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MARCH 1964 75c

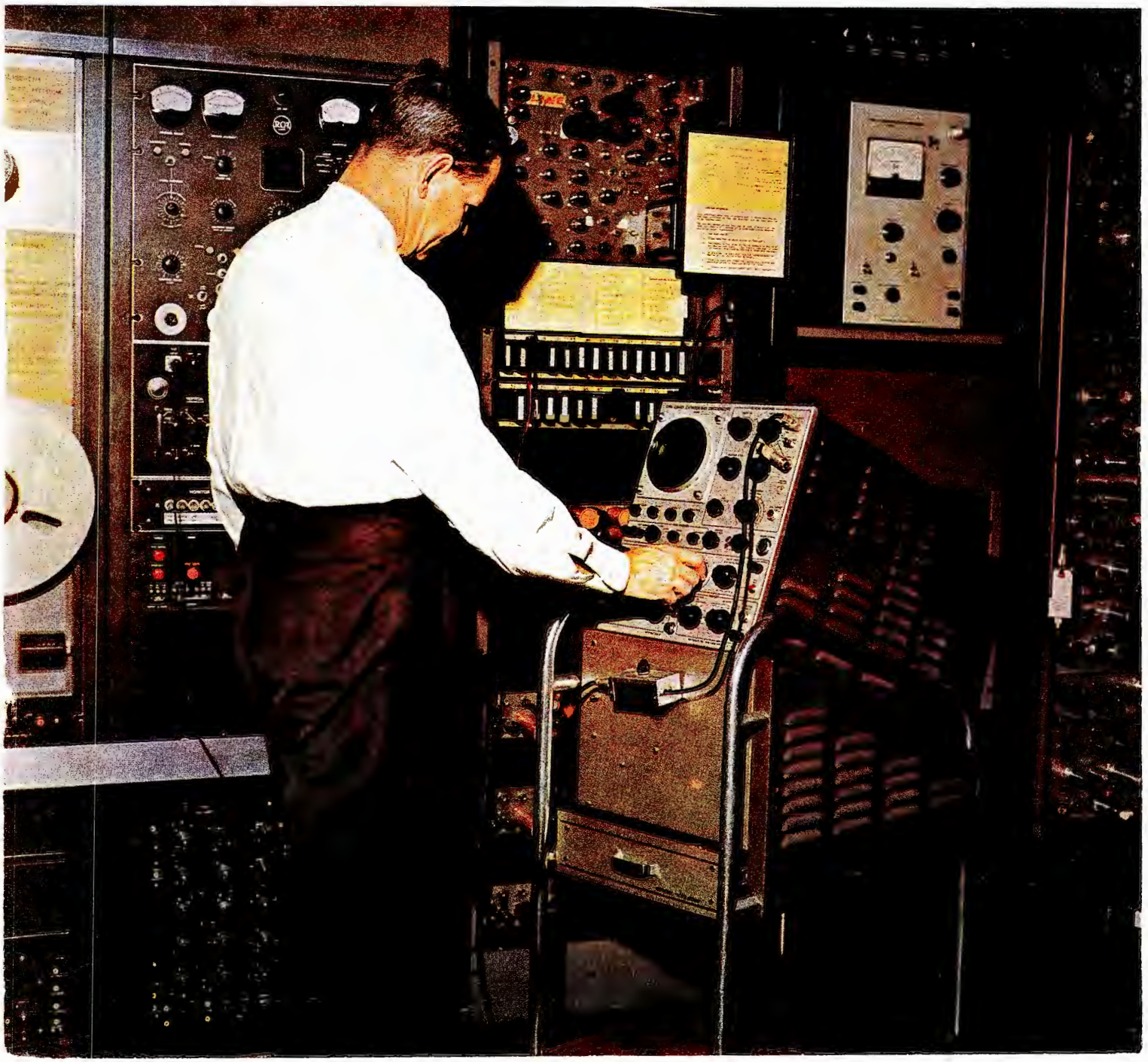
ANNUAL NAB CONVENTION ISSUE

Pre-show information including staff editorials, exhibit hall floor plans, list of exhibitors, new product previews, and other convention features.

Plus . Parallel Transmitter Operation Minimizing Problems in SCA Service, FCC 3rd Class Broadcast Endorsement, and SMPTE Conference Information.

Broadcast Engineering

the technical journal of the broadcast-communications industry



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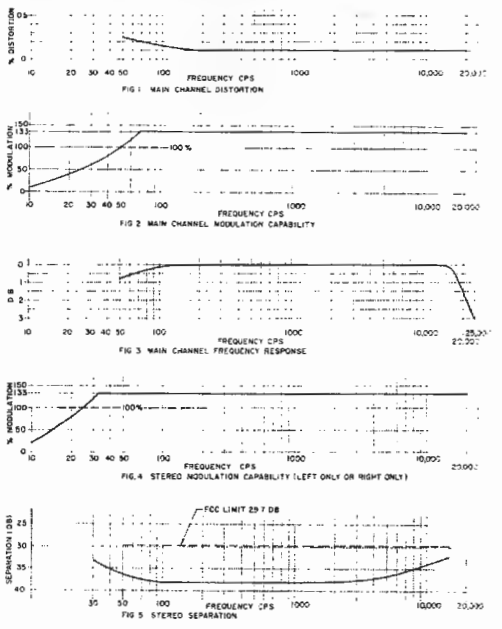

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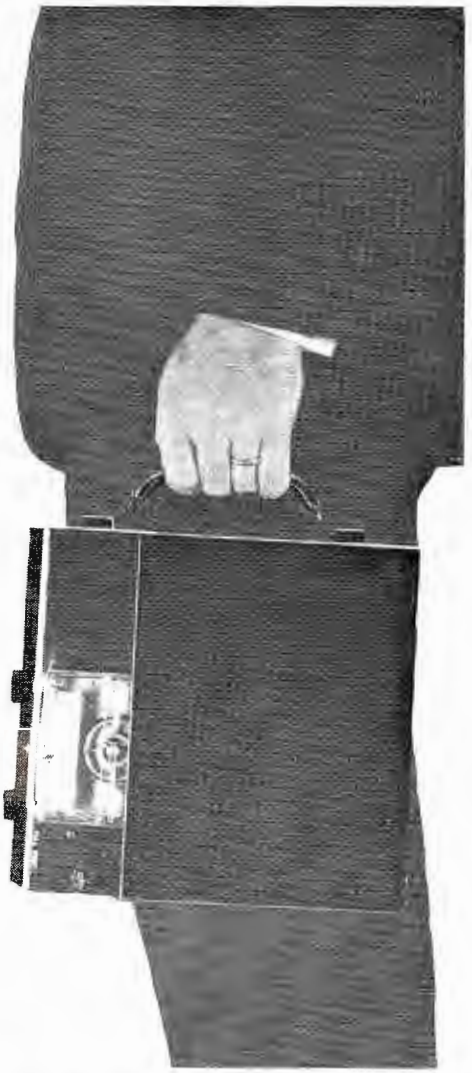

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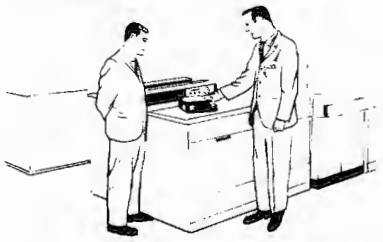

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the technical journal of the broadcast-communications industry

Broadcast Engineering

Volume 6, No. 3 **March, 1964**

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FEATURES

DEPARTMENTS

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SUBSCRIPTION PRICE: U.S. $6.00, one year; $10.00, two years; $13.00, three years. Outside U.S.A. add $1.00 per year for postage. Single copies, 75 cents, Back issues, $1.00.
BROADCAST ENGINEERING is published monthly by Technical Publications, Inc., an affiliate of Howard W. Sams & Company, Inc. Editorial, Circulation, and Advertising headquarters: 4300 West 62nd Street, Indianapolis 6, Ind.

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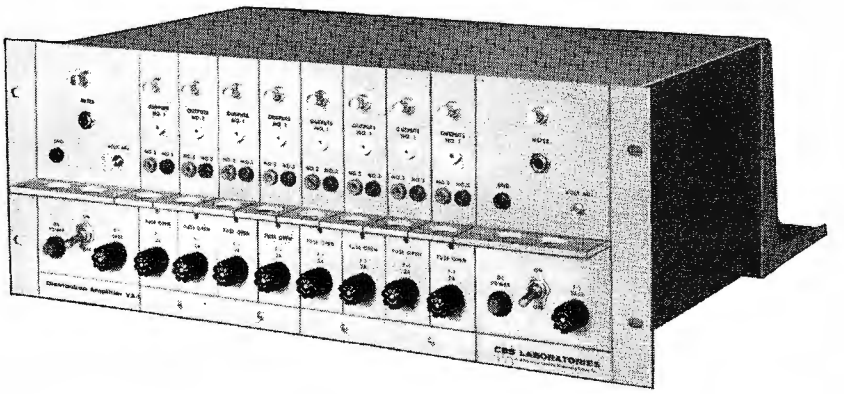

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ABOUT THE COVER

Stations all over the country are learning to make more efficient use of their scopes. With a little planning and forethought, the equipment in the station and transmitter can be laid out to facilitate quick troubleshooting and maintenance checking with the station scope.

On this month's cover, you see Ernest Pell — Technical Director of WPSD-TV, Paducah, Kentucky — setting up the station scope for some maintenance checks at the custom-built test panel of the control-room racks. The panel, visible just in front of Mr. Pell, carries labeled jacks that are connected to key test points in the racks. If a sudden failure occurs, the scope will quickly reveal points at which the signal is either missing or distorted.

When we visited WPSD-TV, we were immediately struck by the neatness of the entire plant. From the immaculate, tiled lobby and office area (pictured below) to the equally neat control room, the watchword seemed to be clean layout.

WPSD-TV has been on the air since May, 1957. At that time, their visual power was 60 kw. In the fall of 1958, power was increased to 100 kw, with 50 kw aural. In July, 1961, the WPSD-TV transmitter and antenna was moved to a little spot called "Monkey's Eyebrow," overlooking the Ohio River. The station signal is microwaved to the transmitter, and piped up a 1550′ tower to a 6-bay antenna that is 1638′ above average terrain. Their Grade A contour takes in parts of five counties in Missouri, eleven in Illinois, and eleven in Kentucky.

TOTAL PACKAGE CONCEPT ASSURES MAXIMUM STEREO PERFORMANCE

A complete FM stereo broadcast package — specially engineered to deliver the greatest stereo realism possible — is now available from the Gates Radio Company.

This exclusive system features a full power range of stereo transmitters from 10 watts to 20,000 watts, the new Cycloid antenna with one through sixteen bays, a dual peak limiter, stereo Cartritape, the choice of two stereo audio consoles and two professional stereo turntables (12 or 16-inch)—plus other important accessories that add realistic depth and separation to broadcast sound.

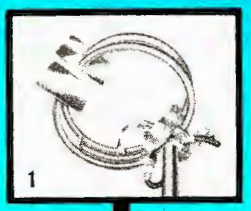
All equipment in the package was researched, designed and manufactured after the FCC rules and regulations concerning FM stereo were finalized — yet each product has been extensively field tested.

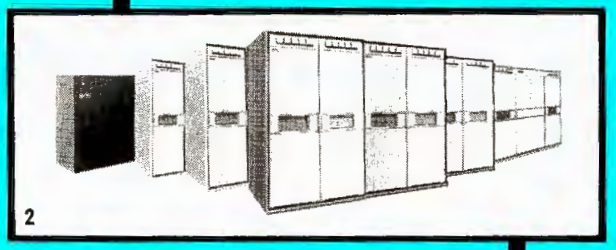
To assure maximum stereo performance, the new FM station will want a fully integrated system designed specifically for stereo—and Gates is the only manufacturer in the broadcast industry to offer such a complete equipment plan. This total package concept solves the broadcaster's problem of purchasing equipment from several different sources — which could result in an incompatible stereo broadcast system.

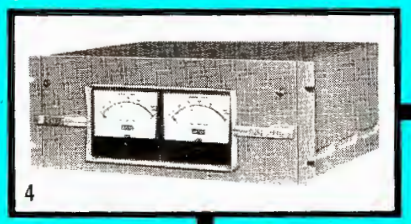
Many FM stereo stations already on the air may find that they are not getting full stereo performance due to an incomplete system. By reviewing the package diagram on the right, they can determine the equipment needed to assure true stereo transmission. And the monaural station should investigate to see how relatively simple and inexpensive it is to convert to the "wonderful world of stereo" with the complete Gates package.

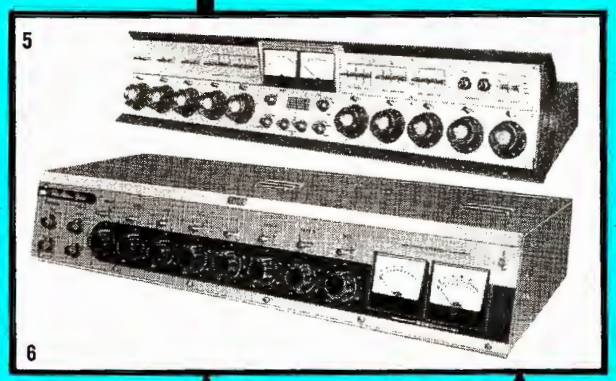
Full technical information on this special FM stereo package is now available. Write Gates Radio Company, Quincy, Ill., for the FM Stereo Fact File.

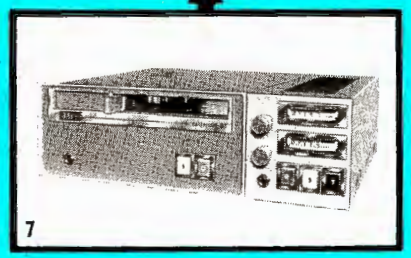
GATES OFFERS MOST COMPLETE FM STEREO PACKAGE IN INDUSTRY

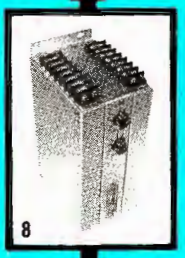












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Circle Item 6 on Tech Data Card

NEW
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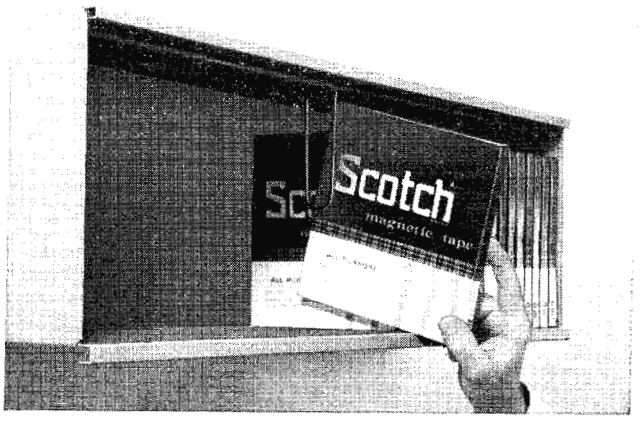
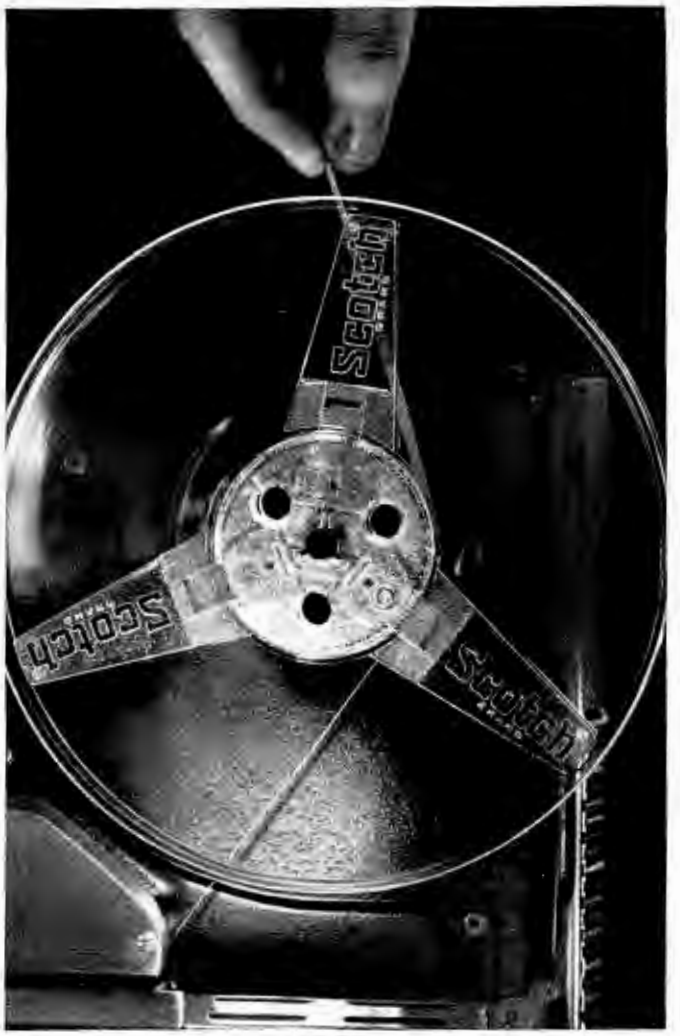
Here's what's in this new package: The tape library storage cabinet shown. 12 special new take-up reels that actually thread themselves. And you get these items for $108 *off* regular audio-visual net prices with the purchase of one of a variety of SCOTCH® BRAND Recording Tape assortments.

File cabinet is valued at $176, the 12 self-threading reels at $12. You can have both cabinet and reels for only $79.95 when you buy 144 rolls of 7″ size "SCOTCH" Recording Tape . . . or 288 reels of 5″ size tapes or cartridges at maximum quantity discounts. You choose from tapes created especially for heavy-duty audio-visual use as well as from professionally-proved standard tapes.

