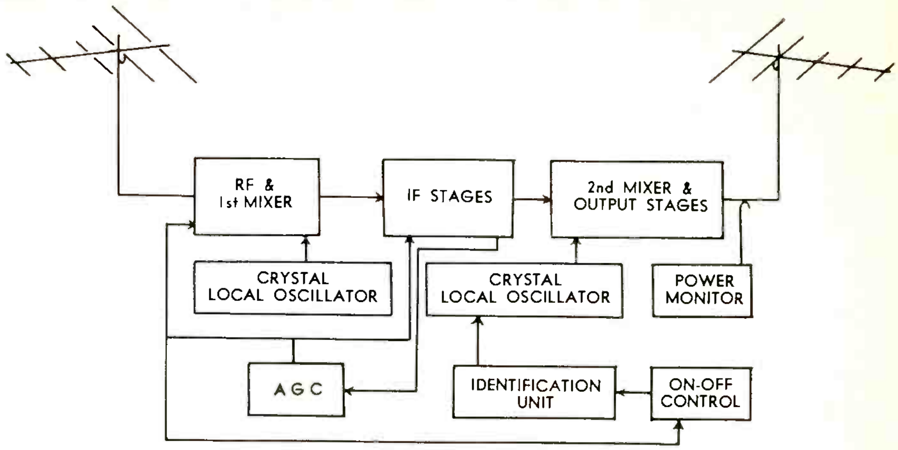


Figure 4. Block diagram of double conversion translator.

(4) Automatic gain control must be provided to maintain the output within 2 db for a 30 db input variation and which will not permit the output to exceed the rated output power.

(5) A control circuit must be provided to place the translator in a non-radiating condition when the proper input signal is absent.

(6) Identification of the translator at half hour intervals is required. Since operation is invariably unattended an automatic device is necessary.*

Translators will be found in two forms, single and double conversion. These are shown in Figs. 3 and 4. In the single conversion type the input channel is changed directly to the output channel, while the double conversion translator changes the signal to an IF frequency and then to the final frequency. Translators available in the past have by and large been assembled from channel amplifiers manufactured for various types of non-radiating distribution systems. The ready availability of these channel amplifiers made it logical to construct translators from them when the translators were custom assembled. There are however several pitfalls in the single conversion method. Many input-output combinations are not possible. If a harmonic of the input channel falls in the output pass band interfering components will show up in the output. For instance channel 3 (visual carrier 61.25 Mc) to channel 8 (180-186 Mc) should be avoided because of the third harmonic. Similarly harmonics of the injection signal may fall in the output channel.

In a single conversion translator the output channel frequency band is the sum of the input channel frequency band and the local oscillator. Thus local oscillator frequencies range from a minimum of twelve mc to a maximum of 166 mc and problems of interference to other translators result unless the circuits which generate the injection frequencies are exceptionally well shielded.

The double conversion translator concept permits a more flexible design. Here the signal is brought to a standard intermediate frequency amplifier and converted to the output channel. It is desirable to select the standard TV IF frequency (41-47 Mc) for this application since the VHF station allocation table minimizes certain types of interferences for equipment with this IF. It is fortunate that several other advantages accrue from this choice of IF. There are no impossible conversions. In most instances no spurious mixer products or harmonics fall near the output channel. In the few cases where they do it is possible to shift the IF frequency slightly to move these unwanted signals farther away from the output channel. Another important advantage is that none of the frequencies used in either the input or output conversion, or their sub-multiples when lower frequency crystals and multipliers are used, need fall within any VHF TV Channel. Thus a double conversion translator can be designed which is certain not to interfere with the input signal to itself or any translator at the same site.

The control section must provide for AGC controlled on-off operation of the later stages and for identification. The block diagrams (Figs. 3 and 4) shows the interrelation of the control circuits to the rest of the translator. The control circuit is activated whenever the AGC voltage exceeds a predetermined level. Identification is accomplished by a code wheel or tape which contains the station call letters in International Morse Code. It has been found most satisfactory to 100% modulate the injection signal with an audio tone which in turn imposes similar modulation upon the output.

System Aspects

Many elements go into a complete installation. Some of these have been covered in the previous sections and the rest will be covered here. The receiving antenna must be chosen to complement local conditions. It must have sufficient gain to deliver the required signal to the transmission line. Higher gain antennas rapidly become more expensive and their orientation is more critical. In cases where an interfering signal might arrive from the reverse direction, even occasionally, a screen behind the antenna becomes a necessity. An informal survey of the antennas which have been erected to receive the same channel in the same general location area will usually indicate a type of antenna that will give satisfactory service.

There are several advantages to be gained from the use of a preamplifier at the antenna. The loss in the input transmission line of course

(Continued on page 37)

*A recent modification of the FCC rules permits the identification for a series of translators in tandem to be introduced at the first one.

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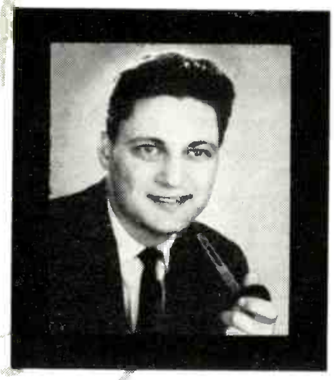

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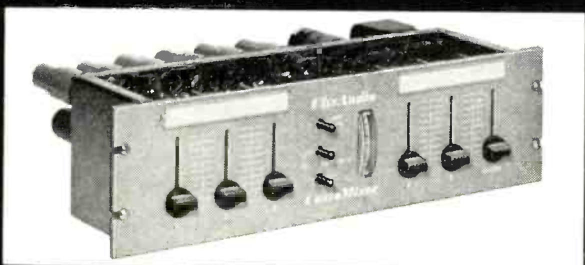

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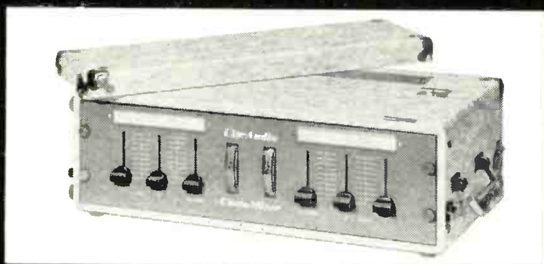

A 2-channel fully stereophonic mixer (shown in optional carrying case) with two mix positions and a master gain control per channel. Special "MIX" switch permits all mix positions to feed **both** channels simultaneously with sub-master on each channel. Model D-4.

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". . . sine squared pulse testing developed in Europe . . ."

IRE Symposium starts on page 10

tric Co. discussed the performance of the GL-7629 and GL-7293 image orthicon tubes. The GL-7293 has an extra field mesh which improves beam landing, trail and shading. The GL-7629 is a super-sensitive, long-life, thin-film target image orthicon which allows operation for color and black and white when illumination is limited.

Ralph C. Kennedy of NBC traced the history and development of sine squared pulse testing as it has developed in Europe. A comparison of Heaviside step vs. sine squared pulse spectra and their effects on a system, the methods of pulse generation, and the methods of testing various portions of system bandwidth by use of shaped bars, T and 2T pulse were discussed. The paper presented a summary of the whole area of sine squared pulse use for system testing.

The problems encountered when designing transmitter high voltage power supplies using seni-conductor rectifiers were discussed by Lynn R. Zellmer of G. E. A new video signal processing amplifier was described by Arch C. Luther of RCA and the progress in development of TV directional antennas was described by Herman E. Gihring of RCA. The design of the airborne TV station to be used for educational TV was described by Charles E. Nobles of Westinghouse.

At the symposium banquet Raymond A. Heising, a pioneer in radio development and the inventor of numerous circuits, described his early experiences in radio and Henry Loomis, the Director of the Voice of America, discussed the facilities and problems of the Voice of America.

The officials responsible for the planning and management of the symposium were Nugent Sharp, consulting radio engineer, chairman; George C. Wetmore of Page, Creutz, Steel and Waldschmitt, program manager; Serge Bergen of Kear and Kennedy Consultants, treasurer; Raymond Guy, senior staff engineer for NBC, papers; Howard T. Head of A. D. Ring & Associates, field trip; and John H. Battison, consultant public relations.

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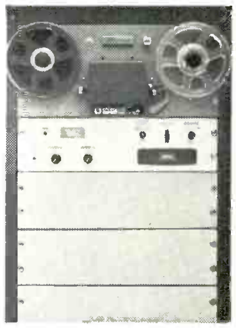

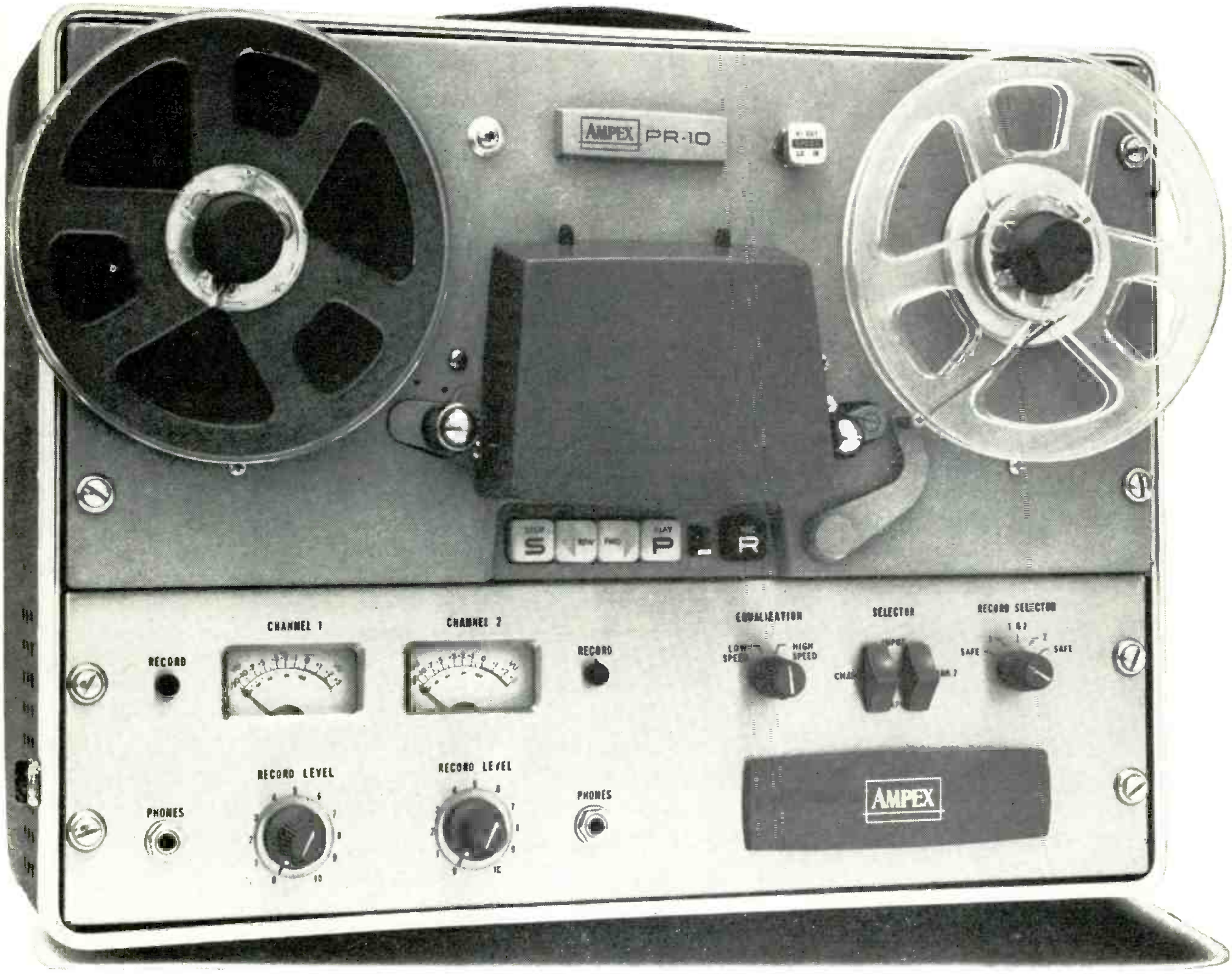

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AMENDMENTS AND PROPOSED CHANGES OF F.C.C. REGULATIONS

Remote Pickup Broadcast Stations; Frequencies

The Commission has under consideration certain editorial changes in §§ 4.436 (a) and 4.461 of its rules and regulations.

Section 4.436 (a) sets forth the emissions authorized for remote pickup broadcast stations on the frequencies allocated for assignment to such stations. Section 4.461 sets forth the frequency tolerance remote pickup broadcast stations are required to observe in operating on frequencies assigned for use of such stations. Subparagraphs (1), (2) and (3) of § 4.436 (a) and the Table in § 4.461 do not now reflect the changes in frequencies allocated for assignment to remote pickup broadcast stations during the past several years. The purpose of the amendments adopted herein is to bring the provisions of these subparagraphs and the Table up-to-date in this respect.

It appearing, that the amendments adopted herein are editorial in nature and, hence, compliance with the public notice, procedural, and effective date requirements of section 4 of the Administrative Procedure Act is unnecessary; and

It further appearing, that the amendments adopted herein are issued pursuant to authority contained in sections 4 (i), 5 (d) (1) and 303 (r) of the Communications Act of 1934, as amended, and section 0.341 (a) of the Commission's Statement of Organization, Delegations of Authority and Other Information;

It is ordered, This 3d day of October 1960, that, effective October 10, 1960, §§ 4.436 (a) and 4.461 of the Commission's rules are amended as set forth below.

(*Sec*. 4, 48 *Stat*. 1066, *as amended*; 47 *U.S.C*. 154. *Interprets or applies sec*. 303, 48 *Stat*. 1082, *as amended*; 47 *U.S.C*. 303).

Released: October 3, 1960.

FEDERAL COMMUNICATIONS COMMISSION,
BEN F. WAPLE,
Acting Secretary.

SEAL

1. Subparagraphs (1), (2) and (3) of § 4.436 (a) are deleted and new subparagraphs (1), (2), (3) and (4) are substituted, to read as follows:

§ 4.436 Emission authorized.

(a) * * *

(1) For stations operating on the frequencies 25.87 to 26.03 Mc, 40 kilocycles.

(2) For stations operating on the frequencies 26.07 to 26.47 Mc, 20 kilocycles.

(3) For stations operating on the frequencies 152.87 to 153.35, 160.89 to 161.37, 166.25, and 170.15 Mc, 60 kilocycles.

(4) For stations operating on the frequencies 450.05 to 450.95 and 455.05 to 455.95 Mc, 100 kilocycles.

2. The Table in § 4.461 is revised to read as follows:

§ 4.461 Frequency tolerance.

The licensee of a remote pickup broadcast station shall maintain the operating frequency of its station in accordance with the following:

Frequency range	Tolerance (percent) Base station	Mobile station
1,605 to 4,000 kc:		
200 watts or less	0.01	0.02
Over 200 watts[1]	.005	.02
4,000 to 30,000 kc:		
5 watts or less	.005	.02
Over 5 watts	.005	.005
30 Mc to 300 Mc:		
5 watts or less	.005	.01
Over 5 watts	.005	.005
300 Mc to 500 Mc:		
All powers	.01	.01

[1]The listing of tolerance for power over 200 watts is in accordance with treaty values and shall not be construed as a finding that such power will be authorized.

OPERATION OF STANDARD BROADCAST STATIONS WITH FULL CARRIER AND SINGLE SIDEBAND

Order Extending Time for Filing Comments

1. The Commission has before it for consideration a request of Kahn Research Laboratories, Inc., Freeport, Long Island, filed September 22, 1960, to extend the time for filing comments in the above-entitled proceeding from September 30, 1960, to October 31, 1960.

2. The petitioner states that the additional time requested is needed to prepare a comprehensive response to the questions upon which the Commission invited data and views in its Notice of Inquiry in this proceeding.

3. Upon consideration of petitioner's views and the nature and range of the questions upon which data and views were invited, the Commission believes that extending the closing date for the submission of comments is desirable to afford adequate time for the preparation of meaningful comments and that the public interest would be served by the extension.

4. In view of the foregoing: *It is ordered*, This 28th day of September 1960, that the request of Kahn Research Laboratories, Inc., for extension of time is granted, and that the time for filing comments in response to the Notice of Inquiry herein is extended from September 30, 1960, to October 31, 1960.

Single Level for Allowable Noise and Hum in Standard Broadcast Transmitters

1. The Commission has under consideration its proposal in the notice of proposed rule making (FCC 60-885) issued on July 22, 1960, to amend § 3.40 (a) (6) of its rules and regulations to read as follows:

(6) The carrier hum and extraneous noise (exclusive of microphone and studio noises) level (unweighted r.s.s.) is at least 45 decibels below 100 per cent modulation for the frequency band of 30 to 20,000 cycles.

2. The time for filing comments in this proceeding was specified as August 22, 1960, and the time for filing reply comments was specified as September 1, 1960. No comments opposing the proposal were filed.

3. The proposal would minimize the need for complex measuring equipment; would provide for measurement procedures which are more in keeping with presently acceptable practice; and would insure acceptable transmitter performance. We believe the proposed amendment would serve the public interest.

4. Authority for the adoption of the amendment herein is contained in sections 4 (i) and 303 of the Communications Act of 1934, as amended.

5. In view of the foregoing: *It is ordered*, That, effective October 21, 1960, Part 3 of the rules and regulations is amended as follows:

§ 3.40 Transmitter; design, construction, and safety of life requirements.

(a) *Design*. * * *

6) The carrier hum and extraneous noise (exclusive of microphone and studio noises) level (unweighted r.s.s.) is at least 45 decibels below 100 per cent modulation for the frequency band of 30 to 20,000 cycles.