Another Storage Special: The "Storette" A $12.95 value! Yours for only $6.95 with 36 rolls of "SCOTCH" Recording Tapes. "Storette" holds 36 tapes, 5″ or 7″ reels or cartridges. Sits on counter or shelf, lays on its back or hangs on wall. "Follow-block" divider keeps tapes upright. 2-coat baked enamel finish. Units interlock for stacking, up to 7 high. Your choice of a wide variety of "SCOTCH" Recording Tapes—professionally proved standard tapes or special heavy-duty types.



CABINET HOLDS UP TO 300 TAPES! Six shelves are fully accessible, hold up to 300 recording tapes, on 5″ or 7″ reels, or in cartridges. Top-mounted "follow block" dividers hold tapes upright, keep shelves orderly. Sturdy doors have full-length piano hinges. Automotive-type lock permits strict security of valuable tapes. Adjustable floor levelers. Over-all size—5′ high, 3′ wide, 11″ deep.



NEW REEL THREADS ITSELF! No tape fumbles! Not with this new "SCOTCH" Self-Threading Reel. Eliminates thread-up problems, even for folks inexperienced with tape recorders. Just lay tape through, as shown, start recorder, and reel threads up automatically. Releases freely on rewind. No slots, hooks, attachments. Solid sides protect against dust, damage. Snap-tight collar makes reel self-storing.

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Circle Item 7 on Tech Data Card

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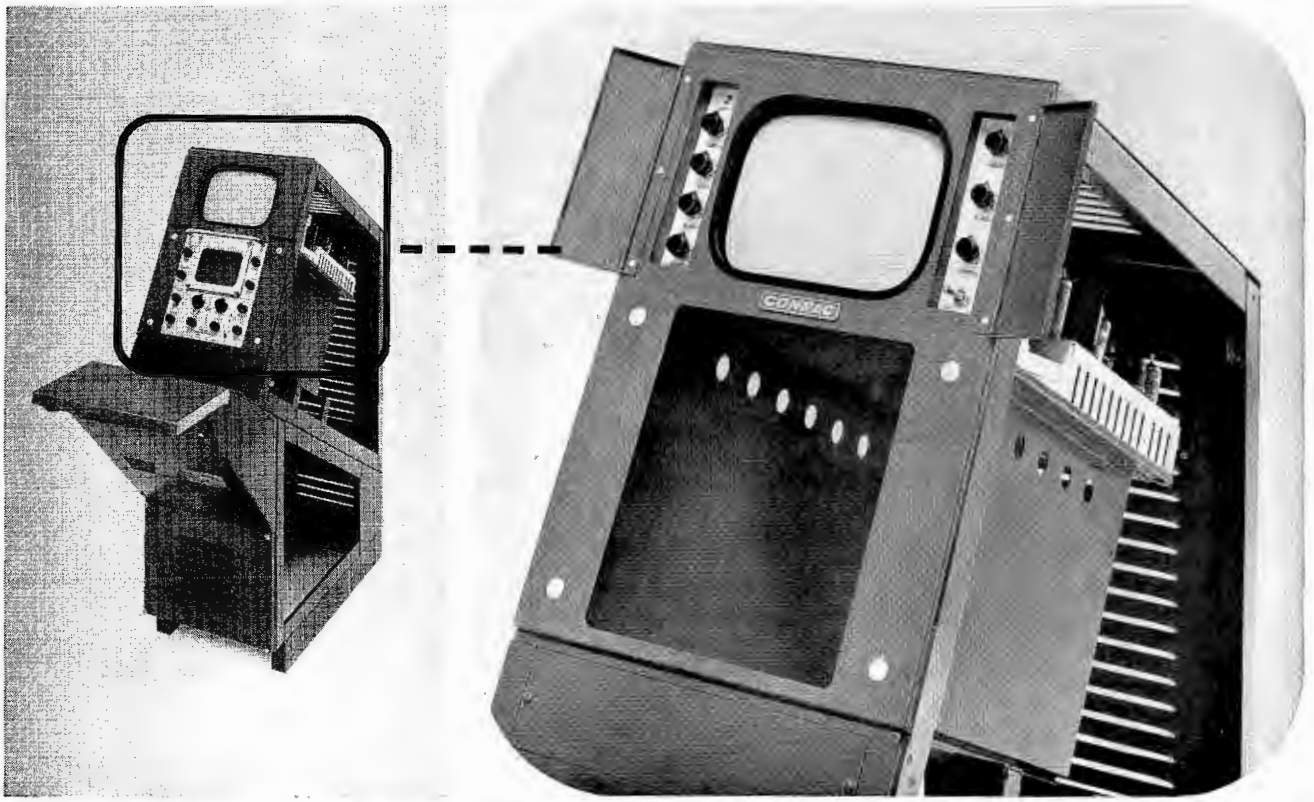


Specifically designed to fit thirteen-inch consoles, the CONRAC CTA8/TU is a direct replacement for the monitor portion of older master monitors. The housing has mounting facilities for the Tektronix 527 Scope to allow modernization of your equipment with a minimum of inconvenience.

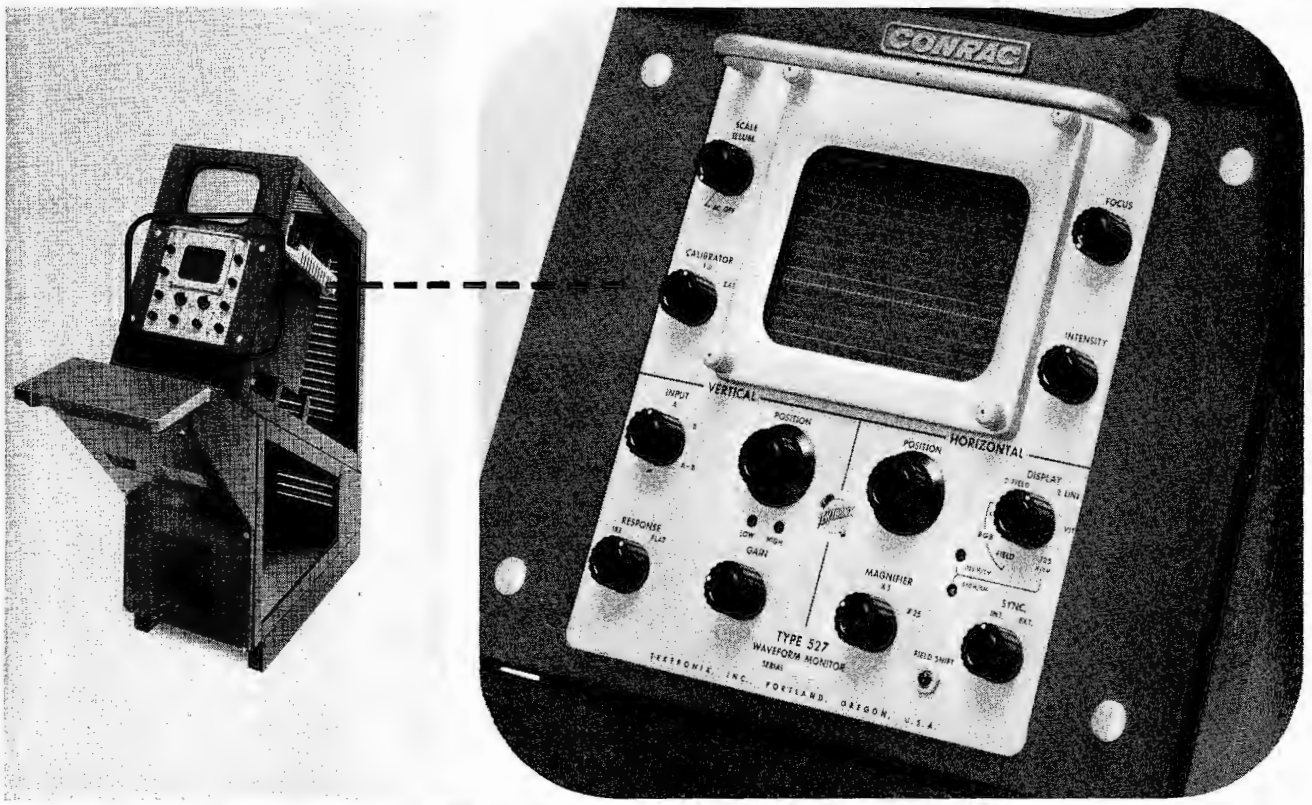
This broadcast-quality monitor features low voltage regulation, video bandwidth flat to 10 megacycles, provisions for plug-in sync drop relay, and a kinescope with a laminated, bonded safety shield.

For complete specifications write CTA8/TU across your letterhead and send it to CONRAC, Glendora, California.

CONRAC DIVISION Glendora, Calif.
GIANNINI CONTROLS CORPORATION

Circle Item 8 on Tech Data Card

Tektronix waveform monitor for 13″ consoles



The Type 527 is a precision test instrument designed for displaying linearity, signal level, and bandwidth of television-signal waveforms.

It offers conventional 2 LINE and 2 FIELD displays . . . dual inputs which can be used differentially . . . 3 calibrated time-base rates at 0.125 H/CM, 0.025 H/CM, and 0.005 H/CM, which eliminate the need for time markers.

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Type 527 Waveform Monitor. $925

Special Model—Type 527 MOD 132C, has all features of the standard model plus a line selector, which permits single-line analysis, and a video-distribution amplifier, which permits slaving a picture monitor to the waveform monitor display.

Type 527 MOD 132C Waveform Monitor. $1110

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RCA announces...a whole new

NEW BTF 5E 5KW

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NEW STYLING, new steel/blue color and convenient new "eye-level" height make these transmitters most attractive to look at and much easier to use.

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line of FM transmitters!

NEW BTF 10E 10KW

NEW BTF 20E 20KW

NEW CIRCUITRY means improved stability and a new kind of stereo and multiplex performance.

NEW EXCITER assures simpler, more straight-forward operation and maintenance, greater dependability.

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The Most Trusted Name in Radio

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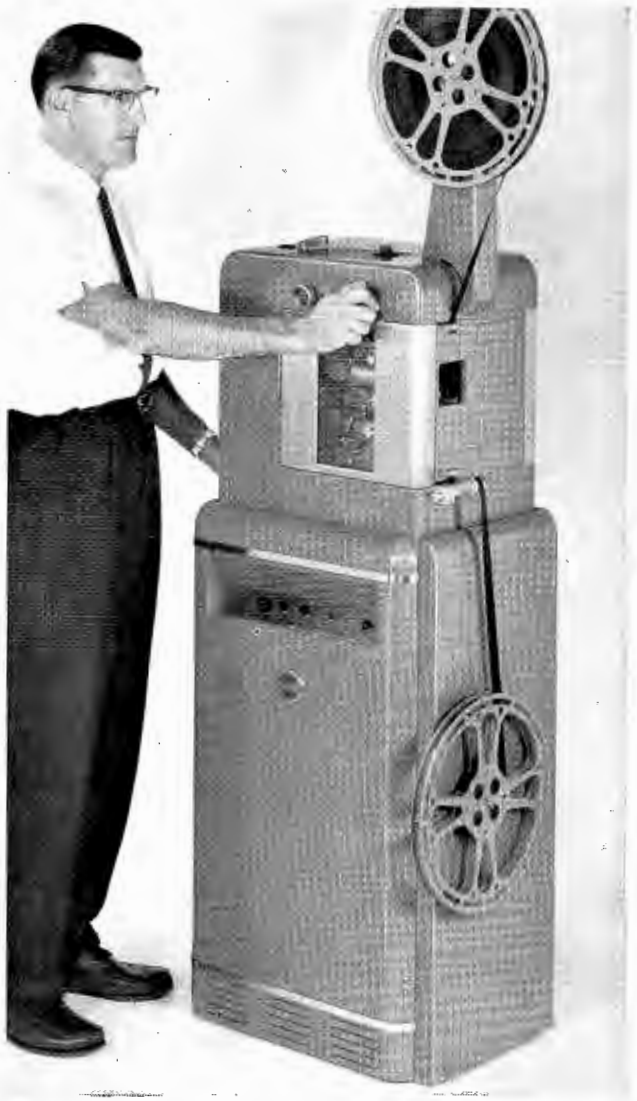

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Circle Item 11 on Tech Data Card

MINIMIZING PROBLEMS IN SCA SERVICE

by Donald L. Coleman, Jr.* — A discussion of crosstalk and other problems as experienced in SCA transmission and reception.

As more and more FM stations are taking to the air with SCA multiplex transmission, it seems timely to attempt a discussion of some of the associated problems. I shall try to indicate a few lessons that have been learned the hard way over three years of background music operation.

Before delving into the subject too deeply, let's make these points clear: A technique that works with one transmitter or receiver may not necessarily work with another. And while we feel that we are becoming quite expert, we do not consider ourselves to be "know-it-alls." It's doubtful if anybody is — this is a strange business. Let's consider the problems in logical order.

The Audio Source

The audio source is usually a tape reproducer (Fig. 1). The tape recordings should be made under controlled conditions. That is, they should be recorded on equipment which has proper level control facilities, by personnel who know how to ride gain. The tapes should be dubbed from discs or other tapes that were properly recorded in the first place. However, while flat response to 15,000 cps is nice in its place, this isn't the place. The response of the final reproduction should be restricted to 7500 cps. This is particularly true if you are running two subchannels. The receivers probably can't handle 15 kc anyway, so why strain the capabilities of the system with something that you can't use and which will probably cause crosstalk trouble. You'll probably have enough of that without asking for it.

Feed the audio signal through a limiter; an AGC amplifier works very well. This tends to smooth out variations in volume and keeps the average modulation on the subcarrier up. For one thing, limiting helps with the crosstalk problem. And an AGC amplifier makes the received signal more pleasant to listen to. Actually a little compression when the tapes are made, and some more before the audio is fed to the transmitter, is a good technique.

The Transmitter

The transmitter is where the over zealous engineer can really get into trouble. Before the subcarrier generators (Fig. 2) left the factory, they were aligned with equipment the average station engineer has never heard of. So, unless you have very obvious component problems, or see smoke, leave these things alone. Replace tubes when necessary, check your injection level regularly, and clean the equipment—but leave the adjustments be. An engineer who feels he hasn't properly maintained the equipment until he has diddled with all the adjustments richly deserves what he gets.

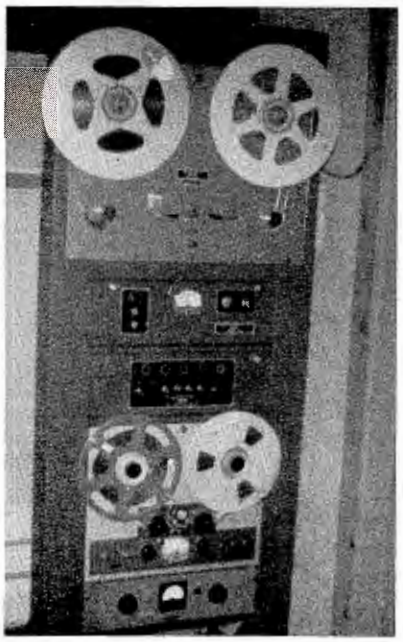

Fig. 1. Typical tape reproducer used with SCA; note AGC amplifier at rack bottom.

Experience has shown that an injection level greater than 10% gains you little, if anything. While your generator is probably capable of 20 to 30%, it doesn't really improve the signal at the receiver; so why use it? Don't make the mistake of expecting your ordinary main channel modulation monitor to indicate correct subchannel modulation unless you have one of the newer monitors actually designed for this service. Most of the older monitors will not read correctly above 15 or 20 kc.

At least one manufacturer has developed a very neat way of measuring injection. The subcarrier generator is disconnected from the subcarrier inserter (a separate phase modulator that applies subchannel information to the main carrier). In its place, an audio generator set to 15,000 cps is connected. The generator output is increased until the main channel modulation monitor reads 10%. Then the audio voltage necessary to achieve this is measured. The subcarrier generator is reconnected and its output adjusted for the same voltage. The modulation monitor will no longer indicate 10%, but the injection level will be correct. And the monitor reading can be used as reference thereafter.

The exciter stages following the subcarrier insertion point will probably not have to be adjusted any differently than they already are; so, on to the rest of the transmitter. Tune the stages following the exciter "on the nose." It is frequently possible to get better efficiency by tuning a class C slightly on the high-capacitance side of resonance —don't do it when using SCA. Such

*Chief Engineer, WFGM & WFGM-FM, Fitchburg, Mass. and B-E Consulting Author.

tuning introduces phase distortion, a prime cause of crosstalk. Yes, and it can develop in the power amplifier stages of your transmitter.

Transmitting Antenna

A long standing theory states that a poor standing wave ratio (VSWR) on the transmission line will cause untold misery in the crosstalk department. This is basically a sound rule, but in certain cases the effects may not be quite as drastic as generally expected. This was indicated by an experience we had at WFGM. A midwinter disaster—in the form of a shorted transmission line — caused us to try driving a homemade 72 ohm turnstile antenna with our 250 watt, 50 ohm driver stage, while we tried desperately to get repair parts. The transmission line used in this manner had such a bad mismatch there were actually hot spots on it. The number of multiplex customers served with this arrangement was greatly reduced — but those who could receive the signal experienced only a minor increase in crosstalk. Of course, I don't mean to imply that high VSWR is not a very serious condition, but only wish to point out that the resulting crosstalk may not be as great as frequently supposed.

The antenna should be reasonably flat across a band of 200 kc, centered on the carrier frequency.