FM AND TV BROADCAST STATIONS

Notice of Proposed Rule Making

1. Notice is hereby given of proposed rule making in the above-entitled matter.

2. The Commission has received a Pe-

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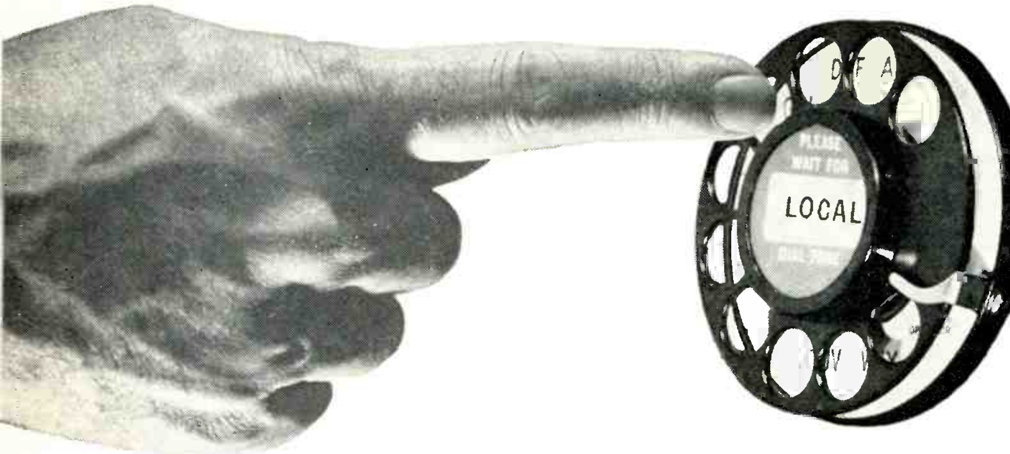

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tition from Electronics Industries Association (EIA), dated March 10, 1959 (RM-101), requesting certain changes in the rules governing television broadcast stations as follows:

(a) The present wording of § 3.687 (a) (2) concerning frequency response in the vicinity of the color pass band is ambiguous. EIA suggests a change in the language to remove this ambiguity.

(b) EIA proposes a second change which would permit TV broadcast stations to determine the operating power of the aural transmitter by direct measurement.

3. These, and certain related changes in both the TV and FM rules, are being considered by the Commission and this Notice is issued in order to obtain comments from the industry and other interested parties relative to the merits of these changes.

4. The proposed amendment relating to color transmission standards merely serves to clarify the specifications for the frequency response in the vicinity of the color pass band.

5. The proposed amendments relating to the operating power of FM broadcast and TV aural transmitters would permit stations to determine operating power either by measuring the power delivered to a dummy load connected to the transmitter output terminals (direct method) or by employing the presently prescribed indirect method. Further, it is proposed to require that the power monitoring meter in the transmission line shall be calibrated at intervals not exceeding 6 months.

6. It is proposed to relax the requirements relating to operation with reduced power to the extent that the Commission need only be notified if the required minimum operating schedule cannot be maintained with authorized power or if the period of reduced power operation is greater than 10 days.

7. One additional amendment proposed herein would modify the wording in § 3.689 (a) (1) which specifies the transmitter modulation to be employed when determining the operating power of the visual transmitter. The modification would abolish reference to the "standard black television picture" and would substitute language which specifies the form and amplitude of the modulating signal.

8. Interested persons are invited to comment with respect to the desirability of these changes, the relative accuracy of the two methods of determining power, the need, if any, for checking the VSWR when power readings are taken, the effect on the accuracy of the power indication of changes in the VSWR which might go undetected, the desirability of periodically recalibrating the power output meter or redetermining the efficiency factor, and any other pertinent matters. Comments are also invited relative to the other proposed changes.

9. To assist those persons wishing to comment, proposed language for the amendments contemplated herein is shown in the attached Appendix.

10. Authority for the adoption of the proposed amendments is contained in sections 4 (i) and 303 (r) of the Communications Act of 1934, as amended.

11. Pursuant to applicable procedures set out in § 1.213 of the Commission's rules, interested parties may file comments on or before October 14, 1960, and reply comments on or before October 24, 1960. In reaching its decision on the rules and standards of general applicability which are proposed herein, the Commission will not be limited to consideration of comments of record, but will take into account all relevant information obtained in any manner from informed sources.

12. In accordance with the provisions of § 1.54 of the rules, an original and 14 copies of all written comments shall be furnished the Commission.

1. Amend the last sentence in § 3.687 (a) (2) to read: "In addition, between the modulating frequencies of 2.1 and 4.18 Mc, the amplitude of the signal shall not vary more than ±2 db from its value at 3.58 Mc."

2. Amend § 3.689 to read as follows:

§ 3.689 Operating power.

(a) *Determination*—(1) *Visual transmitter*. The operating power of the visual transmitter shall be determined at the output terminals of the transmitter, which includes any vestigial sideband and harmonic filters which may be used during normal operation. For this determination the average power output shall be measured while operating into a dummy load of substantially zero reactance and a resistance equal to the transmission line characteristic impedance. During this measurement the transmitter shall be modulated only by a standard synchronizing signal with blanking level set at 75 per cent of peak amplitude as observed in an output monitor, and with this blanking level amplitude maintained throughout the time interval between synchronizing pulses. If electrical indicating instruments are used to determine the power output, such instrument shall conform to the accuracy specified in § 3.688 for other indicating instruments. If temperature and coolant flow indicating devices are used to determine the power output, such devices shall permit determination of this power to within an accuracy of 4 per cent of measured average power output. The peak power output shall be the power so measured in the dummy load multiplied by the factor 1.68. During this measurement the direct plate voltage and current of the last radio stage and the transmission line meter shall be read and compared with similar readings taken with the dummy load replaced by the antenna. These readings shall be in substantial agreement.

(2) *Aural transmitter.* (i) The operating power of the aural transmitter shall be determined by either the direct or indirect method.

(ii) Using the direct method, the power shall be measured at the output terminals of the transmitter while operating into a dummy load of substantially zero reactance and a resistance equal to the transmission line characteristic impedance. The transmitter shall be unmodulated during this measurement. If electrical indicating instruments are used to determine the power output, such instruments shall conform to the accuracy specified in § 3.688 for other indicating instruments. If temperature and coolant flow indicating devices are used to determine the power output, such devices shall permit determination of this power to within an accuracy of 4 per cent of measured average power output. During this measurement the direct plate voltage and current of the last radio stage and the transmission line meter shall be read and compared with similar readings taken with the dummy load replaced by the antenna. These readings shall be in substantial agreement.

(iii) Using the indirect method, the operating power is the product of the plate voltage (*Ep*) and the plate current (*Ip*) of the last radio stage, and an efficiency factor, F, as follows:

Operating Power = $Ep \times Ip \times F$

(iv) The efficiency factor, F, shall originally be established by the transmitter manufacturer for each type of transmitter for which he submits data to the Commission, and shall be shown in the instruction books supplied to the customer with each transmitter. In the case of composite equipment, the factor F shall be furnished to the Commission by the applicant along with a statement of the basis used in determining such factor.

(b) *Maintenance*—(1) *Visual transmitter.* The peak power shall be monitored by a peak reading meter which reads proportional to voltage, current, or power at the output terminals of the transmitter, this meter to be calibrated at intervals not exceeding six months. The meter calibration shall cover, as a minimum, the range from 80 to 110 per cent of authorized power and shall have indications at 80, 100 and 110 per cent or the meter shall be calibrated to read directly in power units. The operating power so monitored shall be maintained as near as practicable to the authorized power and shall not be greater than 110 per cent nor less than 80 per cent of authorized power except as indicated in subparagraph (3) of this paragraph.

(2) *Aural transmitter.* The operating power of the aural transmitter shall be monitored using a transmission line meter which reads proportional to the voltage, current or power at the output terminals of the transmitter, the meter to be calibrated at intervals not exceeding 6 months. The calibration shall cover, as a minimum, the range from 80 to 110 per cent of authorized power and the meter shall have indications at 80, 100 and 110 per cent or it shall read directly in power units. The operating power so monitored shall be maintained as near as practicable to the authorized power and shall not be greater than 110 per cent nor less than 80 per cent of that authorized except as indicated in subparagraph (3) of this paragraph.

(3) *Reduced Power.* In the event it becomes technically impossible to operate with the authorized power, the station may be operated with reduced power for a period of 10 days or less without further authority of the Commission: *Provided*, That the Commission and the Engineer in Charge of the radio district in which the station is located shall be immediately notified in writing if the station is unable to maintain the minimum operating schedule (specified in § 3.651) with authorized power and shall be subsequently notified upon resumption of operation with authorized power.

2. Revise § 3.267 to read:

§ 3.267 Operating power; determination and maintenance of.

(a) The operating power of each station shall be determined by either the direct or indirect method.

(1) Using the direct method the power shall be measured at the output terminals of the transmitter while operating into a dummy load of substantially zero reactance and a resistance equal to the transmission line characteristic impedance. The transmitter shall be unmodulated during this measurement. If electrical indicating instruments are used to determine the power output, such instruments shall conform to the accuracy specified in § 3.320 for other indicating instruments. If temperature and coolant flow indicating devices are used to determine the power output, such devices shall permit determination of this power to within an accuracy of 4 per cent of measured average power output. During this measurement the direct plate voltage and current of the last radio stage and the transmission line meter shall be read and compared with similar readings taken with the dummy load replaced by the antenna. These readings shall be in substantial agreement.

(2) Using the indirect method, the operating power is the product of the plate voltage (*Ep*) and the plate current (*Ip*) of the last radio stage, and an efficiency factor, F, as follows:

Operating power = $Ep \times Ip \times F$

(3) The efficiency factor, F, shall be established by the transmitter manufacturer for each type of transmitter for which he submits data to the Commission, and shall be shown in the instruction books supplied to the customer with each transmitter. In the case of composite equipment, the factor F shall be

furnished to the Commission with a statement of the basis used in determining such factor.

(b) The operating power of the transmitter shall be monitored by a transmission line meter which reads proportional to the voltage, current, or power at the output terminals of the transmitter, the meter to be calibrated at intervals not exceeding 6 months. The calibration shall cover, as a minimum, the range from 90 to 105 per cent of authorized power and the meter shall have indications at 90, 100 and 105 per cent or it shall read directly in power units. The operating power so monitored shall be maintained as near as practicable to the authorized power and shall not be greater than 105 per cent nor less than 90 per cent of authorized power except as indicated in paragraph (c) of this section.

(c) In the event it becomes technically impossible to operate with authorized power, the station may be operated with reduced power for a period of 10 days or less without further authority of the Commission: *Provided*, That the Commission and the Engineer in Charge of the radio district in which the station is located shall be immediately notified in writing if the station is unable to maintain the minimum operating schedule (specified in § 3.261) with authorized power and shall be subsequently notified upon resumption of operation with authorized power.

3. Revise § 3.567 to read:

§ 3.567 Operating power; determination and maintenance of.

(a) The operating power of each station shall be determined by either the direct or indirect method.

(1) Using the direct method the power shall be measured at the output terminals of the transmitter while operating into a dummy load of substantially zero reactance and a resistance equal to the transmission line characteristic impedance. The transmitter shall be unmodulated during this measurement. If electrical indicating instruments are used to determine the power output, such instruments shall conform to the accuracy specified in § 3.320 for other indicating instruments. If temperature and coolant flow indicating devices are used to determine the power output, such devices shall permit determination of this power to within an accuracy of 4 per cent of measured average power output. During this measurement the direct plate voltage and current of the last radio stage and the transmission line meter shall be read and compared with similar readings taken with the dummy load replaced by the antenna. These readings shall be in substantial agreement.

(2) Using the indirect method, the operating power is the product of the

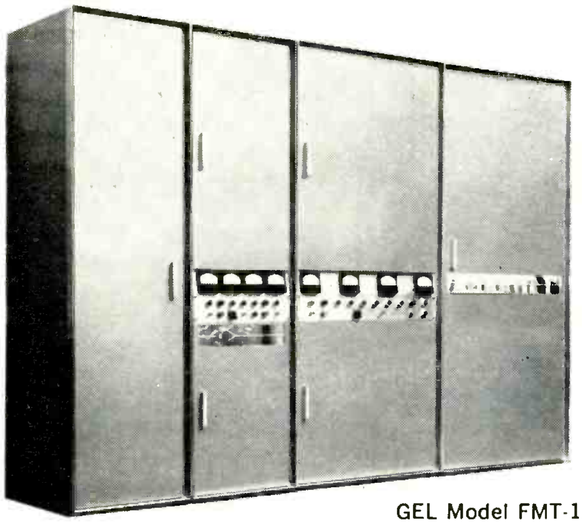


plate voltage (E_p) and the plate current (I_p) of the last radio stage, and an efficiency factor, F, as follows:

Operating power = $E_p \times I_p \times F$

(3) The efficiency factor, F, shall be established by the transmitter manufacturer for each type of transmitter for which he submits data to the Commission, and shall be shown in the instruction books supplied to the customer with each transmitter. In the case of composite equipment, the factor F shall be furnished to the Commission with a statement of the basis used in determining such factor.

(b) (1) The operating power of stations licensed for transmitter power output greater than 10 watts shall be monitored by a transmission line meter which reads proportional to the voltage, current, or power at the output terminals of the transmitter, the meter to be calibrated at intervals not exceeding 6 months. As a minimum, the meter calibration shall cover the range from 90 to 105 per cent of authorized power and the meter shall have indications at 90, 100 and 105 per cent or it shall read directly in power units. The operating power so monitored shall be maintained as near as practicable to the authorized power and shall not be greater than 105 per cent nor less than 90 per cent of authorized power except as indicated in paragraph (c) of this section.

(2) Stations licensed to operate with a transmitter output power of 10 watts or less may be operated at less than authorized power but in no event shall the operating power be greater than 5 per cent above the authorized power. The transmitter of each such station shall be so maintained as to be capable of operation at maximum licensed power.

(c) If a station licensed for transmitter power output greater than 10 watts finds it impossible to operate with authorized power, the station may operate with reduced power for a period not to exceed 10 days. In the event the period of reduced power operation exceeds 10 days, the Commission and the Engineer in Charge of the radio district in which the station is located shall be notified in writing on the eleventh day and shall also be notified when operation with authorized power is resumed.

Transmission of Call Signs by Television Broadcast Translator Stations

At a session of the Federal Communications Commission held at its offices in Washington, D. C., on the 28th day of September, 1960;

Section 4.783 of the Commission rules requires each television broadcast translator station to transmit its call sign by means of an automatic device incorporated in the transmitting apparatus, at the beginning of each period of operation and during operation, within 5 minutes of the hour and half hour. The transmission must be made in international Morse telegraphy and is for the purpose of station identification. § 4.750 of the rules deals with this automatic equipment with respect to type acceptance.

During a series of meetings with prospective translator operators, recently held in a number of Western cities, the Commission was asked to reconsider this requirement. It was pointed out to the Commission that in many instances a TV translator would be retransmitting the signals of another TV translator rather than those received directly from a TV broadcast station, and in such cases a TV translator might transmit its call sign at the same time it is repeating the call sign transmitted by the translator it is rebroadcasting. This could result in some garbling of the call signs. Furthermore, the cost of equipping each translator in an integrated system, with individual automatic devices for transmitting the call signs, would add substantially to the cost of the system. It was suggested that the originating translator in such a system could transmit a single call sign for the entire system or transmit the individual call signs of all translators which were repeating its signals.

The Commission has carefully considered this suggestion and has concluded that station identification can be effectively accomplished by permitting the originating translator in a tandem or cluster system of translators, to transmit the call signs of all of the translators in the system which retransmit its signals, either directly or through intermediate translators. This may add somewhat to the complexity of the automatic device used by the originating translator to transmit multiple call signs, but should result in a substantial over-all saving by removing the need for individual automatic devices on each translator in the system. We have considered and rejected the suggestion that a single call sign used to identify all of the translators in such a system. A single call sign would not show how many translators were in a system nor indicate the locations of the individual translators. The transmission of a series of individual call signs would supply this information to an observer.

In some cases a translator or series of translators operated by one licensee may be retransmitting signals from a translator operated by another licensee. If the licensee of the originating translator is willing to add the call signs of the individual translators operated by the second licensee to its station identification transmission, the Commission will consider the station identification requirements to have been met. If the licensee of the originating translator is unwilling to transmit these call signs, the licensee of the second translator or group of translators must provide for the automatic transmission of its call sign or call signs within its own system. Should garbling result from the coincidental transmission of call signs by both groups of translators, the Commission may require each of the licensees to employ more accurate timing of call sign transmissions to prevent such simultaneous transmission.

The amendments adopted herein have as their purpose the easing of identification requirements for translator operations and their early adoption will enable savings in the transition of nonconforming operations to full compliance with the rules. We therefore believe it is not practicable, necessary or in the public interest to comply with the public notice, procedural, and effective date requirements of section 4 of the Administrative Procedure Act prior to making the rule changes effective.

Authority for the action taken herein is found in sections 4 (i) and (j) and 303 of the Communications Act of 1934, as amended.

Accordingly, it is ordered, effective October 10, 1960, §§ 4.750 (c) (7) and 4.783 (a) of the Commission's rules are amended as stated below.

1. Section 4.750 (c) is amended by adding a proviso at the end of subparagraph (7); as amended, subparagraph (7) reads:

§ 4.750 Equipment and installation.

* * * * *

(c) * * *

(7) The transmitter shall be equipped with an automatic keying device which will transmit the call sign assigned to the station, in international Morse Code, within 5 minutes of the hour and half-hour. Transmission of the call sign shall be accomplished either by interrupting the radiated signals in the proper code sequence or by amplitude modulating the radiated signals with an audio frequency tone containing the telegraphic identification. The modulating signal may be inserted at any suitable stage in the apparatus but shall result in at least 30 per cent amplitude modulation of the aural carrier. If an audio frequency tone is used it shall not be within 200 cycles of the 1,000 cycle tone used for CONELRAD alerting: *Provided, however,* That apparatus intended to be used solely for rebroadcasting the signals of another translator need not be equipped for such automatic transmission of its call sign if its call sign will be transmitted by the translator which it is rebroadcasting.

2. Section 4.783 (a) is amended to read as follows:

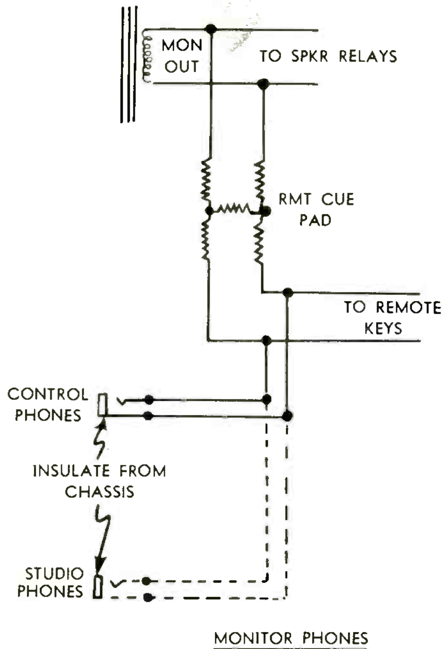
§ 4.783 Station identification.