Receiving Antenna

The receiving antenna is as important as any other portion of the system. An improper antenna system can result in more trouble than you may imagine. It is not enough to have a **strong** signal at the receiver input. This signal must also be as free as possible from multipath effects. A multipath-afflicted signal may be of little consequence with only the main channel, but when the subchannel is operating, look out!

In a few temporary installations, located close to the transmitter, a piece of wire wrapped around the line cord served as the antenna. We have done this where the expense of erecting a normal antenna did not seem justified. However, such setups can be quite troublesome and should be avoided.

Within 5 to 10 miles of the transmitter, dipoles located in open areas work quite well. In a vicinity where there are high buildings, water tanks, or hills, signals may bounce around before arriving. A dipole cannot reject the resulting multipath signals, and crosstalk is produced. On the other hand, a larger, more directive antenna may pick up too much signal, and crosstalk occurs again.

Fig. 2. FM exciter with SCA generators.

Beyond 10 miles something better than a dipole is a must. We have had very good luck with a five-element yagi, cut for our frequency. The original model had a 300 ohm folded-dipole driven element. We used this with a balun made of coax to match RG-59/U. Many installations have been put into service over the past three years, using this type of antenna. The model we are currently using is similar except for a "gamma" matched driven element which eliminates the need for the balun.

Fig. 3. Technician adjusting SCA receiver discriminator at the customer's location.

Occasionally, situations warrant the use of six- and ten-element antennas. We have even stacked them to get enough signal. These measures are sometimes required to produce a narrow forward lobe, thereby cutting down on multipath effects. Again, it's a situation where a setup that works well one place may not operate in another.

Antenna location has several important aspects. It is important to choose a position as near as possible to the receiver. However, this consideration may be of secondary importance where trouble is experienced from multipath effects, and ignition noise. Locating the antenna as far as possible from a highway can be more important. Receiver manufacturers have not yet succeeded in completely eliminating response to ignition noise.

In another case of positioning, a serious amount of crosstalk was traced to an antenna oriented properly for maximum signal but pointed directly at a bank of transformers on a power pole. Shifting the orientation reduced the signal somewhat, but completely cleared up the crosstalk.

So we see that proper orientation is not always toward the point of maximum signal. On some jobs the only way to achieve good reception is to have one man on the roof and another at the receiver, watching a meter on the limiter grid and **listening to the audio.** There must be enough signal to permit adequate limiting when normal tube aging occurs. The final audio is the important thing. The installation that requires mint-condition tubes to provide good reception will be a constant source of service calls.

Receiver

We have found that today's receivers are pretty well aligned at the factory. However, there are some adjustments which should be checked on the job. The RF stage must be tuned to the transmission line. The oscillator may also need to be touched up, as will the main channel's discriminator secondary.

• Please turn to page 62

AUDIO MODULATION REVISITED

Technical Talks* — A review of various plate modulation methods employed in broadcast transmitters.

Some months ago in Technical Talks we began a discussion of modulation methods, and covered some theory of grid systems. This month let's look at various methods of applying plate modulation.

PA Plate Modulation

The Heising system was probably the first really effective method of producing high quality amplitude modulation for broadcasting. It is relatively simple, and requires fewer and less-expensive components than the more common transformer method. For years, Heising was very popular in amateur transmitters. I can well remember, as a youthful ham, endeavoring to find a choke that would handle the required current, and at the same time be within the limits of the money in my pocket.

Current Flow

A single-ended PA stage with a Heising modulator is shown in Fig. 1. Tube V1 is the power amplifier and V2 the modulator. The tubes may or may not be of the same type. However, they must have similar characteristics, since under class A conditions each would take approximately the same plate current. The plate current for both tubes is supplied via AF choke L1, and is effectively decoupled for RF by choke L2. The RF output of V1 is applied to the PA tuning network through DC blocking capacitor C1.

Operation of the Heising, or constant-current modulator, is based on the tendency of an inductance to resist changes in current flowing through it. Very briefly, if the plate current of V2 decreases, that drawn by V1 must increase to maintain constant current flow through the modulating choke.

When the modulator grid is driven positive, current flow in the plate circuit will increase. Thus, to maintain a constant current through the modulating choke, the current drawn by V1 must decrease. Plate voltage is reduced at the same time, and unless the plate voltage of the PA tube is reduced to zero (or very close to it) the modulation percentage will not reach 100%.

This is why resistor R1 is placed between the two plates. The V1 plate current flowing through R1 produces a voltage drop which reduces the DC plate voltage. Thus, even though voltage is sufficient on V2 for adequate plate current to flow, the drop across the resistor almost cuts off PA stage V1. Conversely, when the modulator grid is driven negative the plate current decreases; to keep the total current through the choke constant the PA stage draws additional current.

This resistance-choke coupling is far less efficient than the transformer coupled system, which is popularly known as a class B modulator. The Heising modulator, which operates class A, must dissipate 1.2 times the PA tube power. Also, there is constant plate flow, even when there is no modulation, and average efficiency seldom exceeds 30%. However, many low-power broadcast transmitters in use today still employ this system.

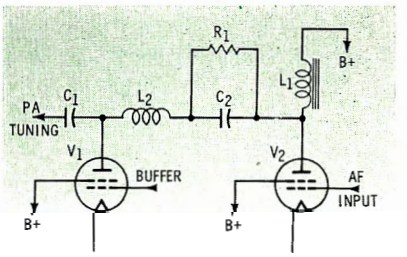

Fig. 1. Basic diagram of Heising circuit.

Feedback

Negative and positive feedback are so widely used today in broadcast equipment that many of our readers are well versed in the general principles. Here, we are interested in the use of negative feedback in the transmitter itself.

In a radio transmitter, negative feedback can be applied to accomplish two results — better overall audio quality and freedom from hum in the modulating and final RF stages.

Consider the production of hum in the PA stage. Even a small 250 watt transmitter requires a fairly high heater current in the final tube. This current generates an intense magnetic field in the vicinity of the grid, and directly around the cathode area where electrons are being emitted. The magnetic field builds up and collapses at a 60 cps rate, and is strong enough to affect the passage of electrons in its immediate vicinity. In this way the field can induce a 60 cps hum in the output of the PA stage.

One common use of inverse feedback is to eliminate this hum. A small portion of the PA output signal is sampled and rectified. The resulting audio voltage is fed back to the input of the modulator, thus providing an out-of-phase bucking voltage to cancel hum in the final. This, of course, is hardly the application of inverse feedback that is generally envisioned. However, it is an application that is particularly useful in some of the older transmitters.

Inverse feedback is also used for reducing hum, noise, and other dis-

*by John H. Battison, Consulting Engineer, Washington, D.C.

tortions in the audio and modulator sections of a transmitter. It is applied around the modulator stage and preceding audio stages whenever possible. In general, this feedback is easier to incorporate when modulation is performed at one of the lower-level stages. Feedback is more difficult to use with high-level modulation because of the large phase shifts that occur in large modulation transformers. When excessive audio distortion occurs it is a good idea to check the feedback system for balance. This is particularly important in transmitters that employ a series (or ladder) of push-pull low-level audio amplifiers to drive the final modulator stage. A defective resistor in the feedback ladder can play havoc with audio quality.

Linear Amplifiers

From what has been said already, it may appear that modulation is performed only (or preferably) in the high-power stages. However, the contrary is often true, since it is far more economical to modulate a low power stage.

A high power transmitter would require a great deal of audio power for 100% modulation in the final amplifier. To avoid the need for expensive tubes and components a transmitter can be modulated at a low level. The resulting signal is then amplified **linearly** in succeeding RF and buffer stages, up to the final.

Class A

Class A amplifiers will perform linear amplification — that is, they amplify an RF signal so the output wave is directly proportional to the input. This is possible because plate current flows at all times during the RF cycle, never dropping to zero; thus the waveform is not distorted. Class A amplifiers can be operated into purely resistive loads, since there is no need for a tuned plate circuit.

Class B

Because of the overriding need for high efficiency in most broadcast transmitters, the class A amplifier has been replaced in high power linear circuits by the class B amplifier. The principles of class B operation are generally well known to the reader. I feel it is important,

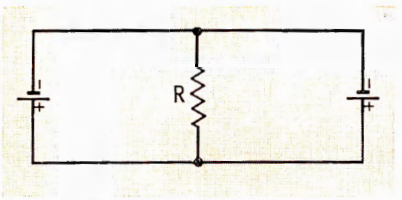

Fig. 2. Double-Z effect of twin sources.

however, to mention the swamping resistor in the grid circuit; its purpose is to assure that the modulation waveform will be as nearly as possible an exact replica of the input signal. This resistor must dissipate an input power equal to about one tenth the output, and is connected from grid to ground through a capacitor.

There are only a few steps from the class B linear to the grounded grid circuit. In the latter, the input drive is actually in series with the output. Although this requires up to 25% more drive, the extra power is not wasted — it adds to the output. The input circuit of a grounded grid amplifier is loaded heavily by the series input-output effect, eliminating the need for a grid swamper. Drive power otherwise wasted in the swamping resistor (in a class B linear circuit) becomes extra drive by series addition with the grounded grid output.

Because the grid functions as an electrostatic shield in a grounded grid amplifier, (eliminating the need for triode neutralization) this circuit is very popular for high frequency transmitter applications, such as FM. A consideration in grounded grid circuits is the prevention of RF breakdown in the heater transformer. This may be accomplished by the use of very heavy insulation or RF chokes at the heater connections. As a matter of fact, a station can sometimes be kept on the air in an emergency by forming a few turns of heavy copper wire into an air-core choke and connecting it in series with the heater transformer— as close to the heater connection as possible. This is useful in case heater transformer insulation breaks

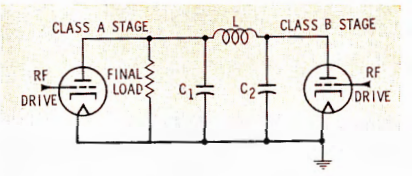

Fig. 3. Basic diagram of Doherty circuit.

down and RF drive is lost.

Doherty Circuit

Although more efficient than the class A amplifier, the class B linear is not the final answer. Next in line is the Doherty linear amplifier which can be about twice as efficient as the class B circuit if very careful adjustment is exercised. We do not have sufficient space to go into a complete analysis of the Doherty, but a brief rundown of salient features will either refresh your memory or whet your appetite for further study.

The output of a Doherty amplifier stage consists of a class B signal, with an additional class C peak. Unfortunately, this addition is not merely a case of adding the two signals in the same load. The Doherty system is based on the fact that two generators connected across the same load will each see twice the impedance of the load. In Fig. 2, for example, each battery supplies half the current that one would alone. Therefore, neglecting other conditions, the apparent value of R is twice what it would be if only one battery were connected.

There are other factors. As the output of the class C peak tube increases, it would cause the apparent impedance of the load to rise, and the output of the class B carrier tube would decrease. To overcome this practical defect, a quarter-wave line is connected between the output of the class B tube and the load (Fig. 3). Because this line will invert the impedance by means of its 90° phase shift, the impedance "seen" by the class B tube decreases whenever that "seen" by the class C tube increases. Thus both tubes develop maximum power at the same time.

To correct for the out-of-phase output, the grid drive to one of the tubes is advanced 90° ahead of the other by means of a phase shift network. Of course, in actual equipment, the circuitry is more complex than what we have discussed here.

Nevertheless, these principles apply, and knowledge of this basic operation should enable you to trace the phasing circuits. The initial setup of a Doherty stage is more involved than that of a simple linear modulator, but thereafter an oscilloscope is all that is needed to keep it in tune and operating properly. ▲

OPERATING A DIRECTIONAL ANTENNA

*by Elton B. Chick** — Part Two. How to tune an antenna system for proper directional characteristics.

In the first installment, in the January issue, you were shown how certain operating parameters affect the operation of a directional antenna system — power, current ratios, and phase relationships. Directions were given for measuring and interpreting the first of these three parameters—power. This, the second and final installment, will continue the discussion by teaching you how the system can be tuned for proper directional characteristics, and pointing out a few of the fallacies you'll want to watch out for.

The Phasor and Tuning Units

The next item in the chain of equipment that makes up the directional antenna system is the phasor. As there is a large number of antenna designs, there is perhaps an equally wide variety of phasor designs. Each directional antenna, including the phasor, is a custom made installation — tailored to the frequency, power, and directional requirements of the station. Generally, the phasor performs two functions: power division and a portion of the antenna phasing. Additional phase shift is provided by transmission lines and tuning units at the base of each antenna tower.

Normally, the operator will have no need to make operating adjustments to the phasor. If a directional antenna will stay within the license limits, even though it may drift noticeably, there is no point in constantly making minor adjustments to keep the phase relationships or current ratios at exact values. In fact, such frequent adjustments are quite likely to result eventually in serious maladjustment of the system. Also, they render the logs useless for studies of long term stability of the array.

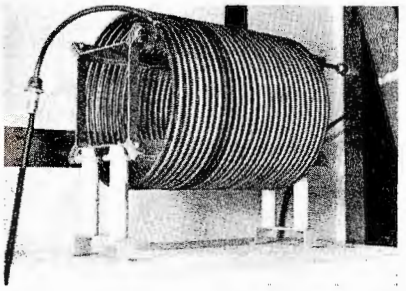

Fig. 1. A sample-loop line-isolating coil.

For the inexperienced operator, the best policy in dealing with the phasor is to leave it alone. Make no adjustments unless instructed to do so by the chief engineer, the consulting engineer, or someone else competent to adjust the system. Once you've gained experience under proper supervision, make adjustments only if the pattern fails to stay within the license requirements.

Although transmission lines require no adjustments, some antenna systems employ lines which use dry air or an inert gas as a dielectric.

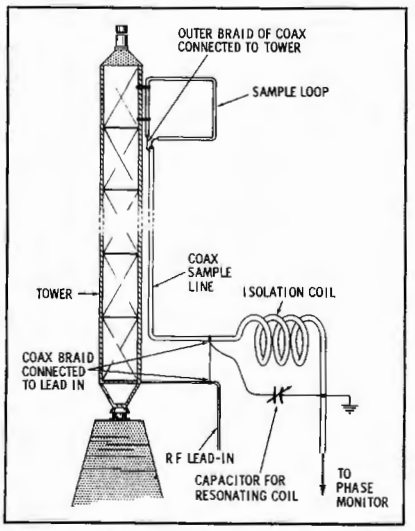

Fig. 2. Wiring of isolation coil, with a resonating capacitor across the winding.

This air or gas is usually kept under pressure, generally about 5 to 15 psi. Checking and recording line pressures may be one of the operating requirements. Of course, this is not an FCC Rule, but it may be essential to proper operation and maintenance.

The purpose of the antenna tuning unit is to provide an impedance match between the transmission line and its associated tower. This network also performs a certain amount of phase shifting which is essential to the operation of the antenna system. As with the phasor, this unit will normally need no adjustment.

The main concern of the operator here is the individual antenna ammeter. This meter indicates the current being fed to the tower, and its reading is essential in calculating antenna current ratios. A note of caution: Such meters are almost always equipped with a shorting switch or with some switching arrangement that removes the meter from the circuit when it is not being read. It is very important that this meter be out of the circuit when it is not in use, because it can easily be damaged or destroyed by lightning or by an overload from any other cause.

Sampling Loops and Phase Monitor

A sample loop is simply a small pickup loop mounted on a tower to take a sample of the current in that tower. This sample current is fed back to the phase monitor through a coaxial line. The sample loop is usually mounted on the tower at or near the point of maximum current (tower current loop). In some cases, usually on short towers, the sample loop may be insulated from the tower so the coaxial sample line is at RF ground potential.

*Assistant Director of Engineering, Rounsaville Radio Stations, Atlanta, Georgia.

On the other hand, the loop may be placed a considerable distance up the tower, and the sample line will be at the same RF potential as the tower. In this later case, it is necessary to provide a means of bridging the sample line across the base insulator of the tower without creating an RF short circuit. This is done by a sample-line isolation coil like that shown in Fig. 1. The coil is wound of coax, with enough turns that its impedance is quite high in relation to the tower base impedance; hence it does not noticeably affect the base impedance.

In some cases where the base impedance is high, it may be necessary to tune the isolation coil to resonance with a shunt capacitor. The parallel resonant circuit has a very high shunt impedance across the tower base and thus will not affect antenna impedance appreciably. Fig. 2 shows how a capacitor can be used across an isolation coil.

An important parameter of a directional antenna is the phase relationship among the various towers in the system. The phase monitor indicates the phase of the RF current in each of the various towers. The correct use of this type of instrument is essential to proper operation of a directional antenna. Fig. 3 shows a typical monitor for use with a three tower array. This instrument has a single meter to indicate phase from 0° to 90° and 90° to 180° in two ranges. A range switch selects one of the two scales, depending on the value to be read. Prior to reading the phase meter, it is necessary to calibrate the sample voltages from each antenna by setting each to the sample amplitude — indicated by a calibration point on the phase meter scale.

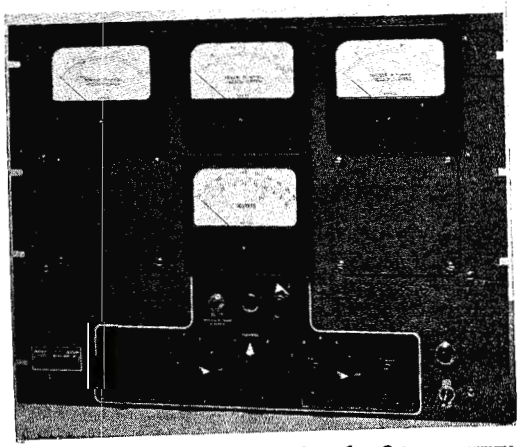

Fig. 3. Phase monitor for 3-tower array.