(a) Each television broadcast translator station shall transmit its call sign in international Morse code at the beginning of each period of operation and during operation, within 5 minutes of the hour and half-hour. The transmission may be accomplished either by means of an automatic device incorporated in the translator apparatus, which will modulate the local oscillator or a suitable amplifier stage in the translator with an audio frequency tone keyed in the proper sequence so as to cause the modulation to appear on the visual and aural carriers emitted by the translator: or by rebroadcasting the signals of another translator which transmits the call signs of translators which are rebroadcasting its signals. The audio frequency tone shall produce no less than 30 per cent amplitude modulation of the emitted aural carrier and shall not be within 200 cycles of the 1,000 cycle tone used for CONELRAD alerting. In cases where a translator transmits more than one call sign, the individual call signs shall be separated by the international Morse code character for the fraction bar composed of a dash, two dots, a dash, and a dot, sent as a single character (— . . — .). Call sign transmissions shall be made at a code speed not in excess of 20 words per minute. At this speed the transmission of each individual call sign will require approximately 4 seconds.

.echnical Hints

Monitoring Remote Lines

One of the cheapest and most useful gadgets I have ever added to a console is the phone jack connected across the output of the "remote cue" pad in the monitor amplifier. If your amplifier is rack



mounted it can be tapped across the cue side of any of your remote line switches. Mounted in this manner, the operator can listen to his own program and at the same time be instantly aware of a remote operator calling in with the remote line key in the cue position.

In addition, on our console I use the monitor amplifier as a cueing amplifier and for talkback. By leaving the phones in this jack the operator can cue a record or tape while he is reading a spot, monitor the net while clipping commercials and carry on a running two-way conversation with a remote operator without reversing the line key each time.

By adding a second jack in the studio a "floor" announcer can receive instructions from the control board without resorting to hand signals and monitor his own program at the same time. Total cost about two-bits per jack.

One caution—be sure the jack is mounted between the remote-cue pad and the remote keys. Otherwise you will be unable to hear remotes calling in and the output of the monitor amplifier will blow your ears off. Although standard practice calls for mounting resistors in series with such monitoring jacks I have noticed no loading due to the headphones without them, probably because we have Hi-Z phones (2000-4000 Ohm.) Don't forget to insulate the jack from any metal mounting.

Fred Chapman, C.E.
WSTU
Stuart, Fla.

Tip for Preparing Engineering Exhibits

You can save real money on the duplication of maps and other engineering exhibits if you use a process called Xerox. Regular photocopies usually cost 50¢ to a $1.00 each with no appreciable break on quantity purchases. Xerox duplicating runs about two to three dollars for 25 to 100 copies. Any size map or exhibit can be reduced to standard 8½ by 11 letter size and copies are exceedingly clear. The service is offered by blueprint and photocopy houses and some printers.

Multiplex Specifications

Browning Laboratories has released a set of technical specifications which they recommend for stations transmitting background music via FM multiplex. They point out that the specifications depend on various special problems and therefore the requirements may vary in some cases. The suggested specifications are as follows:

(1) Fifteen per cent modulation of the main channel by each of the two subchannels.

(2) Peak deviation should be 7.5 kc from the instantaneous center frequency of each subchannel. This is 100 per cent modulation of the subchannel.

(3) The instantaneous center frequency of each of the two subchannels should be 67 kc and 41 kc. A few stations are using other frequencies.

(4) Each instantaneous center frequency should not vary more than ± .5 kc.

(5) The cross-talk between main channel and either subchannel should be at least 50 db down.

(6) The cross-talk between the two subchannels should also be 50 db down. Cross-talk between subchannel to main channel should be 60 db. Most of these measurements should be made at a time when both subchannels are on the air, as well as the main channel with different program material (preferably tones) on each channel.

(7) * The distortion of each subchannel should be less than 3.5 per cent from 50 to 100 cps and 2.5 per cent from 100 to 7500 cps.

(8) * The frequency response on each subchannel should not exceed the standard 775 microsec preemphasis curve as follows:

50 to 100 —4 db
100 to 7500—3 db

(9) Noise level output to be 55 db down with 100 per cent modulation on each subchannel.

(10) Main channel modulation should not exceed 70 per cent (a peak modulation flasher should frequently be observed to assure this).

(11) If beep control tones are used, they must be transmitted during musical "silent" periods with the subchannel (s) off the air. These tones must be transmitted one at a time.

(12) The beep control frequencies should be the same as those most of the simplex operators have been using for years which are 20 kc as the muting frequency and any frequency from 23 kc to 35 kc as the restoring frequency. Each restoring frequency is at least 3 kc apart from another.

(13) The tones should use no more than 30 per cent modulation of the main channel and should be free of any harmonics.

Gardiner G. Greene,
President
Browning Laboratories, Inc.
100 Union Ave.
Laconia, N. H.

*In the interest of standardization, this is required by the FCC on main channel. Your subchannel performance should be substantially improved.

Monitor Speaker Control

It's very annoying to someone in the studio when the control operator turns his monitor gain control up and down constantly. Yet this is the only way the console manufacturers have provided to control his speaker. Many times he must lower its level while he talks on the phone or cues a record with a soft intro.

The answer is individual controls on each speaker. Inexpensive T-Pads such as those sold for Hi-Fi speakers are fine and cost less than $4.00 each. When mounting them in a speaker system be sure the impedance is proper for the circuit. If they are mounted between the speaker line transformer and the speaker voice coil the impedance should be the same as the speakers. If they are mounted before the line transformer the impedance should be the same as the tap being used on the transformer (usually 1500 or 2000 ohms on most of the older installations feeding three or four speakers). On some of the newer systems the monitor output is around 8 or 16 ohms and the transformers used in the line have 48 ohm taps (three speakers). Watch out for these.

One thing you may have trouble with is the control room installation. The speaker is usually some distance from the operator's hands, so a control mounted on it will be useless. One trick that is really good here is to remove the monitor gain control from the console front panel and remount it on the monitor amplifier chassis. This also allows the engineer to adjust this "master" control for optimum maximum gain to minimize feed-through from not-so-soundproof walls. Replace the monitor gain control with a T-Pad and connect it in the control room speakers circuit either ahead of or behind the muting relay. In this case the pot should be the same impedance as the tap on the line transformer. Watch lead dress, as the signal level going to and from this new pot will be much higher than the signal which went to the input of the monitor amplifier. It is best to cable new shielded leads well clear of the main low-medium level wiring harness that runs through the console.

FRED CHAPMAN C.E.
WSTU
Stuart, Fla.

Industry News

Allied Radio's 1961 Electronics Catalog Ready

Allied Radio Corp., Chicago, announces the release of its 1961 catalog of electronic parts and equipment. Allied's new 576-page catalog, the largest of its kind, lists over 48,000 items and includes 240 pages in rotogravure. Covers are reproduced in four colors.

Special emphasis has been placed on parts and equipment for broadcast station requirements and for industrial maintenance, research, and production needs.

A complete presentation of broadcast station supplies includes power tubes, distortion analyzing equipment, turntables, power amplifiers, pickup arms, cartridges, equalizers, CAA-approved tower light controls, patch cords, panels, meters, racks, cable, connectors, power supplies, microphones, mike stands and electronic applications include semiconductors, special purpose tubes, booms, TV monitors, and many other items.

Additional listings for industrial rectifiers and diodes, test instruments, voltage stabilizers, transformers, controls, resistors, capacitors, printed circuit components, connectors, relays, switches, fuses, dial lights, tools and bulbs.

Allied's new 1961 electronics catalog may be obtained without charge upon request, on your station or company letterhead. Write to Allied Radio Corp., 100 N. Western Avenue, Chicago 80, Ill.

KOAT-TV Buys Adler Microwave

A 5-hop microwave system has been purchased from Adler Electronics by KOAT-TV, Albuquerque, N. M. Scheduled for October completion, the 2 KMC heterodyne repeater system will provide KOAT-TV with ABC network programs picked up off-the-air from KTVK in Phoenix. The complete turnkey installation including relay equipment, towers, antennas, shelters, auxiliary power, and VHF communications is being supplied by the Adler Industrial Products Division.

Raymond Guy Becomes Consultant

Raymond Guy after 42 years with the NBC-RCA has retired early from the company to enter the field of engineering consultation and representation in AM, FM, TV and international broadcasting, with headquarters at 264 Franklin St., Haworth, N. J.

Guy was recently cited by the Radio and Television Executives Society for having the longest continuous experience as a broadcast engineer of any one in the world and last year received a special citation from the Broadcast Pioneers "for the distinguished services he has rendered to his country, his industry and his profession as a true pioneer in the establishment of broadcasting, and as a leader in its technical development for 39 years."

In recent years he has served as treasurer and president of the Institute of Radio Engineers, secretary and president of the Broadcast Pioneers, president of the DeForest Pioneers and president of the Veteran Wireless Operators Assn.

He is a fellow of the IRE, the AIEE and the Radio Club of America and has been awarded the Marconi gold medal by the VWOA. Entering broadcasting in 1921 at WJZ, the world's second station, as an engineer-announcer he participated in RCA's research and development in international broadcasting (since 1925), TV (since 1928), FM (since 1936) and has served on scores of industry or government committees, including U. S. delegations as an industry advisor at treaty conferences in Montreal, Havana, Mexico City, Atlantic City and Washington. Guy directed NBC's comprehensive field test of FM in 1939-40 and its UHF field test in Bridgeport, Connecticut, in 1951-2-3, and participated in similar RCA projects in New York and Washington. He is an industry advisor and science consultant to the Voice of America and recently made a trip around the world to evaluate the operation. In recent years he was appointed senior staff engineer of NBC after many years as director of radio and allocations engineering, with responsibility for planning and building all NBC transmitting facilities.