In addition to indicating phase relationships, this instrument is equipped to indicate percentage of normal base current. On special order, most monitors can be supplied with scales to indicate base current remotely. Regardless of scale type, remote ammeters must be calibrated regularly by checking them against the tower base ammeters (FCC Rule § 3.114). The calibration adjustment for these meters must be such that their readings remain within 2%.

Phase Readings

Directional antenna phasing is determined during the initial design of an array. After a system is constructed and is adjusted to produce the desired pattern, a final set of phase values are determined—which may or may not agree with those in the calculated design. A number of factors may cause this difference; probably the most frequent is the effect of unequal lengths of sample lines. Whatever the cause, the station engineer need be concerned only with keeping the phase indications, as read on the monitor, close to the final values specified in the station license.

Although the FCC does not specify a limit to phase deviations, it is desirable to maintain phase at the licensed value. However, this may be difficult because most directional antennas have some measure of drift. It is generally considered acceptable to maintain tower phase within 2° or 3° of the specified value. Just how much phase change can take place before the radiation pattern is adversely affected will depend on the design of the array. Patterns with deep minima or nulls are affected the most. In some antennas, a change as much as 5° will cause only a small change in the pattern. On the other hand, a 5° shift in another array could have disastrous effect, causing the pattern to be altered so much that monitor points and maximum radiations are no longer within limits.

In reading directional antenna phase relationships, it is necessary to specify a particular tower as the reference tower. The phase of the currents in the other towers is measured with respect to this reference tower. The reference is considered

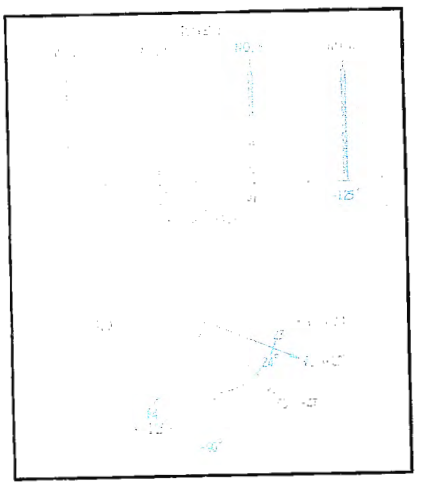

Fig. 4. Typical phase and vector diagrams.

to be at zero degrees. To visualize this, study Fig. 4. Number 1 tower serves as a reference, and the phase of the other towers are given with respect to tower 1.

In writing phase relationships in the log, it is customary to head the column to show just what each phase reading indicates. The phase of tower 2 in Fig. 4 should be written as —23°, and the column would be headed 2:1—as shown in Fig. 5. Occasionally, confusion exists in specifying the phases, because the log column heading is incorrect. When we write a column heading as 2:1, we mean the phase of tower 2 with respect to tower 1. If we were to write a heading of 1:2 it would indicate that the column shows the phase relationship of tower 1 with respect to tower 2; tower 2 would thus become the reference, and the phase would have a plus sign. There is nothing wrong in writing phases in this latter manner, provided the sign is correct. However, the general practice of expressing all phases with respect to the reference tower results in a log that eliminates confusion and is easy to understand.

It may be helpful at times to use as a reference a tower other than the one specified. As an example, assume that all the phases of a four-

PHASE MONITOR — DEGREES				
2:1	3:1	4:1		
-23	-47	-125		
-23	-47	-125		
-23	-47	-125		

Fig. 5. Sample tower-phase entry in log.

tower array suddenly changed. It might appear that the whole antenna system had gone berserk, when actually the trouble was at the reference tower. To check this condition, one of the other towers could be used as a reference. If the remaining towers showed the proper relationship to the new reference, there would be little doubt that something had caused a shift in phase of the regular reference tower.

Suppose trouble developed with reference tower 1 in Fig. 4, and tower 2 was chosen as a temporary reference. The relationship between tower 2 and towers 3 and 4 would be: 3:2, —24°, and 4:2, —102°. If tower 3 were chosen, the relationship would be: 2:3, +24°, and 4:3, —78°. The determination of these relationships can easily be illustrated with a vector diagram, as shown in Fig. 4.

Current Ratios

When one speaks of a current ratio in directional antenna work, it is usually intended to mean the ratio of the current in a given tower to the current in the reference tower. A ratio is simply a number which shows the relationship between two quantities. For example, the ratio of 3 amps to 5 amps is obtained by dividing 3 by 5 —which gives 0.6 as a result. A frequent mistake in expressing or calculating a ratio is an incorrect statement of the ratio; often the quantities are reversed. If the above example were written incorrectly, the ratio would be 1.667 which is considerably different from 0.6.

The FCC Rules do not require that directional antenna base currents be maintained at specific values; rather, the Rule — § 3.57 (b) — requires that the tower current **ratios** be kept within 5% of a specified value. A station license will usually designate a reference tower, assigning a ratio of 1.00 to that tower.

While the Rules do not require that current ratios be logged, it is obvious that they must be calculated for each set of antenna base ammeter readings. If this is not done, the operator will have no way of knowing if or when the 5% ratio limit is exceeded.

• Please turn to page 64

PARALLEL OPERATION OF TV TRANSMITTERS

*by M. W. S. Barlow** — The fundamentals, operation, and advantages of paralleled transmitter systems.

Parallel operation of broadcast transmitters has become popular during the last decade, especially where the very best in performance and unbroken service is desired. Perhaps because economic advantages of having two transmitters instead of one are hidden behind greater capital cost, paralleled installations have been rare in North America. As the number of stations increases, with accompanying difficulties of hiring a well trained staff, the reliability of paralleled transmitter operation gains in importance. The improvement in electrical performance and adaptability to remote control are also major factors.

The size of the market, as well as possible loss of revenue and prestige that goes with breakdowns, will govern final choice of the system. However, it is interesting to note that almost all BBC FM stations now employ paralleled transmitters —frequently two 5-kw units. In addition, AM and shortwave transmitters are being paralleled to increase power and reliability.

Sound transmitters are much less complex than TV transmitters, and are subject to fewer breakdowns. It is in TV broadcasting that advantages of parallel operation become most noticeable. These may be summarized as:

1. Less down time.
2. Better performance.
3. Smaller spare parts inventory.
4. Smaller transmitter staff.
5. Maintenance problems are eased since one transmitter can be shut down for servicing while the other maintains program.

There are also secondary benefits, such as the advantage of having an identical unit available for comparison, and the better servicing possible when the staff is not working against the clock to clear a fault. There are even some cases where less experienced personnel might be employed.

Consequently almost every major TV station built recently outside North America has installed paralleled transmitters, rather than the old "main-and-standby" system. In Canada, CFCF-TV and CFTM-TV have been running paralleled TV transmitters for over 18 months; CJOH-TV has had paralleled sound transmitters for two years.

*Broadcast Engineer, CFCF-TV, Montreal, Quebec.

The Montreal Installation

Stations CFCF and CFTM each have paralleled 18 kw Marconi "ghostless" transmitters with associated 9 kw sound transmitters (Figs. 1 and 2). The two stations occupy the same building and are maintained by a staff of seven, plus a supervisor and janitor. This staff size is dictated mainly by a safety requirement calling for two men on hand at all times.

In addition to the two TV stations which comprise four vision and four sound transmitters, the same staff also maintains three FM stereo SCA transmitters and five VHF communications transmitters. No increase in staff is anticipated when the installation expands to 5 FM and 3 TV stations.

This transmitter arrangement, identical for each station, is shown in Fig. 3. One vision and one sound transmitter are combined by means of a filterplexer in the conventional manner. At this point a standard TV signal is available and can be fed into an antenna. The outputs of the two filterplexers are combined in a hybrid diplexer. The antenna is split into halves and fed with two

Fig. 1. Control position for CFCF (left) and CFTM transmitters.

Fig. 2. CFCF section of the desk with all monitors and metering.

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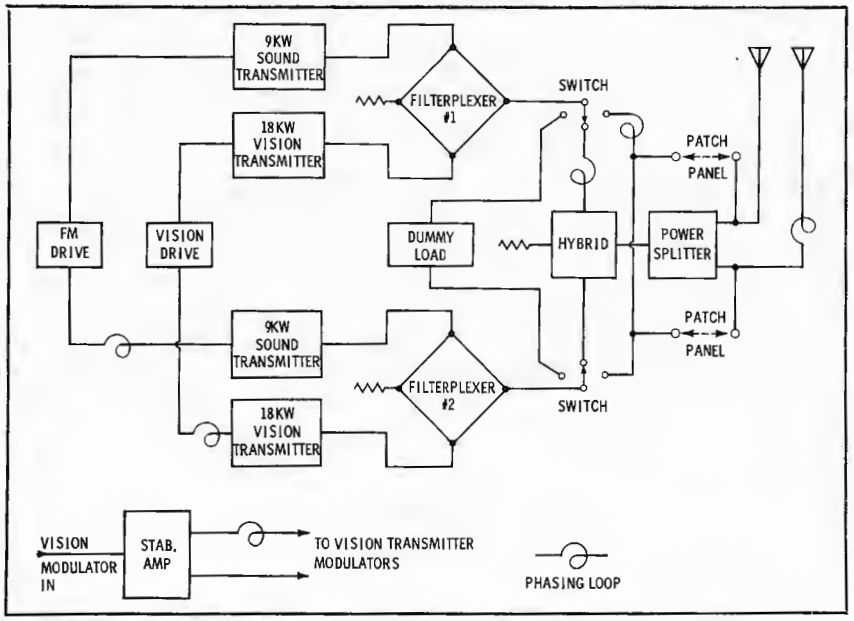

Fig. 3. The parallel television transmitter and split antenna layout at CFCF/CFTM.

transmission lines from a power splitter. Motorized switches enable either transmitter to bypass the diplexer, and a king-size patch panel has provision for direct antenna feed (Fig. 4). Thus either or both transmitters can drive the complete antenna or one half of it. Either pair of transmitters can also be switched into a water-cooled dummy load for test purposes.

Results

During the first eight months of operation, the TV transmitters were run singly into standby antennas, pending completion of the Montreal tower complex. During this period 71 minutes of air time were lost. This may seem high, but includes the initial shakedown of transmitters and antennas. Throughout the last month some three minutes and twelve seconds were lost on one station. Since the completion of the parallel installation, no time has been lost on CFTM in eighteen months, while only 30 seconds has been lost on CFCF. The latter was caused by an unfortunate coincidence of flashover in a brand new output tube as the second bank was being switched off to correct a modulator fault. Thirty seconds lost time in 36 station-months is a creditable record, and can be equalled by the majority of paralleled stations.

Improved electrical performance results from an inherent condition—it is unlikely for similar imperfections to occur in both transmitters. In general, the performance of a paralleled pair is superior to that of either transmitter alone. This is particularly noticeable on transient response where we use sine-squared pulse and a calibrated graticule to give a "go-no-go" indication of performance. The signal from either transmitter alone will barely fit

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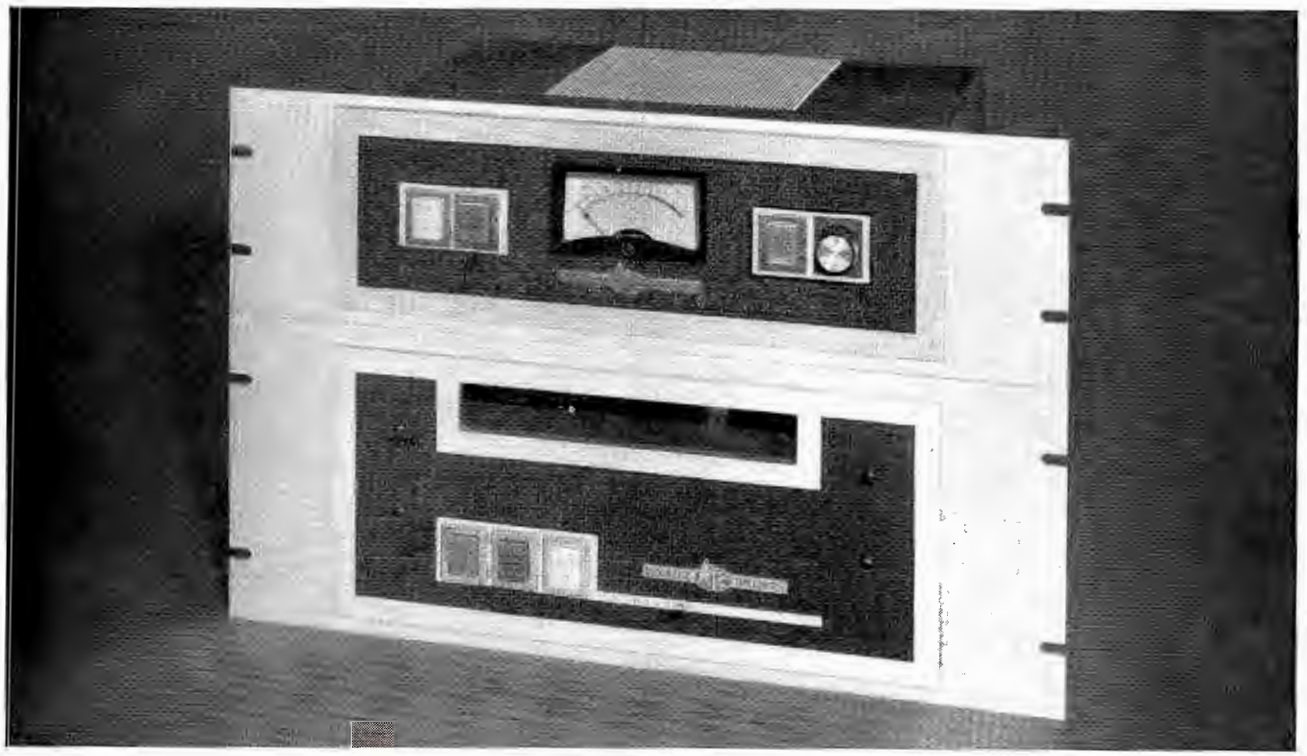

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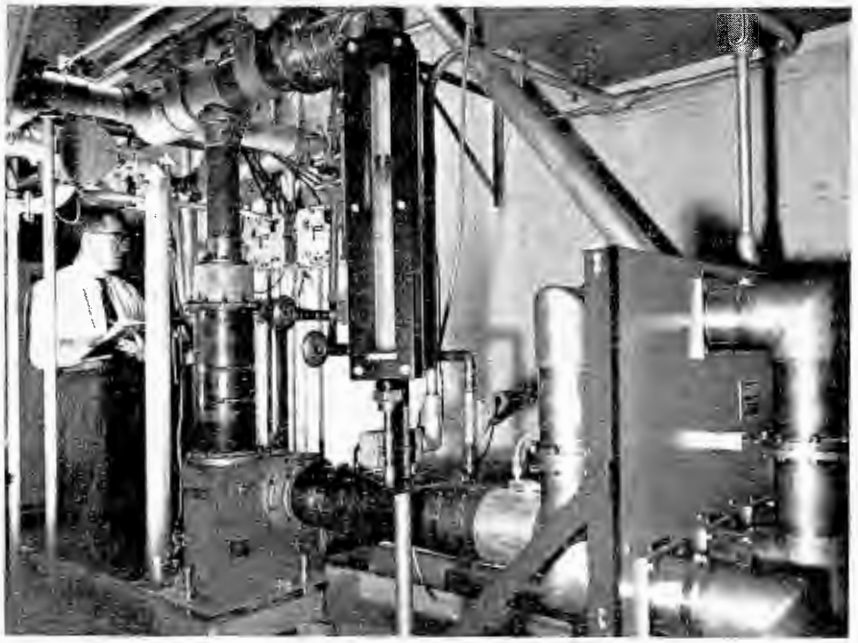

Fig. 4. Hybrid diplexer, bypass switches, 4⅛" RF patch panel, and water flow meter.

within the limits, but the signal from two in parallel fits easily. This test is very precise, and cannot easily be equalled by comparing sideband analyzer responses.

Unattended Operation

Our experience tends to support conclusions of other users that paralleled transmitters are ideal for unattended operation. In the U.S.A. "unattended" operation in synonymous with "remote control," because of certain legal requirements. In Canada it is permissible to have remotely monitored transmitters, and there is no requirement for adjustment or meter logging. The transmitters may be switched on and off by clocks or carrier-present relays in off-air repeater systems.

Modern transmitters have enough feedback loops to maintain power output and black level stability well within specifications.

Video AGC amplifiers operating on reference-white vertical interval signals can be used, if required, to hold the video gain constant. Under these conditions any deterioration or failure in the monitored picture must be due to transmitter trouble, and requires a technician to visit the site. With single remotely operated transmitters there could be many hours delay before the fault is repaired. With paralleled transmitters the program will be uninterrupted. For this reason it is advantageous to have paralleled transmitters even at very low power repeater sites, such as the 3 watt-plus-3 watt units of the BBC and Swedish TV services. Routine maintenance is done during weekly or monthly visits to the transmitter site by a technician from base headquarters. The saving is considerable in staff, test equipment, spare parts, and transmitter building overhead.

Second Thoughts

Perhaps the biggest test of a system design is to look back and note what would be done differently "next time." In the case of the CFCF-CFTM installation (which was planned as an "attended" operation) the only changes we would consider are minor. The motorized RF feeder switches could be replaced by manual ones, as they are rarely used on the air. For the same reason an antenna routing diagram could also be omitted. In general, though, we are very satisfied with the performance and operation of the stations. The operators, of course, feel they've never had it so good. ▲

References:

1. The Operation of High-Power Television Transmitters in Parallel, M. W. S. Barlow; Journal of the S.M.P.T.E., Vol. 72, Number 1, January 1963.

2. Bilingual Operation of TV Transmitters with Minimum Staff, J. R. Snow and M. W. S. Barlow; Sound and Vision Broadcasting, Vol. 3, No. 2, Summer 1962.