New Building at Collins

Construction of a $1.4-million addition to its Cedar Rapids manufacturing facilities has been announced by officials of the Collins Radio Co.

The new structure will be added to the northwest corner of the Manufacturing Building located at C Avenue and Fiftieth Street N.E.

It will occupy 80,000 sq. ft. on the ground level with more than 20,000 sq. ft. on the upper level. Construction will mark another step in Collins' master plan for its northeast Cedar Rapids site. The facility, which will be ready for occupancy next April 1, will be used primarily for manufacturing operations.

The second level of the new structure will include a 15,000 sq. ft. cafeteria and kitchen area. The kitchen will cater all cafeterias operated by Collins in its three main Cedar Rapids installations.

The addition will bring the ground area of the C Avenue manufacturing building to 420,000 sq. ft. or nearly 10 acres. Construction will be handled by Alpha Corp. of Dallas, a wholly-owned Collins subsidiary.

Last month construction was begun on a 38,000 sq. ft. addition to the company's Engineering Building. This will serve as a data processing and equipment display center.

Lindahl Heads Broadcast Division

International Radio & Electronics Corp., Elkhart, Ind., announces the appointment of Hilmer Lindahl as vice-president in charge of radio broadcast equipment.

Mr. Lindahl is 45 years of age, and has a total of 26 years of varied electronic experience. He first worked as radio engineer at KVI, Tacoma, Wash., and at WMBI in Chicago, Ill. Then he was appointed the chief engineer at WRLC in Taccoa, Ga. Mr. Lindahl worked for five years with the Raytheon Corp. in development engineering, sales and as test standardization engineer for broadcast equipment. He also served in Ethiopia for five years in foreign radio broadcasting.

He has been with International Radio & Electronics Corp. for approximately nine years, and has served as design engineer and plant superintendent before his present promotion.

Rester Appointed By Ampex

Gerald F. (Jerry) Rester has been appointed eastern regional sales manager for the video products division of Ampex Professional Products Co.

Rester, formerly sales manager of electronic recording products for Radio Corp. of America, will supervise Ampex's' video sales activities in the eastern and central states area bounded by but not including Montana, Wyoming, Colorado, Oklahoma, Arkansas, Tennessee and the Carolinas.

In addition to his more than five years with RCA, Rester was technical operations engineer and staff engineer with the National Broadcasting Co. in New York from 1950 to 1955 and electronics test engineer for Grumman Aircraft Engineering Corp. from 1948 to 1950.

Two Subcommittees Named for Broadcast Engineering Conference

Two subcommittees of the NAB Broadcast Engineering Conference Committee have been named to push forward on plans for the 1961 Engineering Conference of the National Assn. of Broadcasters. The conference will be held May 7-10 at the Shoreham Hotel, Washington, D. C.

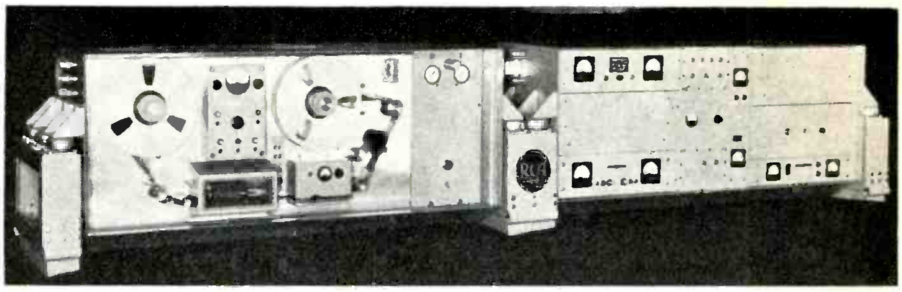
The subcommittees were named at a meeting of the committee which is headed by Virgil Duncan, chief engineer of WRAL-TV, Raleigh, N. C.

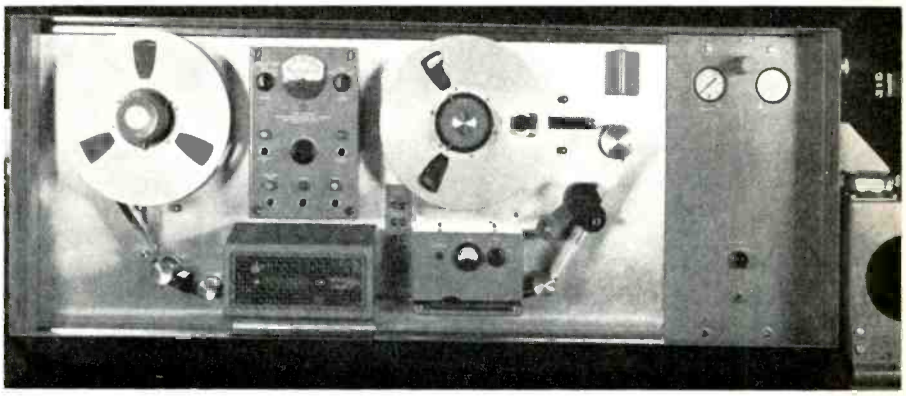
Next year registrants at the Engineering Conference will attend luncheons specially arranged for them on all three days rather than the regular convention luncheons.

Named to a subcommittee to recommend three luncheon speakers were Frank Marx, vice-president, American Broadcasting Co., New York, chairman; James D. Parker, director, radio frequency engineering, CBS Television Network, New York, and William S. Duttera, representing Andrew L. Hammerschmidt, vice-president, NBC, New York.

A second subcommittee was appointed to make nominations for the Broadcast Engineering Award which is presented at the conference. Members of this subcommittee are A. Prose Walker, NAB manager of engineering, chairman; Mr. Marx, Benjamin E. Windle, chief engineer, WCLT (AM-FM), Newark, Ohio, and Mr. Duncan.

The committee also reviewed arrangements for the conference and discussed suggested engineering papers with Mr. Walker and George W. Bartlett, NAB assistant manager of engineering.





Transistorized TV Recorder For Navy Submarine

SEADRAGON, the U. S. Navy nuclear submarine which trail-blazed a possible military and commercial route through the Northwest passage by diving beneath giant icebergs on its way to the north pole, has another "first" to its credit.

On board is the first undersea video tape recorder, according to Minnesota Mining and Manufacturing Company who developed the magnetic video tape on which under-the-ice characteristics "seen" by externally installed TV cameras will be recorded and stored.

A joint Navy-RCA effort, the completely transistorized recorder is small enough (20" x 20" x 100") to fit into the limited confines of a torpedo rack. Although this represents a 60 per cent space reduction over existing commercial television video tape equipment, the 4 megacycle recording it produces is considered fully compatible with its commercial counterpart.

The tape used is 2-inch wide video tape on 10½-inch reels (2600-foot length), which moves past a normal video scanning type recording head at 15 inches per second.

Tape record of under-ice "ceiling" obtained on the Seadragon's polar trip will be a navigational aid at land bases for studying physiography of ice under the ice cap. Navy can determine by arrangement and density of ice formations whether or not a "path" lies ahead—an important factor in finding safe submarine routes.

Video tape will be played back on an RCA TRT-1A at the Navy Electronics Laboratory in San Diego, Calif., where monitor television receivers will provide a "porthole" to the underside of polar ice for the benefit of crews training in hazardous polar navigation.

Joseph Roberts Appointed by ITA

Joseph Roberts, formerly transmitter project engineer for RCA, Camden, N. J., has been appointed chief engineer of Industrial Transmitters & Antennas, Inc., manufacturer of FM broadcast and communications equipment.

Mr. Roberts will be responsible for the design and development of high power FM transmitters, and for expansion of engineering facilities at the new ITA plant in Lansdowne, Pa., where other transmitter activities are contemplated. Before joining ITA, he was active for several years in AM, FM and TV transmitter design, and also has served as broadcast chief engineer.

VHF Translators . . .

Starts on page 18

reduces the signal available at the input to the translator. This is frequently more serious than just the reduction of one or two db since the losses of the cable introduce noise into the signal.†

Another advantage accrues from the use of external preamplifiers in those cases where the translator shares a site with other transmitters such as fixed stations in the mobile service. This type of station frequently transmits hundred of watts in one of the VHF bands. The problem of such a transmitted signal getting into the input and/or low level circuits with sufficient strength to cause interference is a common one. A remote preamplifier raises the signal level in the input transmission line reducing the relative importance of any extraneous signal picked up in the transmission line or the input circuits.

A suitable shelter is highly desirable. It is possible to mount a VHF Translator in a weather proof housing on the same pole that carries the antennas. However, a small building gives better protection to the equipment and will provide a more satisfactory environment in which to conduct such servicing as may be necessary. The use of test equipment, beyond a simple multimeter, in the open is unsatisfactory even in fair weather. The output transmission line must be chosen as a compromise between its cost and the permissible attenuation. This is particularly true when the output is one of the high VHF channels where the cable loss is considerably greater than the low channels.

The selection of transmitting antennas will have to be individually made for each site. In any particular situation it will be necessary to compromise the required forward gain with the desired horizontal arc over which coverage is desired. Additional gain may be obtained from increased vertical directivity but the cost increases very rapidly, compared to the gain, after the first 3 db improvement. Another class of problem with which the transmitting antenna will be required to cope is the radiation of energy in an undesired direction even though at reduced intensity. This will be a problem when another signal on the same channel, whether from a regular TV station or from another translator, is being utilized in the same geographical area. Careful attention to minor lobes and back radiation will be required.

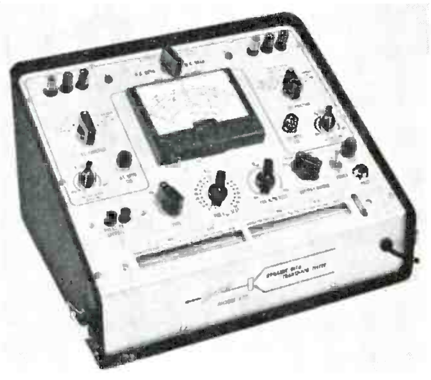
It is desirable to use a transmitting antenna with a low VSWR—preferably one which will maintain this performance even in bad weather. In a typical installation, a transmitting antenna with a VSWR of worse than about 1.2 can be expected to generate visible ghosts in the transmitted signal.

The availability of power lines is frequently a serious problem. It is not unusual for the power lines to cost more than all of the rest of the installation including equipment. Indeed, the availability of power at a second best site frequently may result in its selection over one where propagation considerations are more favorable. The power requirements of even several 1 watt VHF Translators will easily be met by minimum capacity branch circuits. Provision for at least 500 watts of test equipment has been found desirable. In cases where the necessary translator location is so far from existing power lines that their extension is impractical, gas driven generators have been used. In this case two units are usually installed with an automatic switchover arrangement included. When power is supplied in this way it is desirable to include sufficient wiring so that test equipment may be run from the generator that is not supplying the translator(s).

There can be no doubt that VHF Translators will be installed under these new rules in great quantities, both by the end users and by broadcast stations seeking to improve their coverage. It is equally certain that interference problems will arise which will require diplomatic and engineering skill to eliminate. The authorization of this class of service was energetically demanded by a large group of potential viewers who are now calling upon the entire industry to make it work.

†For a more complete discussion of the sources of noise in an input system see St. Clair, B. W., National Assn. of Broadcasters Handbook Prose Walker, Editor, Fifth Edition, p. 8-54 to 8-56, McGraw-Hill, N. Y.

Product News



DYNAMIC BETA TRANSISTOR TESTER

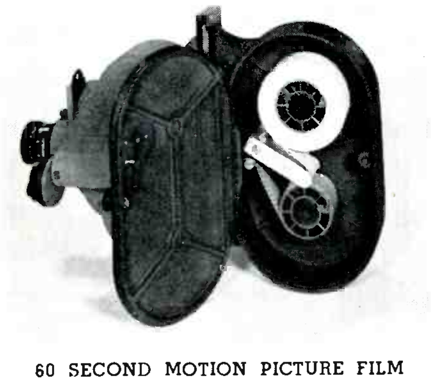
Development of a new, versatile dynamic Beta transistor tester has been announced by the Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland 8, Ohio, manufacturer of electronic test equipment and meters. The transistor tester is the Model 870.

This new tester tests transistors according to manufacturer's specifications. Collector current and collector voltage can be varied to provide the proper conditions for correct Beta measurements. Beta measurements which are not made at the specific current and voltages established by transistor manufacturers are meaningless.

The tester measures large signal DC Beta on power transistors as well as small signal AC Beta on low and medium power transistors. Collector test current is variable up to 2 amperes, permitting Beta measurements of power transistors rated 5 amperes and more.

This new tester provides low voltage, high current tests. It has 3 Icbo ranges: 0-100 ua, 0-1 MA, 0-10 MA. Two Beta ranges: 0-100 and 0-300 are incorporated together with a feature that permits half-calibration effectively increasing the upper Beta range to 600.

Application for this tester include quality control assignments, as well as incoming inspection, sorting and grading of transistors, or servicing transistorized equipment.



60 SECOND MOTION PICTURE FILM DEVELOPER

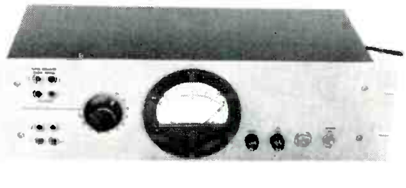
Camera Equipment Co., Inc., of New York has been named exclusive eastern distributor for a new technique to process 16 and 35mm movie film in a camera in less than 60 seconds. Called Rapromatic Processing, this new automatic way to develop and fix film has applications in fields which require immediate access to results, such as: Photo-instrumentation, oscillo recording, cinefluorography, in-flight photography, real-time display, sporting events, TV news coverage and many other needs of industrial photography.

Rapromatic Processing is accomplished by fitting Raproroll, a chemically presaturated paper material in roll form, into the magazine or other processor. A mechanical squeezing action at the point of sandwich formation develops and fixes film on contact as footage is being shot. There are no dripping fluids, no pumps, no applicators, no costly processing equipment. The camera stays dry while the film negative in the magazine is developed and fixed.

For further information, contact Arthur Dorman, Camera Equipment Co., Inc., New York.

CONELRAD PROGRAMMER

The Rust Automatic Conelrad Programmer provides a complete Conelrad alert cycle for radio broadcasting stations by either push button or remote control. It has the following automatic functions: carrier off—5 seconds; carrier on—5 seconds; carrier off—5 seconds; 1000 cycle tone—15 seconds. The unit can operate continuously with little or no maintenance since it has no vacuum tubes or transistors. Servicing is simplified through the front by a hinged panel, and the equipment need not be removed from the rack. Requires only 3½ inches of height on a standard 19-inch rack. For further information write: Rust Industrial Co., 130 Silver St., Manchester, N. H.

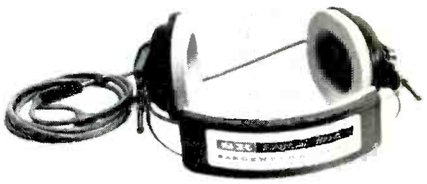


TRANSISTORIZED VOLUME LEVEL INDICATOR

The Daven Co., Livingston, N. J., announces an improved, transistorized version of its widely-used 924 series Volume Level Indicator Panels. Called the Type TR-924-C, this unit was designed to accurately measure the power level on 600 ohm audio transmission circuits within the range of —40 dbm to +20dbm.

Essential to the operation of Type TR-924-C is a two-transistor negative feedback amplifier circuit which encompasses the output meter and its rectifiers within the feedback loop. This results in high over-all stability and wide frequency response. In order to secure maximum immunity against temperature effects, overall D. C. negative feedback is utilized to stabilize the operating points of the transistors. Regulation of the voltage supplying the amplifier provides complete freedom from line voltage effects and surges.

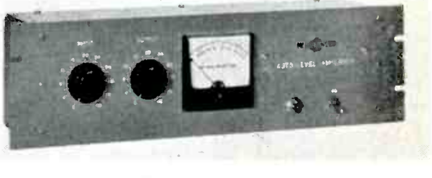
Both bridging and terminating inputs are provided, either by means of jacks located at the front of the instrument or a terminal block at the rear. The jacks are wired so as to lift whatever inputs are connected to the rear terminal block, whenever a plug is inserted, if such action is desired. An alternate set of jacks allows paralleling the front panel jacks across the terminal block inputs. All inputs are floating, allowing operation from either balanced or unbalanced sources.



NEW PROFESSIONAL STEREO HEADPHONES

A distinctive new professional-quality stereo headset is now being offered by Sargent-Rayment Co., Oakland, Calif., high fidelity component manufacturer. Designed for both private listening and professional monitoring of recording sessions, the stereo headset provides unusually realistic sound reproduction.

Frequency response is smooth and distortion-free throughout a wide range, from 60 to 12,000 cps. Bass response is increased by a scientifically designed molded aluminum casing, which also lends ruggedness to the units and makes them practically indestructible. A sealed outer surface of grey cellular vinyl chloride, on ear pieces and headrest, make the unit not only comfortable but also hygienically superior to conventional hi-fi headsets. "Right" and "left" markings are provided on the phones for the professional user. Literature is available from the manufacturer at 4926 E. Twelfth Street, Oakland 1, Calif.



NEW COLLINS LIMITING AMPLIFIER

An automatic limiting amplifier capable of raising average radio broadcast program audibility has been developed by the Cedar Rapids Division of Collins Radio Co.

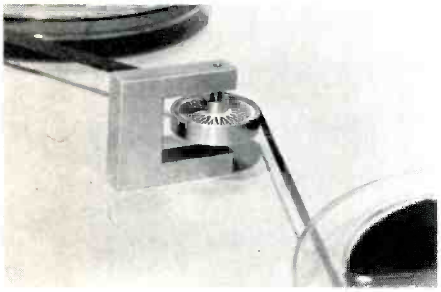
Functioning on a low compression ratio, the Collins 26J-1 allows limiting action up to 30 db without noticeable effect other than bringing up the average listening level of the program level.

Automatic fades between microphone and recorded music are achieved by setting the microphone level at a higher level than the turntable. When the microphone is activated, the higher level automatically fades the music into the background and allows the speech to come through clearly.

The rack mounted unit consists of a push-pull variable gain input stage which drives a push-pull output stage. A bias rectifier provides bias to regulate gain of the input stage. Four silicon rectifiers are used in a full wave bridge circuit.