3. The Operation of Transmitters in Parallel, W. J. Morcom; Sound and Vision Broadcasting, Vol. 2, No. 1, Spring 1961.

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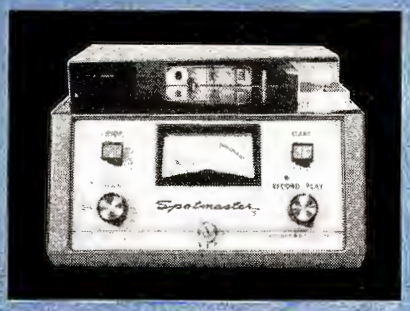

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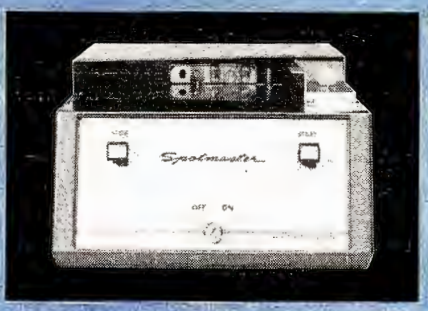

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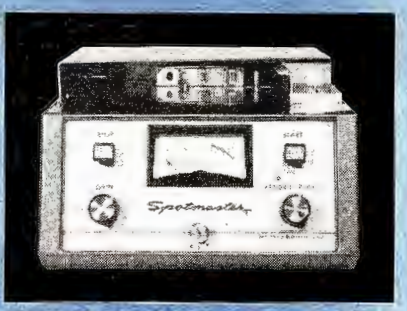

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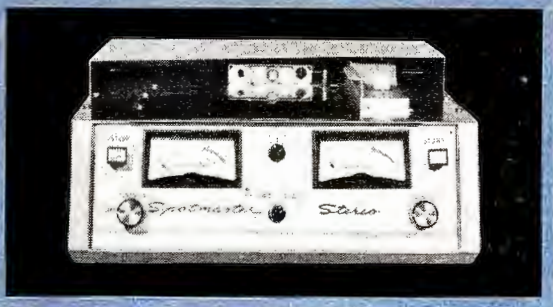
500 A-R Rack Mount Record/Playback Unit

505 A-R Rack Mount Playback Unit



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Circle Item 18 on Tech Data Card

FCC THIRD CLASS BROADCAST ENDORSEMENT

*by Edward M. Noll** — A guide to preparation for a third class license with broadcast endorsement for limited operators.

The restricted radiotelephone operator's permit will no longer be valid for broadcast use after April 15, 1964. After that time, certain operators will have to hold a radiotelephone third class operator's license **endorsed for broadcast operation.** This requirement applies to those AM stations with a power of 10 kw or less which utilize a nondirectional antenna, and FM stations with transmitter outputs up to 25 kw.

The written examination required for a third class radiotelephone license consists of Elements 1 and 2 of the Commission's examination material. In addition, the license must be endorsed for broadcast operation. This requires that Element 9 be passed as well.

Study Material

The subject matters of the three elements include basic law, basic operating practice, and basic broadcasting. The questions are multiple-choice, in which several possible answers are given and the applicant chooses the best. Each element consists of twenty questions, 5% credit is allowed for each answered correctly. Passing grade is 75.

Reference material and typical questions can be obtained from the following FCC publications:

1. Special Study Guide and Reference Material for Examination for Radiotelephone Third Class Operator Permit with Broadcast Endorsement for Operation of Certain Broadcast Stations (November 1963). This booklet contains typical questions for elements 1, 2, and 9 plus reference materials regarding laws and regulations.
2. FCC Supplement 1 (May 15, 1961). Supplemental element 2 questions are listed in this bulletin.
3. Study Guide and Reference Material for Commercial Radio Operator Examination (May 15, 1955). This publication includes typical questions for elements 1 and 2, plus reference material.

The examination can be taken at any of the Commission's thirty-two offices, as well as at fifty-six special examination points that maintain a regular examination schedule. Arrangements are in the formative state to provide additional examination scheduling and avoid excessive travel by applicants.

Licensing Objectives

Possibly, the major objective of the new broadcast license endorsement is to make limited operators more cognizant of their responsibility in the operation of a broadcasting transmitter. Every operator should be able to interpret meter readings and know what operational steps should be taken when there is an indication of faulty transmitter operation.

Remote controlled operation of broadcast stations has become increasingly popular among low-power broadcasters. Certainly limited operators should be well versed in operating the remote control panel. Operators should be familiar with FCC technical standards, especially with relation to power output, modulation percentage, and carrier frequency stability. He should be able to make a reasonable appraisal of meter readings which monitor the above operating conditions.

Operators should be competent in keeping both program and operating logs. He should know the basics of broadcast law, including what information can and cannot be transmitted. Moreover, he should have an **exact** knowledge of his responsibility as a licensed operator.

Element 1 Study Hints

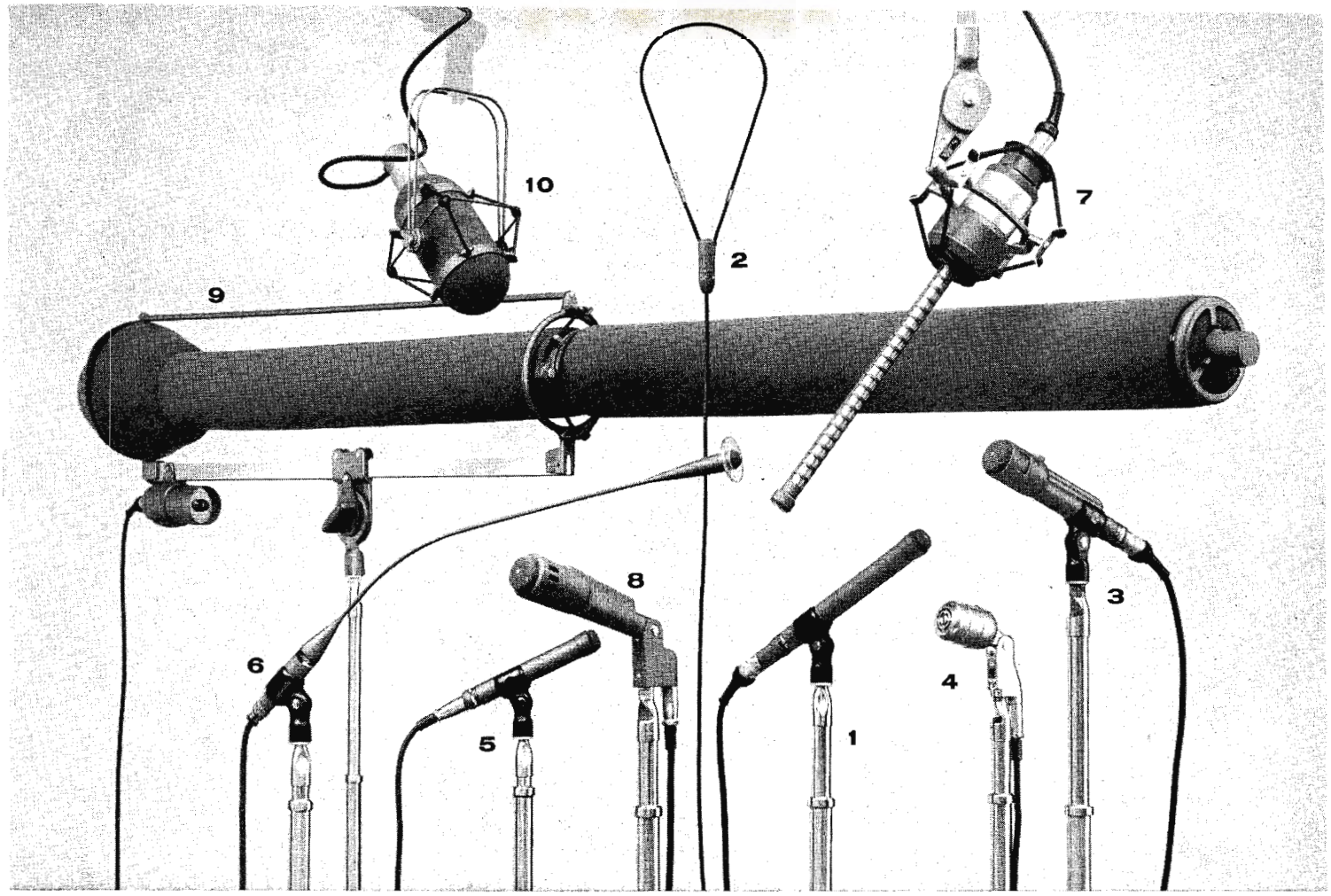
Commercial broadcast licenses are issued only to citizens and nationals of the United States. License applications and permits are obtained by writing to, or visiting, the local FCC field office. Arrangements can then be made for taking the required examination. Licenses are issued for a period of five years and may be renewed. A proper procedure must be followed if a license or permit is lost; the field office must be provided with information describing the loss, and an application for a duplicate must be submitted.

Log keeping is the particular responsibility of a qualified person. Corrections in such a log may be made only by the person who made the original entry. Such corrections must be signed and dated.

An operator must respond immediately to any FCC inquiries or notices of license suspension. Harmful interference in the form of any emission, radiation, or induction which endangers the functions of radio navigation or other safety service, or seriously degrades, obstructs, or repeatedly interrupts a radiocommunications service, may not be permitted. False, obscene, indecent, profane, unnecessary, and unidentified communications may not be transmitted. A broadcast station may not rebroadcast the program, or any part of the program, of any other broadcasting station without the authorization of the originating station.

In radiocommunications there is

*Chalfont, Pa.



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8. ECONOMY is vital in every studio operation, yet quality must be upheld. And the E-V 665 is ideal where superb cardioid performance is needed, but the utmost in mounting flexibility is not required.

9. Even the 7-foot long E-V 643 ultra-directional microphone is protected by this unique E-V GUARANTEE: except for refinishing, all repairs are *free* no matter what happens to the unit during the first two years!

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Element 2 Hints

A licensed operator should be familiar with good operating procedure. Although many of these factors may not apply specifically to his broadcast activity, they should still be familiar to a license holder. The following summary of radiotelephone practice, published by the FCC, requires no further explanation. Most Element 2 questions are based on the information contained in this summary. This information, while important for all, is specially valuable to those operators who will be called upon to operate two-way radios in news pickup services.

SUMMARY OF RADIOTELEPHONE OPERATING PRACTICE*

A licensed radio operator should remember that the station he desires to operate must be licensed by the Federal Communications Commission. In order to prevent interference and to give others an opportunity to use the airways he should avoid unnecessary calls and communications by radio. He should remember that radio signals normally travel outward from the transmitting station in many directions and can be intercepted by unauthorized persons.

Before making a radio call the operator should listen on the communications channel to insure that interference will not be caused to communications which may be already in progress. At all times in radio communications the operator should be courteous.

Station identification should be made clearly and distinctly so that unnecessary repetition of call letters is avoided and to enable other stations to clearly identify all calls.

A radio transmitter should at all times be either attended or supervised by a licensed operator, or the transmitter should be made inaccessible to unauthorized persons.

A radio transmitter should not be on the air except when signals are being transmitted. The operator of a radiotelephone station should not press the push-to-talk button except when he intends to speak into the microphone. Radiation from a transmitter may cause interference even when voice is not transmitted.

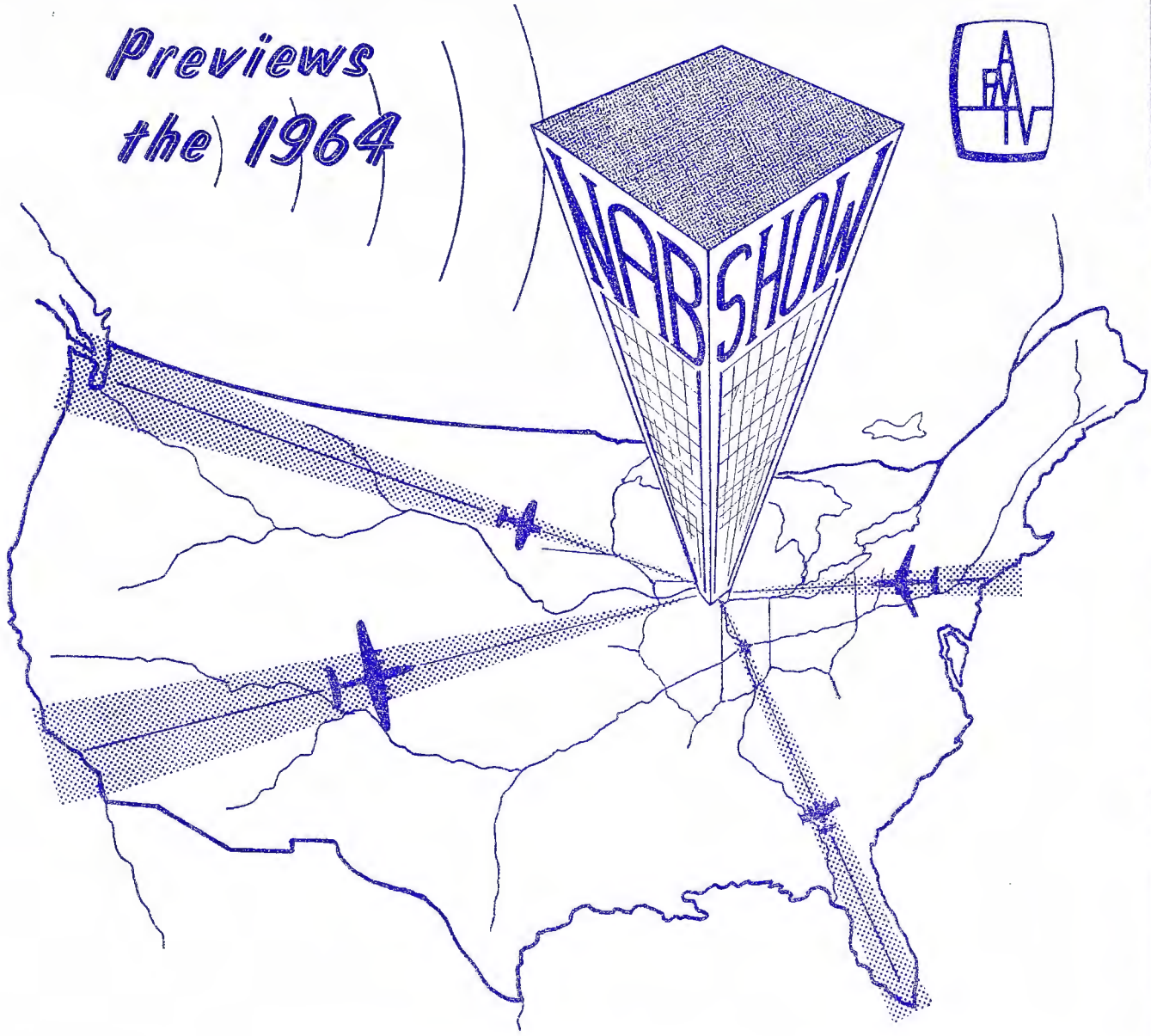
When radio communications at a station are unreliable or disrupted due to static or fading, it is not a good practice for the operator to continuously call other stations in attempting to make contact, because his calls may cause interference to other stations that are not experiencing static or fading.

A radiotelephone operator should make

• Please turn to page 50

Broadcast Engineering

the technical journal of the broadcast-communications industry



Conrad Hilton Hotel, Chicago, Ill., April 5-8, 1964

Editorial comments • Exhibit hall floor plans • List of exhibitors • New products

March, 1964

33

special NAB section

Editorial Notes and Comments from the Staff of BROADCAST ENGINEERING

The broadcast industry has progressed a long way through the years, from the days of the scanning-disc camera and the "tin-can sound." This continuing growth and development is evidenced by advances made during the past year, and will be further shown in accomplishments during the year to come.

With every new development come some feelings of doubt and uneasiness. This can be seen in the cases of UHF television, stereo FM, color, and a current consideration of great consequence—automation.

Comprising cartridge tape, automatic logging, preset switching, automatic program control, computers, and remote control, automation in its many facets has become in some quarters a demon. This is not and need not be the case. Automatic and semi-automatic control is a tool—not a substitute. With it the broadcasting industry can produce a high-quality end product for the millions of viewers and listeners who depend on the media for information, education, and entertainment.

As you walk through the exhibit area at the NAB Show, or read published accounts of the convention, note the many new products oriented toward efficient operation of stations. Never before has such a wide display of devices for the broadcast and recording industries been brought together for your examination.

We believe the systems and equipment can and will be employed to further the technical and esthetic status of broadcasting—under guidance of the competent engineering and program personnel at work in stations throughout the free world.

As the art is advanced, technical standards become more stringent; ability on the part of broadcast engineers and operators to do a precise job is of even greater importance. With this as a goal, it is necessary to keep abreast of new developments —in theory and practice—as they are made. To aid our readers in accomplishing this essential task, BROADCAST ENGINEERING has taken steps to insure full coverage of the field.

As we announced in the January issue, B-E has enlarged its staff considerably through the appointment of a select group of Consulting Authors from all over the country and from many phases of the broadcast industry. A correspondent is on the job in Europe, and the program is being expanded to include the entire free world.

This field staff includes some of the top authors in the field of Broadcast writing. The entire program has been designed to provide BROADCAST ENGINEERING readers with penetrating, informative articles concerning the operation, maintenance, and design functions at every level of station engineering, in every facet of modern broadcasting. At the same time, this expanded staff has increased our collective awareness to developments and trends in our rapidly advancing technical field; it has placed at our fingertips more up-to-date and practical knowledge than has ever been possible since the magazine came into being.

We'd like for you to meet the members of our present Consulting Author staff and read some of their own comments concerning the industry of which we are all a part. We're proud of these men. Their remarks represent the opinions of an unusually representative cross-section of the broadcast engineers of this country. They are speaking from personal experience with the problems and accomplishments that beset each of you every day and every week, throughout the year. Read then, and take this opportunity to meet your BROADCAST ENGINEERING staff.

The Editors

Forest H. Belt
Editor

Stuart N. Soll
Managing Editor

Elliott P. Fagerberg, Consulting Author, Geneva, Switzerland

On the occasion of the annual NAB Show, it is pertinent to take account of the phenomenal expansion of broadcasting—both sound and TV—in Europe during 1963, and examine the even more sensational growth expected during 1964.

One of the most significant developments during 1963 has been the astonishing increase in numbers of new broadcasting stations. In several European countries, multipurpose transmission towers have been put into operation. New transistorized mobile units for field broadcasting both sound and TV have been developed. Helicopters have been outfitted for telecasting. Equipment mounted on motorcycles was used successfully to telecast the famous "tour de France" bicycle races.

Obviously, the unprecedented increase in number of transmitters reflects the phenomenal augmentation of both TV and sound receivers throughout Western Europe. The greatly improved purchasing power of the average consumer has made this area the second most important center of broadcasting in the world. With 600,000,000 potential radio listeners and TV viewers, Western Europe is expected soon to surpass the United States in broadcast facilities.

Particularly indicative of the rapid increase of radio and TV sets in the rural districts of Europe are the numerous low-powered retransmitters (translators) installed during recent years to improve reception where propagation difficulties and interference make normal transmissions unreliable.

As I look into my crystal ball here in the center of Europe, I envisage at least three important broadcasting developments in the immediate future—probably during 1964.

The first of these is introduction of color television transmission throughout Europe. Much successful experimentation has already been conducted. This includes some very interesting French tests using magnetic tape recordings of Secam-system color TV signals. Experimentation with color TV, principally with the Secam system, will be at least intensified during 1964.

Great impetus will probably be given to color TV in Europe in February, 1964, when the ITU gives its blessing to one of three competitive systems: the U. S.-born NTSC technique, adapted to

a 625-line image on a 7 mc channel; the French Secam system; and the PAL (Phase Alternation-method Line) system.

The PAL system, of German origin, is a variation of NTSC, wherein the chrominance signals alternate in phase line by line. The receiver for this variant utilizes a delay line similar to the Secam system.

When the CCIR study group convenes in London, it is expected to recommend one of the systems (or perhaps a variation combining features of each) for worldwide use. The CCIR experts will be guided by intensive coordinated research carried out since November, 1962, under the auspices of an EBU ad hoc group on color TV.

Stereophonic sound broadcasting will probably be the second most important development in Europe this year. As the result of rigorous testing of various techniques early last year, EBU experts have put the seal of approval on what is known in Europe as the pilot-tone system. This is identical with that used in the United States.

European radio manufacturers have for some time been pushing receivers adapted for stereophonic reception. Most of these are designed to receive transmissions employing the system finally approved by EBU. Stereophonic broadcasts using this system have already been introduced in the Netherlands on the 92.6 mc band.

My third prediction is that, in the near future, a standardized system of monochrome TV will be adopted for all of Europe—probably a 625-line picture. A straw in the wind is the introduction by Great Britain of a UHF network which will broadcast TV on 625 lines.

BBC has placed in operation an electronic converter capable of transforming 625-line TV signals to the 405 standard. The new converter is said to eliminate the significant loss of picture quality caused by reflections between the optical surfaces in converters using the image-transfer principle. Inherent noise is also reduced.

The future of European broadcasting has never looked brighter than it does this year.

Patrick S. Finnegan, Chief Engineer, WLBC-AM-TV, WMUN-FM, Muncie, Ind.

According to all reports, our bustling broadcast industry came through the past year in robust financial health. Ours is anything but a static industry. We have seen it rise to new heights of greatness during the national tragedy of President Kennedy's assassination, and also bring Congressional pressure to bear on the FCC proposal to adopt the NAB Code's commercial standards as FCC Rules.

The FM freeze thawed, bringing with it new allocations tables. The grandfather clause, designed to protect existing stations, in reality penalized many of the pioneer FM stations by freezing them into position—out of step with the tables and therefore forbidden to improve their facilities.

As many new UHF stations go on the air, the demand for licensed engineers should increase sharply, particularly for those experienced in UHF engineering. With the FCC continuing to demand stricter adherence to the technical rules, many of the smaller radio stations will be forced to either hire competent technical men or eventually go off the air.

Educational television got a big boost with the release of matching funds from the Federal Government. The majority of these stations will operate in the UHF region. Several went on the air and many more hope to be on the air before this year ends. Some statewide networks, such as Kentucky with its eleven stations, hope to be in operation by the Fall semester.

The NAB Convention gets bigger and better each year. It is a good time to see and learn new things, compare notes and equipment, meet old friends and make new ones. It would be even better if the radio and TV technical sessions were on the same floor; then one wouldn't have to combat elevator traffic to shift from one session to another.

See you in Chicago!

Harry A. Etkin, Staff Engineer, WOAL, Philadelphia, Pennsylvania

The stage for this year was set by the broadcast equipment industry producing a most complete and comprehensive line of radio and television broadcast equipment. The goal has been to see that AM, FM, and TV programs reach the home listeners and viewers in the best possible condition. Design innovations have improved AM and FM transmitters, FM stereo monitoring and multiplexing equipment, antennas, transmission lines, automatic logging equipment, and audio amplifiers, consoles, and tape recorders. Significant changes have also been made in monochrome and color video tape recorders, studio cameras and projectors, special effects and switching equipments.

Another trend is to stress reliability and human engineering in all equipment. This design philosophy has produced equipments with outstanding performance, efficiency, reliability, and ease of operation and maintenance. AM, FM, and TV transmitters feature simplicity of initial tuneup, stability of operation, remote control, high efficiency PA circuitry, semiconductor power supplies, and reduced floor space requirements.

To comply with a new FCC Rule, the broadcast industry has developed economical means of automatically recording all the required parameters of transmitter operation. Measurements are recorded in sequence on a moving strip chart. The usual check points are power output, PA plate current, carrier frequency, monitor output, and modulation monitor output. An alarm signals the operator of improper operation.

Certain broadcast equipment manufacturers have obtained FCC type-approval for FM/SCA multiplex modulation monitors. Pilot amplitude levels and modulation levels of each stereo channel, or left and right channel stereo programs, may all be monitored and measured.

The NAB Show is the showplace for new equipments and products. The exhibits and engineering conferences display the current technology and operating techniques of the industry's newest broadcast equipment.

Donald L. Coleman, Jr., Chief Engineer, WFGM and Music Service Corp., Fitchburg, Mass.

Much has happened to the broadcast industry during the last year, some good and some bad.

Perhaps most significant was the tightening of certain FCC regulations. This has forced many stations to improve operations and performance, and will likely continue to have this effect in the future.

And perhaps the biggest bomb has been FM stereo. In spite of the big push to promote it, stereo has been something less than tremendous—at least here in the Northeast. This is due in part to the poor signals transmitted by

some stations, a situation that can only be cured by the combined efforts of equipment manufacturers, station management and broadcast engineers. Manufacturers must work to eliminate equipment bugs; station management should keep up with the state of the art, and recognize that yesterday's equipment is not always adequate for today's operation; and station engineers have to learn more about the operation of modern equipment.

FM stereo has also suffered from poor consumer-dealer practices. A dealer cannot expect to satisfy a stereo customer when he sells a set on the basis that "you won't need an antenna with this one." The average hi-fi dealer as yet knows very little about stereo; this project of education should be undertaken by both the broadcast industry and dealer organizations.

In the coming year, I look for increased use of automation—both in the transmitting plant and the programming plant. Perhaps the greatest advantages will be realized in programming, where separate operation on AM and FM is becoming more and more necessary. Until FM really gets rolling (and it's going to), the economics of FM broadcasting dictate the use of as much automation as possible, consistent with good programming.

I feel that aural broadcasting, and particularly FM, is in the beginning of a big resurgence, from which will come methods of mass information dissemination and entertainment such as the world has not yet seen. The coming NAB Show will no doubt be the platform for the introduction of many of these developments.

J. Gordon Elder, Consulting Engineer, Toronto, Ontario, Canada

Since the late 'forties, occupancy of the standard AM broadcast band has been described as "approaching the saturation point." While this is undoubtedly true, it is interesting to note that substantial numbers of new or changed facilities continue to be established in North America. More than 1000 AM notifications were made in 1963, including over 100 proposed new stations. Though the majority of these were for smaller communities, a significant number will serve large cities.

The availability of a frequency depends upon several factors. Naturally, as the band becomes more congested, the economic factor becomes more important in arriving at a satisfactory station design.

Six-tower arrays are now quite common. During the past year, a twelve-tower array was placed in operation. The theoretical design of these arrays is fairly straightforward, and mathematical drudgery is avoided by using computers.

However, installing, adjusting, and maintaining such an array poses a number of practical problems. To avoid interference to other stations, exceptional stability is essential, with "tight" patterns. To achieve this requires, among other things: a large unobstructed site; plenty of buried copper; and a flexible, conservatively rated power division, transmission, and tuning system.

The recent development of an operating impedance bridge has introduced a valuable aid in adjusting arrays of any type; it seems almost indispensable for setting up these large ones.

During the coming year, AM allocation problems in North America will inevitably become more severe. Partly as a result, more broadcasters will turn to FM or will expand their FM facilities. Others will press more vigorously for domestic concessions. The administrations and consultants will give considerable thought to the development of proposals for presentation at the next North American Regional Broadcasting Conference, to update the allocation rules.

Elton B. Chick, Assistant Director of Engineering, Rounsaville Radio Stations, Cincinnati, Ohio

Due to extensive travel and prior commitments, Elton B. Chick was unable to take part in this year's NAB Show supplement.

Although timing was unfortunate for this issue, you will be reading many reports and articles written by Mr. Chick in future months. As they have been in the past, his articles should prove to be of great interest and practical value for the operating engineer.

George M. Freese, Consulting Engineer, East Wenatchee, Washington

For more than ten years prior to 1963, the broadcast industry underwent a rapid growth of radio stations, television stations, community antenna systems, translator stations and FM stations. This rapid growth has kept broadcast consulting engineers overloaded with work. For most, this work consisted of AM frequency searches for all types of facilities, preparing the engineering section of applications for new AM, FM, TV, and translators; station planning and designing; preparing station license applications including AM, AM-DA, FM, and TV proof of performance; designing and building special purpose electronic broadcast devices; and so forth.

By 1963, a rather sudden change took place in the industry. AM stations had become crowded; in many areas, competition was so keen that all began losing money. Engineering for new AM facilities became extremely difficult. The number of applications before the commission, and the complexity of these applications, slowed processing. Finally, the commission froze almost all AM applications. Actually, for many areas in the United States, AM expansion was about over before the freeze. Simultaneously with the AM halt, TV station assignments neared saturation, and — ironically — CATV systems and translator system expansion was about over.

There are several ways imaginative consulting engineers have redirected their energies to fit the needs of a changing broadcast industry. Many older facilities, some with DA's, were in need of rather extensive repair. This type of engineering can become more involved than the original engineering. There isn't too much of this work, however, partly due to the poor economic condition of some stations and partly because some stations are fortunate in having a good station engineer to keep things in condition.

Some future developments will depend upon the FCC, but I have confidence they will come. Such things as: 750,000 watts for some class IA; an increase to 20 kw for class III's; better utilization of class IB frequencies by class II stations; and so on.

VHF stations may all eventually be moved to UHF, which will set loose a whole new field of engineering. Cable systems may resort to microwave, translators will have to be rearranged, and the main station will also undergo change. The field of the UHF on-

channel translator booster has hardly been scratched.

I'm an unfortunate engineer in one sense. I have never been to an NAB Show. I would like very much to attend, but work will undoubtedly prevent it.

Melvon G. Hart, Technical Director, Balaban Stations, St. Louis, Mo.

The past year in the broadcast industry has shown an upswing in automation, a vast expansion of FM broadcasting, and a trend toward solid state circuitry. These developments, fortunately, go hand in hand. The increased reliability of silicon diode rectifiers as opposed to mercury vapor tubes (with their sensitivity to temperature extremes), along with the use of reliable remote-control transmitter systems, has allowed many broadcasters to operate FM stations that would not be economically feasible if it were necessary to have an operator on duty at the transmitter site as well as at the studio.

These and other developments have also upgraded the skills needed by the progressive engineer. In the past, an engineer had only to be able to find the right speed on a turntable or repair and operate simple transmitter and audio equipment. Those days are past; if one wishes to make a place for himself in modern radio, he must be conversant with all phases of the industry. Transmitting, audio, recording, and control equipment has become too complex to allow one to sit back and coast while the weeks roll by. The best job security is knowledge and ability, and this can be obtained and maintained only by active interest and participation.

The future trend in radio broadcasting, both AM and FM, will be toward completely automatic transmitter operation. Remote control is only a temporary stop-gap in the vital process of economizing in today's highly competitive market. Automatic transmitter operation is not only feasible but is, in my opinion, superior to manual control. For the most part, technical problems have already been solved. The state of the art is such that automatic equipment can and will afford more precise control of transmitting equipment than manual operation.

The present Rules concerning remote control and automatic logging are, I believe, unrealistic. They require the logging equipment to be at the control position. This requires an elaborate switching arrangement to sample parameters intermittently. If the frequency (for instance) should suddenly jump it would not be noticed until that sequence was selected.

Just as cartridge tape equipment was a big thing at the NAB Show several years ago, I believe automatic transmitter control and monitoring will create considerable interest this year. There is no job in broadcasting more dreary than sitting alone in a transmitter shack out in the country with nothing more to do than read a few meters every half-hour. Automation will free the engineer to pursue more productive and interesting projects. Field intensity measurements can be made more often and the array kept in perfect trim; studio and transmitter maintenance will also benefit by the extra man-hours available.

The engineering future is bright for the man who wants to do a good job and will keep up with developments as they come along—and who knows, maybe even contribute a few ideas of his own.

James French, Jr., KRMA-TV, Denver, Colo.

The past year in Educational Television has been one of continued growth. Many new programs in the adult education field have been added to national ETV offerings; also, most of the ETV stations around the country have several good, wholesome, local programs to interest the viewer.

In the year to come ETV in general will continue to improve programs and offer a wider range of subjects. At our station in Denver, we are enlarging our operations to include two complete operational studios. This will allow us to increase our on-the-air time approximately four additional hours per day. At the present time, we are building and installing the control and projection equipment for the second studio. About 75% of our equipment is solid state built here at the station. This type of gear is of great interest to us here in Denver, and we have transistorized a great portion of our systems. This saves power, simplifies maintenance, and produces outstanding reliability.

The present outlook for the future of broadcast television in the educational field is very bright. Facilities will without a doubt expand as new stations enter into the field. Los Angeles is said to have a very fine ETV station under construction and should be telecasting by September. Last year, ETV acquired a station in New York City which gives an opportunity to acquire talents and programs from that area.

I am sure the NAB convention will be as much a success as usual. This is one of the yearly high points in the broadcast industry.

Robert A. Jones, Consulting Engineer, LaGrange, Ill.

Looking back over the past year, I would say that the lifting of the FM freeze by the Commission was one of the important occasions of 1963. This occurred in midsummer, and since then a continual flow of FM applications has been filed with the FCC. Under the new FM Table of Assignments, applicants can't choose the particular FM channel they may desire, but have to apply for whatever channel is available to their city. While this may seem inflexible, it can be modified by petition for rule-making—as has been done by several prospective applicants. Furthermore, a specific FM channel can be requested at any city within 25 miles of the one shown in the Table of Assignments.

Nineteen sixty-three was the year the FCC announced revision of the operator requirements for certain FM stations and nondirectional AM stations. Effective January 1, 1964, these stations no longer had to have a full-time operator with a First Class License.

Most antenna manufacturers, with the return of FM applications, began to push the dual-polarity models. Preliminary tests indicate that using both horizontal and vertical elements is superior to the common method of feeding just the horizontal ones. The improvement appears to be most noticeable in auto receivers in urban areas.

The big news in 1964 will probably be a lifting of the AM freeze, now almost two years old. This will bring a return of AM applications, but on a more limited and selective scale than before. It is not yet known how these new rules will be worded, but early indications are that they will favor existing stations and the rural, small-town applicants.

In addition, I believe the coming year will bring a greater interest in FM broadcasting, as evidenced by more station applications and a larger FM-listener public. More automation will be used this year even in the average station. This will affect operations all the way from programming and engineering through bookkeeping and record-keeping. We will likely continue to see more trends toward miniaturization. Who knows, we may soon see a 1 kw AM

transmitter, without tubes, in a one-cubic-foot box.

The NAB Show is the best opportunity of the entire year for the station's engineers to renew old friendships, talk shop with fellow engineers, and meet with his station's consultant about engineering difficulties or future plans. Each year numerous technical talks and interesting papers are given by qualified speakers in many technical fields. Obviously all such papers will not appeal to any one person; but by choosing carefully, and attending those in his field, each station engineer can broaden his technical knowledge of this broadcasting business. Where else under one roof can we shop and compare all the makes and models (some with skirts) presented by the equipment manufacturers each year? I plan to attend and trust many of you will, also.

Robert Kastigar, TV Station Engineer, Chicago, Ill.

Engineering for the television industry is not always aimed at developing anything new, per se, but rather to contribute new improvements and innovations that apply to old methods and equipment. Considerable research and development are devoted to making old designs (possibly last year's!) more compact, more reliable, more accurate, more stable, more flexible, less costly, and easier to operate.