Frequency response of the 26J-1 is ±1 db from 50 to 15,000 cps, with a 3:1 optimum compression ratio adjustable from 1.6:1 to 5:1. Attack time is 11 milliseconds on dual operation and 62 milliseconds on average operation. Release time is 0.9 seconds for a 63% recovery on dual operation and 5.2 seconds for 63% recovery on average operation.

Distortion is listed as 1.5 per cent maximum from 50 to 15,000 cps with no compression. There is a maximum of 2 per cent distortion from 50 to 15,000 cps at any level up to 30 db gain reduction with threshold set for a 3:1 compression ratio.

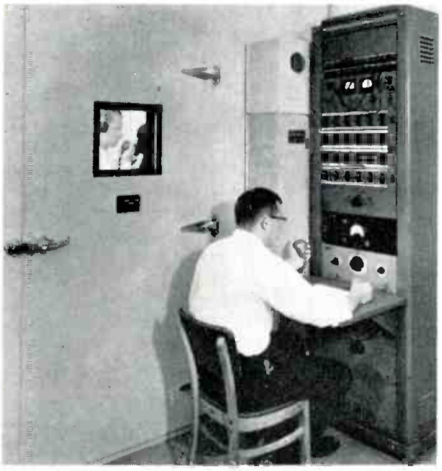


TAPE SPEED MEASURING DEVICE

An extended line of TapeStrobes, the tape speed measuring device for all users of magnetic tape, is now offered by Scott Instrument Labs, Inc., 17 East 48th St., New York 17, N. Y. Tape speed accuracy can now be determined for speeds ranging from 1⅞ ips to 60 ips. (Also available in special 50 cycle models).

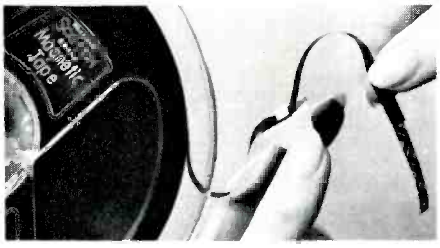
In addition to their standard 7½, 15, 30, ips TapeStrobe (Model A), Scott Labs now offers a standard 3¾, 7½, 15, ips Strobe (Model B). A special step-down adapter (Model W) adds the additional speed of 3¾ ips to Model A and 1⅞ ips to Model B. 60 ips speeds can readily be checked with the Model A Strobe when used with a simple strobe light.

New TapeStrobe instruction sheets include charts for a simple measurement of tape speed errors as small as ½ second in 30 minutes.



NOISE ROOM AIDS IN MICROPHONE DEVELOPMENT

Looking like an oversize telephone booth, this insulated noise room at Shure Brothers, Inc., Evanston, Ill., duplicates the loudest sounds that can be produced by man. Inside the room, Donald O. Rail, 4834 Wright Terrace, Skokie, wears earphones to receive instructions from Austin J. Brouns, 1000 Grove St., Evanston, at the control panel. The sounds inside the room, produced by noise-generating equipment, is so intense that the engineer inside cannot hear himself talk. Yet his voice is transmitted clearly with the background noise muffled over the noise-discriminating microphone he is using. Room was built by Shure to aid in the development of better noise-discriminating microphones.



CLIP TO HOLD TAPE ENDS

A plastic clip that slips smoothly between the flanges of reels to hold loose ends of magnetic tape securely in place has been developed by Minnesota Mining & Mfg. Co., 900 Bush Ave., St. Paul, Minn.

Molded of polystyrene plastic, the triangular-shaped accessory is sturdy yet flexible and easily clips onto tape on reels. All edges are tapered and smooth to prevent any possibility of scratching the tape. The clip was designed as a simple and quick means of keeping tape on either partial or full reels from tangling or unwinding during storage and shipment. Produced only in one width, the clip fits standard quarter-inch recording tape on any size reels.

BOOKLET ON FM RECEIVING ANTENNAS

A 38-page booklet describing the use and importance of proper FM receiving antennae has been prepared by L. F. B. Carini of Apparatus Development Co., Inc., Drawer 153, Wethersfield 9, Conn. The booklet points out the procedures for obtaining maximum reception of FM signals. All of the factors involved in FM antennae are discussed in non-technical language, including why an FM antenna is important, what constitutes a good FM antenna, fringe reception, impedance matching, transmission lines, installation, and other factors. The booklet is priced at 30 cents.

Broadcast Engineering Magazine welcomes editorial contributions from its readers. Articles on everyday operational methods, studio or transmitter layouts, construction projects, and other topics on the technical aspects of broadcasting will be paid for on acceptance. Write us concerning rates and other information. Broadcast Engineering, 1014 Wyandotte Street, Kansas City 5, Missouri.

Advertisers' Index

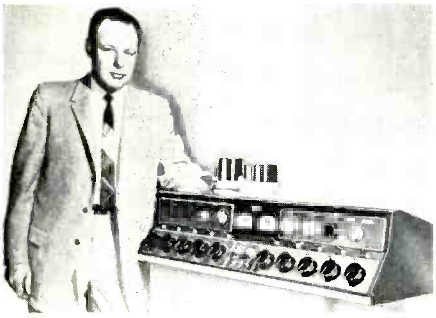
Product News

REAR PROJECTION SCREEN

A new line of portable daylight rear projection screens is announced by Polacoat, Inc., 9750 Conklin Road, Blue Ash, Ohio. The Red-I-Frame Lenscreen screens are available in all popular sizes and include the extra wide sizes for side by side or "dual" presentations. The Lenscreen rear screen provides rich images even though the screen be faced into full room illumination.

The screen frame is easily assembled from sections of tubular parts to which the elastic screen panel is hooked. All parts fit into a compact box for shipping or storage.

The rear-screen membrane is of flexible Lenscreen material, a tough durable vinyl-latex plastic permeated with special lens cells. The translucent sheeting is produced by Polacoat in continuous rolls 10 ft. wide and is available as bound screens, as a material "by the yard," or in rolls of 25, 50, 100, or 150-ft. lengths.



NEW CONTROL CONSOLE

Pictured above is James J. Noble, chief engineer of electronics for Altec Lansing, and the new Altec 250 SU Control Console which he designed for broadcasting, telecasting, recording studio and sound system applications.

The 250 SU offers flexibility for stereo, single, or multiple channel operation.

This flexibility is made possible by the use of newly designed miniature plug-in preamplifiers, program amplifiers, and utility input devices. The plug-in units are $1\frac{5}{8}$ inches wide, $3\frac{13}{16}$ inches maximum height and $9\frac{9}{16}$ inches long. All units are identical in size to permit flexibility in the number and type of amplifiers used per console.

Single unit construction is used because of simplified, less expensive installation. The power supply is mounted externally from the console to reduce any possible pickup of hum inducing flux fields.

The 250 SU has ten mixer positions with 16 connected inputs, each equipped with "bus" switches. Any input position may be used for either high level or low level sources. Mounting trays for the maximum number of plug-in units are installed and wired, it is only necessary to plug in the required number of preamplifiers and/or utility input devices for any specific application.

All output circuitry for single-channel, single-line; two-channel, two-line; dual stereo or three-channel/two-channel stereo is included and wired.

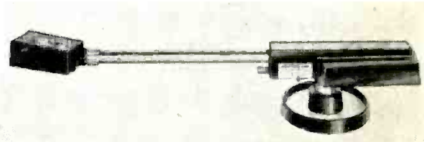
RERECORDING MIXER

A completely transistorized mixer for audio recording has been introduced by the Westrex Corp., 6601 Romaine St., Hollywood, Calif., a division of Litton Industries.

The Westrex Type RA-1627 Mixer accepts up to eight inputs at a nominal level of —5 dbm and provides a single channel of equalized output in the range of —20 to +16 dbm. Input and output connections are made through a terminal strip on the front. A jack field is provided to facilitate special circuit configurations.

Modular construction makes possible configurations to meet any need in disk recording, radio, television, public address or motion pictures. Response is flat within ±0.5 db from 40 to 12,000 cps.

Built for table mounting, the mixer is in a hardwood cabinet with gray crackle finish. Dimensions are 13 inches high, 16½ inches deep and 40½ inches wide. Access to all electronics modules is from the front for easy servicing.



NEW DYNAMIC PROBE MICROPHONE

New Shure Model 545 Unidyne III microphone is a unidirectional dynamic microphone with probe styling which enables it to be used as a stand-mounted or hand-held microphone. Frequency range is 50 to 15,000 c.p.s. Dual-impedance microphone is finished in brushed satin chrome and high-impact black plastic. Unit weighs 0.6 pounds and is 6 inches long.

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

SPECIAL SALE—We're moving to our new plant in New Brighton, Minn. Several used lab and demo video monitors. 17" models $185.00 @ New Warranty. Miratel, Inc., 1081 Dionne St., St. Paul, Minn. 11-60 1t

HELP WANTED

Chief Engineer. Supervisory-maintenance engineer for one thousand watt FM station and closed circuit television on university campus. Must have first class radio license. Excellent working conditions in new studios and with new equipment. Contact immediately D. C. Kleckner, Bowling Green State University, Bowling Green, Ohio. 11-60 1t

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Will buy or trade used tape and disc recording equipment — Ampex, Concertone, Magnecord, Presto, etc. Audio equipment for sale. Boynton Studio, 10-BE Pennsylvania, Tuckahoe, N. Y. 11-60 4t

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