The growth of color is one example: Only a few years ago most color telecasts originated from a studio, under easily controllable conditions. Today, remote color pickup equipment can be operated anywhere in the country, making a color telecast almost as easy to produce as a black-and-white one. Transistors are shrinking the size of equipment we use and making it lighter and more reliable than ever before. Almost any equipment of the conventional tube type is now available using all solid-state components.

Witness the growth of video tape equipment: From a multirack room-sized complex of electronic monsters, it has already been reduced to a fraction of its former size. To the immediate advantages realized from this recording medium have been added flexibility and utility. Today it is possible to assemble and record programs and commercials utilizing splicing, cutting, editing, special effects, and even stop-motion animated effects—in color—that were previously restricted to film alone. Perhaps within this year television studios will compete with commercial film studios on a scale never before possible.

This coming year promises to make the task of the television engineer easier, and more demanding at the same time. And, when our "product" leaves the antenna, it should be the best possible picture and sound available at the present state of the art.

Frank B. Ridgeway, Chief Engineer, WEBR, Buffalo, N. Y.

During the past year quite a number of accomplishments and improvements have been made in the broadcast field. Improvements in program automation, such as improved tape cartridges and better and more rapid cueing, have improved program production and increased the ease of operation. In some stations, automatic logging has freed personnel so they could concentrate on other duties.

One of the more significant accomplishments during the year, so far as some broadcasters are concerned, is the governmental requirement that after April, 1964 all television receivers sold in interstate commerce be equipped to receive UHF channels as well as VHF channels. This has increased the interest in UHF telecasting and a large number of applications have been filed with the FCC for UHF construction permits throughout the country. Furthermore, the FCC announced that permission can be obtained to operate UHF-TV transmitters by remote control.

Another accomplishment was the change in FCC Rules that require a daily inspection (five days a week) of a remotely controlled transmitter by a First Class Operator and the keeping of a third, or maintenance, log. The FCC will permit this work to be done on a contract basis. Many stations were observing a regular maintenance program of varying degrees before this requirement was adopted, but others were not. This uniform requirement should improve broadcasting as a whole and the industry in general will benefit. The individual station should gain advantages of better quality and fewer "outages."

The best place to see most of the latest broadcast equipment under one roof is at the annual NAB convention. At this show the engineer not only sees the equipment, most of it in operation, but he can go from booth to booth and compare the various makes while the detailed specifications are fresh in his mind. More than one station engineer has found it to his advantage to take the station manager on a tour of the equipment display where he can explain the workings of the various equipment. This is a good practice whether the station is in the market for new equipment or not. Tomorrow or next week the operational format of the station may change and different equipment will be needed. This has happened at more than one station!

Another advantage of the NAB Show is the knowledge and advice to be obtained. Regardless of the individual's problem, if he talks to enough people he will find someone who has had similar difficulties or who can help him solve his problem.

Bill Kessel, Station Engineer, KTVT, Fort Worth, Texas

In my segment of the broadcast industry—which is television—I feel that there have been many important advances in the state of the art during the last year. Most of these advances I think hinge on the magic words "solid state."

The transition is well under way from tube type equipment to transistorized. The NAB Show of 1963 had some fine examples of what has been done to reduce size, power requirements, and BTU output of television equipment. There is now a 25 kw transmitter which occupies less floor space than was formerly required for a 5 kw unit. One equipment rack will now hold more distribution amplifiers and power supplies than three such racks would previously hold.

The coming year should bring new advances on all important fronts. These will include more solid state circuitry, better stabilization, better color reproduction, and better black-and-white pictures through improved image orths and vidicons.

I think a good deal of the emphasis in the coming year will be on color. 1963 was a banner year for color receiver sales and all signs point to an even better year in 1964. The broadcaster must gear up to meet the demand for color programming which will come very soon.

We in the broadcast industry are very fortunate, indeed, to have the opportunity to attend a fine show such as that presented by the NAB. In no other way could engineering and management get

a look at all the very latest developments in the broadcast field. The papers are well presented and interesting, and the exhibits are magnificent. Besides, where else could you see all those people whom you have known for so many years and who are now scattered all over the country?

I'll see you at the Show.

George C. Sitts, WHEN-TV, Syracuse, N. Y.

Along with the large blue chip VHF stations in the population centers of the nation, there have always been a few smaller VHF's and UHF's in the small cities which ride somewhere on the line between solvency and bankruptcy. Those that today are solvent owe much to the residents' loyalty to local stations and, perhaps more important, to the desire of local sponsors to gain prestige by using TV to spread their name.

The stations themselves are generally operated on the proverbial shoestring. With sticky IO's, old ike chains, a bunch of used equipment, one operator on duty, and a versatile staff, these stations are a far cry from the nation's major-market operations.

But they have survived, and some have even managed to make a dollar or two. Now things seem to be looking up for these little fellows, and the new light is coming from several directions. First came the vidicon, usable in both the studio and the film room. The vidicon offers small stations substantial savings in both studio and film-chain operating costs, and permits them to stock only one type of pickup tube.

As the vidicon studio camera began to climb in popularity, along came remote camera control. The lighter weight of the vidicon makes such control economically practical, eliminating the need for cameramen in many stations that limit their local live programs to news and weather.

In this trend to cut cost and size, the VTR makers have begun to court the little guy too. There are several units either under development or on the market now that range in price from ten to twenty thousand dollars, and have such features as half-speed and quadrature-head operation.

Down in Washington they began thinking "small" too. The FCC approved remote control for UHF transmitters, paving the way for better transmitter locations. They also promoted all-channel-receiver legislation—a giant step toward a completely developed UHF band and added space for local stations.

All these actions over small TV have encouraged a number of applications for new stations, mostly in the UHF band. As the number of such stations grows, there will have to be a shift in philosophy for the broadcast engineer. It's going to be up to these engineers to combine the knowledge of the "old-timers" with the many recent refinements in equipment and come up with workable plans for each local station.

Any engineers planning to enter this growing and challenging field of small TV will certainly find it worth his while to attend the upcoming NAB Show. It seems to be one of the few opportunities we engineers get to compare the various equipment makers' wares side by side. The advance notices I've seen point to this year's Show being bigger and more inclusive than ever.

Len Spencer, Technical Director, CKAC, Montreal, Quebec, Canada

In La Belle Province de Quebec, increased activity in all fields of broadcasting has been the order of the day, not only among private stations but also by the Canadian Broadcasting Corporation which is responsible to the Federal Government of Canada. The CBC has already started a huge combined radio, TV, and FM complex costing some millions of dollars.

In the private enterprise field, J. C. Lalancette, chief engineer of CJMS in Montreal, reports that their new 50 kw transmitter should be on the air sometime in early Summer. Six 208' towers form their array, a DA2, using four towers by day and six by night. Manufacturers' engineers have also installed telemetering and a remote control system. CJMS has also installed a new 50 kw (erp) FM transmitter, and there are two new studios to complete this very modern Quebec station.

CKTM-TV, of Trois Rivieres, added a 25 kw amplifier and a 1,000' tower. CJAD, a Montreal station, is installing a 50 kw AM transmitter, feeding a four-tower directional array.

When CKRT-TV, at Riviere du Loup, was completely destroyed by fire on the morning of December 19 last year, a complete TV transmitter was installed and checked out by December 31—which no doubt made it a Happy New Year for all concerned!

Thus you can see 1963 was a year of much activity in Quebec. I anticipate that 1964 will see many stations improving their technical equipment by purchasing solid state amplifiers for both studio and remote work. When the standards are issued concerning cartridge tape recorders and playback systems, many station engineers will be anxious to bring their equipment up to date.

There will be a further trend to semiautomation in the higher-powered stations and complete automation in many FM complexes. More automation will be necessary in the smaller TV stations to meet increased competition from all media.

Daytime radio will eventually find a "live program" format that will compete successfully with the TV soap operas, which are presently losing favour by being turned into hamburger by too many commercials.

In the Province of Quebec, French programs will improve so that we can truly say that Montreal is the Paris of North America, while the English programs—though still dominated by our American friends—will acquire a more truly Canadian flavour.

I haven't attended an NAB Show for some years, but I hope to attend in April next.

Edward Tong, Asst. Chief Engineer, WDSU-TV, New Orleans, La.

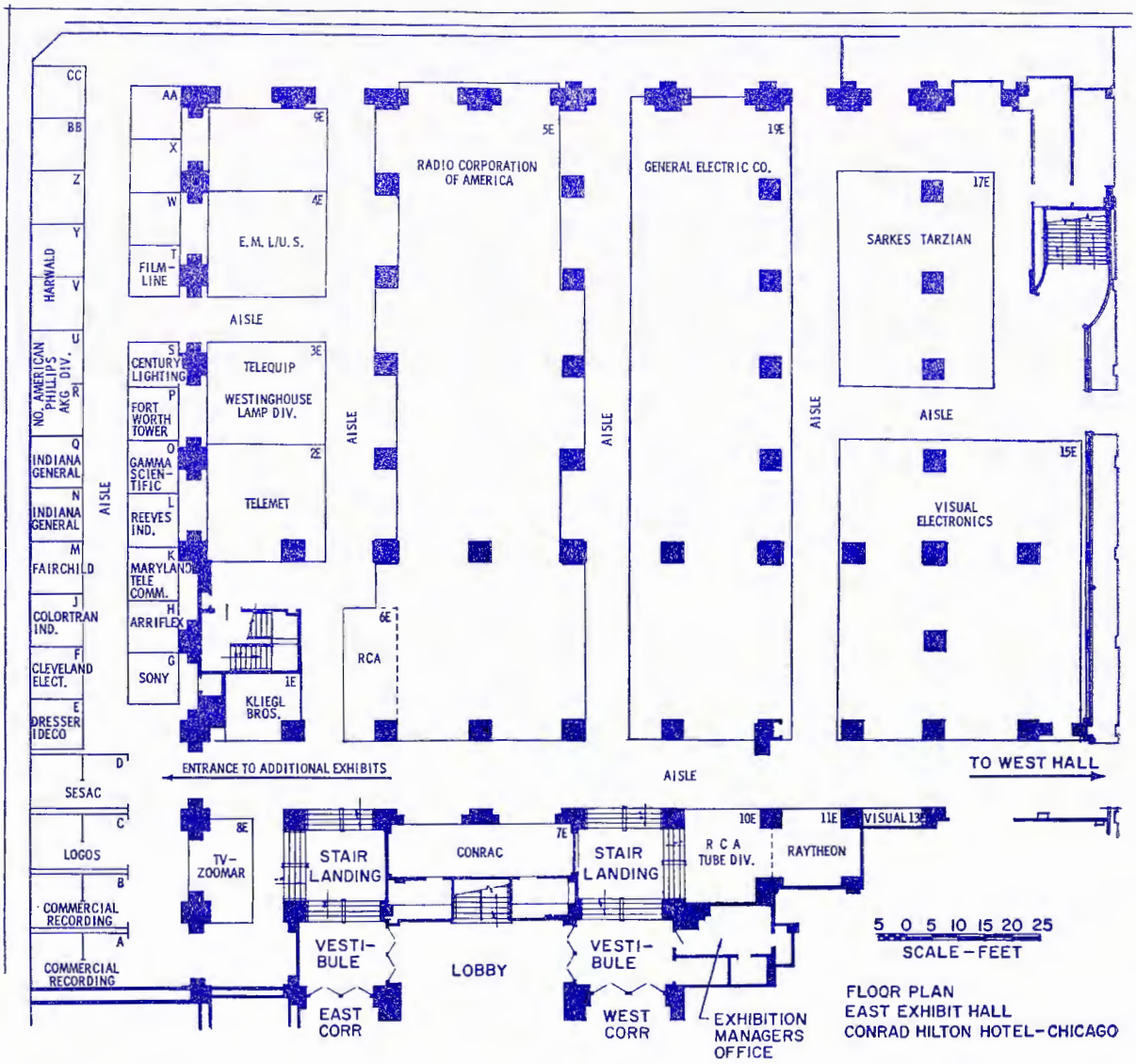
The past year has seen a wealth of events and accomplishments for the broadcast engineer.

The trend in colorcasting continues at an accelerating pace in all areas. The engineer has advantages offered by several new equipments now available using the four-pickup-tube technique.

The interest and demand for solid state equipment has been matched in 1963 by manufacturers with a broad range of units of high performance and amazingly compact structure. This should help to break down the resistance of even the most die-hard of the vacuum-tube advocates remaining among us. We can look for great forward steps in 1964 in both the foregoing facets of our industry.

New portable VTR equipment has been introduced for the broadcaster during 1963. Late in the year a new quad-head portable unit was introduced to create even more competition in this most volatile field. We should look for interesting action here in 1964.

In most broadcasting studio installations, the VTR machine is used in its playback mode three or four times more than in its recording function. The ad-



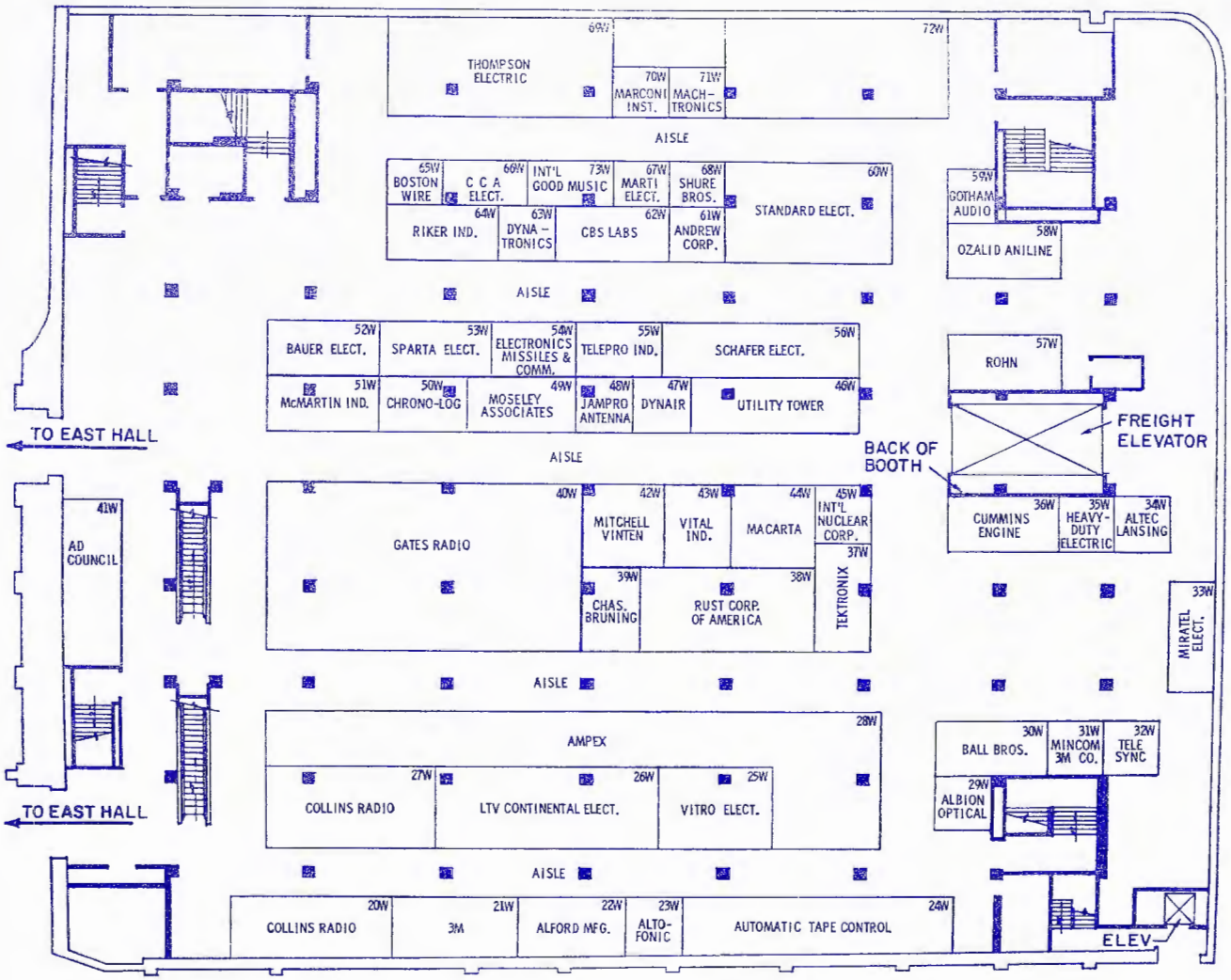
FLOOR PLAN
EAST EXHIBIT HALL
CONRAD HILTON HOTEL–CHICAGO

NAB 18th CONVENTION ASSOCIATE MEMBER EXHIBITORS

Conrad Hilton Hotel, Chicago, Ill., April 5-8, 1964

Booth Numbers:

The Advertising Council, 25 W. 45th St., New York 36, N. Y., **41W**
AKG Div., North American Phillips Co., 100 E. 42nd St., New York, N. Y., **UR**
Albion Optical Co., 1410 N. Van Ness Ave., Los Angeles 29, Calif., **29W**
Alford Mfg. Co., 299 Atlantic Ave., Boston 10, Mass., **22W**
Altec Lansing Corp., 1515 S. Manchester Ave., Anaheim, Calif.—92803, **34W**
Alto Fonic Tape Service, Inc., 1606 N. Highland, Hollywood, Calif.—90028, **23W**
Ampex Corp., 934 Charter St., Redwood City, Calif., **28W**
Andrew Corp., P. O. Box 807, Chicago, Ill.—60642, **61W**
Arriflex Corp. of America, 257 Park Ave. South, New York, N. Y.—10010, **H**
Automatic Tape Control, Inc., 209 E. Washington St., Bloomington, Ill., **24W**
Ball Bros. Research Corp., Boulder Industrial Park, Boulder, Colo., **30W**
Bauer Electronics Corp., 1663 Industrial Rd., San Carlos, Calif., **52W**
Boston Insulated Wire & Cable Co., 65 Bay St., Boston 25, Mass., **65W**
CBS Laboratories Div., 227 High Ridge Rd., Stamford, Conn., **62W**
CCA Electronics Corp., 542 Industrial Dr., Yeadon, Penn., **66W**
Century Lighting, Inc., 521 W. 43rd St., New York 36, N. Y., **S**
Charles Bruning Co., Inc., 1800 W. Central Rd., Mount Prospect, Ill., **39W**
Chrono-Log Corp., 2583 West Chester Pike, Broomall, Penn., **66W**
Cleveland Electronics, Inc., 1974 E. 61st St., Cleveland, Ohio, **F**
Collins Radio Co., Dallas, Texas—75207, **20W, 27W**
Colortran Industries, 630 S. Flower St., Burbank, Calif., **J**
Commercial Recording Corp., 3104 Maple Ave., P. O. Box 6726, Dallas, Texas—75219, **AB**
Conrac Div., Giannini Controls Corp., 19217 E. Foothill Blvd., Glendora, Calif., **7E**
Continental Electronics, 4212 S. Buckner Blvd., Dallas 17, Texas, **26W**
The Cummins Engine Co., Inc., Columbus, Ind., **36W**
Dresser-Ideco Co., 875 Michigan Ave., Columbus 15, Ohio, **E**
Dyhair Electronics, Inc., 6360 Federal Blvd., San Diego, Calif.—92114, **47W**
Dynatronics, P. O. Box 3789, Orlando, Fla., **63W**
Electronics, Missiles, & Communications, Inc., 160 E. 3rd St., Mount Vernon, New York, **54W**
EMI/U.S., 1750 N. Vine St., Los Angeles 28, Calif., **4E**
Fairchild Recording Equipment Corp., 10-40 45th Ave., Long Island City 1, N. Y., **M**
Filmline Corp., 43 Erna St., Milford, Conn., **T**
Gamma Scientific, Inc., 5841C Mission Gorge Rd., San Diego, Calif.—92120, **O**
Gates Radio Co., 123 Hampshire St., Quincy, Ill., **40W**



FLOOR PLAN
WEST EXHIBIT HALL
CONRAD HILTON HOTEL--CHICAGO

General Aniline & Film Corp., Vestal Parkway East, Binghamton, N. Y.—13902, **58W**
General Electric Co., 212 West Division St., Syracuse, N. Y.—13204, **19E**
Gotham Audio Corp., 2 W. 46th St., New York 36, N. Y., **59W**
The Harwald Co., 1245 Chicago Ave., Evanston, Ill., **VY**
Hevi-Duty Electric Co., P. O. Box 563, 3839 W. Grant St., Milwaukee, Wisc.—53201, **35W**
Indiana General Corp., Keasbey, N. J., **QN**
International Good Music, Inc., 1610 Home Rd., P. O. Box 943, Bellingham, Wash., **73W**
Ave., Nashville 4, Tenn., **45W**
Ave. Nashville 4, Tenn., **45W**
Jampro Antenna Co., 6939 Power Inn Rd., Sacramento, Calif.—95828, **48W**
Kliegl Bros. Universal Electric Stage Lighting Co., Inc., 23-32 48th Ave., Long Island City, N. Y.—11101, **1E**
LOGOS, Ltd., 1017 New Jersey Ave., S. E., Washington 3, D. C., **C**
MaCarta, Inc., 709 Railroad Ave., West Des Moines, Iowa—50265, **44W**
Machtronics, Inc., 185 Evelyn Ave., Mountain View, Calif., **71W**
Marconi Instruments, 111 Cedar Lane, Englewood, N. J., **70W**
Marti Electronics, P. O. Box 661, 105 Poindexter, Cleburne, Texas—76031, **67W**
Maryland Telecommunications, Inc., 10 B Winters Lane, Baltimore, Md.—21228, **K**
McMartin Industries, Inc., 605 N. 13th St., Omaha, Nebraska—68102, **51W**
Mincom Div., 3M Co., 2049 S. Barrington Ave., Los Angeles 25, Calif., **31W**
Minnesota Mining & Manufacturing Co., 2501 Hudson Rd., St. Paul 12, Minn., **21W**
Miratel Electronics, Inc., 3600 Richardson St., St. Paul 12, Minn., **33W**
Mitchell Vinten, Inc., 666 W. Harvard St., Glendale 4, Calif., **42W**
Moseley Associates, Inc., P. O. Box 3192, 4416 Hollister Ave., Santa Barbara, Calif., **49W**
Radio Corporation of America, Front & Cooper Sts., Camden 2, N. J., **5E, 6E, 10E**
Raytheon Co., 1415 Providence Turnpike, Norwood, Mass., **11E**
Reeves Soundcraft, 15 Great Pasture Rd., Danbury, Conn., **L**
Riker Industries, Inc., 875 E. Jericho Turnpike, Huntington Station, N. Y., **64W**
Rohn Systems, Inc., P. O. Box 2000, Peoria, Ill., **57W**
Rust Corporation of America, 195 Massachusetts Ave., Cambridge 39, Mass., **38W**
Sarkes Tarzian, Inc., Broadcast Equipment Div., East Hillside Dr., Bloomington, Ind., **17E**
Schafer Electronics, 235 S. 3rd St., Burbank, Calif., **56W**
SESAC, Inc., 10 Columbus Circle, New York, N. Y.—10019, **D**
Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill., **68W**
Sony Corporation of America, 580 5th Ave., New York, N. Y.—10036, **G**
Sparta Electronics Corp., 6450 Freeport Blvd., Sacramento 22, Calif., **53W**
Standard Electronics Corp., P. O. Box 677, Freehold, N. J. **60W**
Tektronix, Inc., P. O. Box 500, Beaverton, Oregon, **37W**
Telemet Co., 185 Dixon Ave., Amityville, Long Island, N. Y., **2E**
Telepro Industries, Div. of TelePrompTer Corp., 247 Park Ave., New York, N. Y. —10017, **55W**
Telequip Corp., 319 E. 48th St., New York 17, N. Y., **3E**
Telesync Corp., 43 New St., Englewood Cliffs, N. J., **32W**
Television Zoomar Co., 500 5th Ave., Suite 5520, New York 36, N. Y., **8E**
Thomson Electric Co., Inc., 50 Rockefeller Plaza, New York 20, N. Y., **69W**
Utility Tower Co., 3140 N. W. 38th St., P. O. Box 7022, Oklahoma City, Oklahoma, **46W**
Visual Electronics Corp., 356 W. 40th St., New York, N. Y.—10018, **13E, 15E**
Vital Industries, 3614 S. W. Archer Rd., Gainesville, Fla., **43W**
Vitro Electronics, 919 Jesup-Blair Dr., Silver Spring, Md., **25W**
Westinghouse Electric Corp., Photographic Lamp Dept., MacArthur Ave., Bloomfield, N. J., **3E**

vent in 1963 of a playback-only machine, which sells at about ⅓ the cost of a combination unit, can well be hailed as a most important development to those hard-pressed people in the control room who constantly strive to make two machines look like four.

I realize that such developments such as Telestar, the Plumbicon, etc., have been upstaged; but the importance of developments all depends upon the location from which we observe these great advances.

John J. Walsh, Engineering Supervisor, Nashville, Tennessee

The year 1963 saw a crackdown by the FCC concerning engineering practices. Although there are many who may think otherwise, the new regulations should show a definite improvement in broadcast quality.

There would have been no need for the FCC to step in and force the issue had it not been for the slipshod methods of some broadcasters. Fortunately, these stations are in the minority. However, as with the proverbial "bad apple," it takes only one in a market to give all a bad reputation.

The advent of the new maintenance log literally forces the broadcasters to maintain their equipment in proper operating condition. The daily inspection requirements, five times weekly, will certainly go a long way toward correcting many of the engineering faults of the past. Keep in mind that this constant checking and tuning will also prolong the life of much expensive equipment.

Of course, there are many cases where these inspections have been a matter of policy in the past, and the only added burden is to keep a record of them on the maintenance log. Upon close examination, it would undoubtedly be found that these are the stations that have a consistently good sound and have little or no trouble with relicensing.

Why not follow the example set by these "better" stations and insist that the engineering staff follow these regulations right down to the letter of the law, and then some? Integrate new and improved policies with the regulations to further improve engineering practices.

In April of 1964 another new ruling takes effect. This Rule is of particular interest to those radio stations operating by remote control, nondirectional, with 10 kw or less. Whereas formerly these stations operated remote control with a Restricted Class License holder, now whoever is in control must hold a Third Class License with a Broadcast Endorsement. This innovation places in control an operator with some knowledge of the workings of the equipment, thus tending toward better operation.

The penalties that could be handed down to an operator by the FCC should give some pause for thought before giving in to carelessness. The very least of these penalties is the loss of his license, which would limit his employment to those stations not required to employ licensed personnel. What with more and more stations operating with fewer First Class engineers, this could be very serious to careers of many broadcast personalities.

Ed Murdoch, Consulting Engineer, Melbourne, Fla.

What does the future hold for Broadcasting? Well, if present trends may be accepted as a guide, it's pretty obvious that stereo FM is to become one shining star of home entertainment. One cold, wintry Florida night—a little over a year ago—I was sitting by the air conditioner preparing an outline for the first of my alleged contributions to BROADCASTING ENGINEERING. My FM tuner was feeding the hi-fi system a wonderful assortment of crashing crescendos and whiplashing strings through the prodigious courtesy of WJBR—a young upstart 3 kw FM-only station which was naive enough to think it could make a living with a classical music format in stereo-multiplex. Recently this self-same naive young upstart station (which should have long ago gone broke) employed me to handle the engineering for a 100 kw application; and—you guessed it—I am now Chief Engineer for the operation.

The country is fast becoming hi-fi conscious. Once a stereo fan is exposed to all of that good free stereo sound, he is sold for life. Not even good monophonic FM sounds like much anymore.

So far, this sounds like just so much gravy for the future till of the stereo FM operator—but there is a catch. A **satisfied** stereo listener is your best advertisement—but, brother, you have got to satisfy him. The stereo listener is generally an audio perfectionist, and he demands perfection from the stereo station.

This brings us directly to the real point of this discussion: Assuming that stereo FM does become a universally disbursed medium, how will this affect the broadcasting engineer?

The answer is quite simple—and quite horrifying. The successful operation and maintenance of stereo-FM equipment requires a much greater degree of engineering knowledge and technical proficiency than is demanded by an AM station, or even an ordinary FM station. Compared to AM circuitry and operation, stereo FM is quite complex. Although stereo radio is a comparatively new field, some manufacturers are making excellent progress in simplifying and stabilizing stereo equipment. Yet, even allowing for improvements in equipment, I think stereo FM will separate the men from the boys (from a technical viewpoint) for several years yet.

Phil Whitney, Manager and Chief Engineer, WINC, Winchester, Va.

An industry as large as broadcasting does not move in any direction overnight. It is difficult to say that any one development belongs to any particular year. With years expended in its inception, many more years may pass before a product becomes widely accepted. In broadcasting, one of the greatest single impacts has been made by the cartridge recorder; introduced some years ago, it is outgrowing the early "bugs" and taking its place as an important necessity in most stations. The most frequently-heard comment among station personnel is, "How did we get by before it?"

In a few respects, broadcasting seems to have regressed during the year just passed. This complaint comes frequently from a manager or owner, and is caused by the FCC's recent ruling regarding daily inspection of all transmitting facilities by a First Class licensed operator. The cry is perhaps loudest from remotely controlled stations in the snow belt. Many newer stations have been located strategically to fit engineering conditions, without regard to accessibility. They were not designed to be inspected daily. The ruling hit these like a thunderbolt, and after the first arduous winter a large segment of the industry is searching for a solution to a tough problem. One engineer reported so much time is now devoted to the daily **trip** to and from the remote transmitter that **maintenance** is suffering.

Broadcast engineers feel that the NAB Show is undoubtedly the most important vehicle for the presentation of new or improved broadcasting equipment. Past Shows introduced the cartridge tape, radio and TV automation, new cameras, video tapes, and even do-it-yourself transmitters. It is the engineer's, and station manager's, best opportunity to see all the important equipment gathered conveniently together at one spot. It is frequently the engineer's best way to convince management that more things can be done better in broadcasting, with new and better tools of the trade. The Show upgrades standards of broadcasting equipment, for every company can see what his competition is doing and better his product accordingly, to compete effectively in the field. The industry looks forward to this year's Show, expected to be the biggest and best yet. ▲

1964 NAB PRODUCT PREVIEW

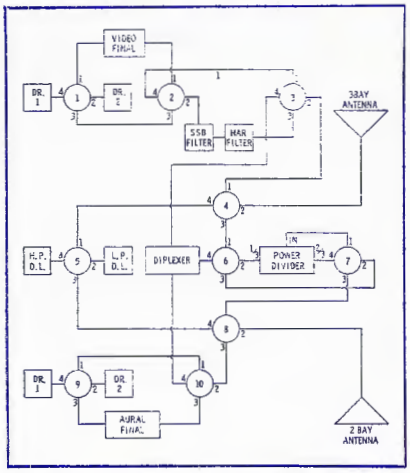


Fig. 1. Switching matrix block diagram.

The activity and interest will be great on the exhibit floor at the 42nd annual Convention and Engineering Conference of the National Association of Broadcasters at Chicago, April 5 to 8. You'll find a wide variety of equipment for radio and television broadcasting as well as professional recording applications displayed and demonstrated — many of the items for the very first time.

To give our readers an idea of what to expect at the exhibit we have compiled this preview of products, some newly on the market, others to be unveiled at the show.

Antennas and Equipment

Several companies will be showing antennas, transmission line, and accessories. These include coaxial switches, towers, lights, air dielectric coax, and instruments.

Andrew Corp.

At booth 61W, Andrew Corp. will show for the first time their 1⅝" foam Heliax coaxial transmission line for AM and FM broadcasting installations. On hand will be the company's new 5" Heliax flexible dielectric cable for television.

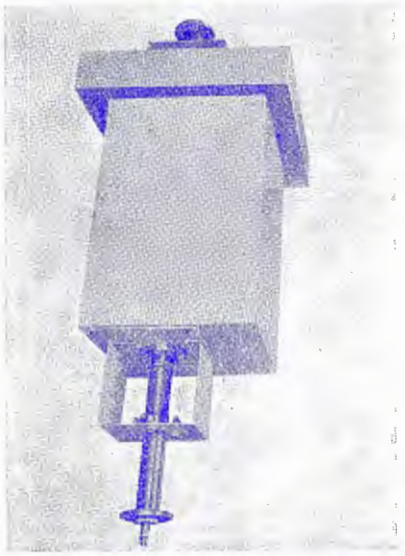


Fig. 2. "Isocoupler" antenna coupling device for using FM radiator on AM tower.

Also to be on display will be a new RF switching matrix for television transmitting installations (Fig. 1). Fully controlled from a panel at the switching cabinet and partially controlled from a panel on the console, the matrix will provide several combinations of interconnection between drivers (visual and aural), finals, filters (SSB and harmonic), diplexers, and transmission lines. It will also select and combine antennas or feed a dummy load. Included with each control cabinet will be a completely lighted routing diagram showing the RF paths through the switching matrix. The total VSWR of the system is from 1.02/1 to 1.06/1 depending upon the connections.

In addition to the above equipment, other antenna devices will be on display. These include coaxial switches for 1⅝" and 3⅛" coax lines, as well as automatic dehydrators and STL parabolic antennas. Antenna propagation computers and transmission line selectors will be available at the booth.

Dresser Ideco Co.

A full complement of staff will be on hand at the Dresser Ideco booth to discuss the full line of television and microwave towers and equipment on display. Information will be available which details the world's largest self-supporting television tower, recently installed by the company.

ITA Electronics Corp.

A new coupling device will represent antenna equipment at the ITA booth. The ISO-7.5 "Isocoupler" (Fig. 2) permits the direct installation of FM antenna and transmission line to existing AM towers with no phasing or LTU changes. The coupler is supplied in a weatherproof enclosure, and will handle up to 7.5 kw of power from 88 to 108 mc.

Jampro Antenna Co.

Booth 48W will be the headquarters of the Jampro Antenna Company's display. A new line of coaxial switches in the 3⅛" and 1⅝" sizes are to be shown. Previously introduced Dual Polarized and single bay batwing antennas will be featured in the exhibit. In addition to discussing the antenna equipment, Jampro representatives will have available complete catalogs on all of the company's products.

Rohn Systems, Inc.

Featured at Rohn Systems' booth 57W will be a new line of tower lights and microwave reflectors. Literature describing AM and FM broadcasting towers will be available along with material on microwave towers and associated hardware. You'll find many of the company's products on display, and working models of the tower lights demonstrated.

Vitro Electronics

A precision antenna instrument, and and operational device is the new Nems-

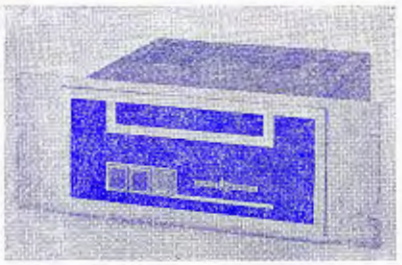


Fig. 3. Compact single cartridge player.

Clarke PPM-101 Precision Phase Monitor. Along with other RF instruments, this device will be shown at Vitro's booth, 25W.

The phase monitor is designed for use with critical directional arrays to meter and display antenna parameters. Phase angle readings are presented on the in-line readout panel of a digital counter directly in degrees, with a resolution of 0.1°. The current ratios between towers are read on the current ratio meter as a deviation from normal value, with a resolution of 0.1%; repeatable accuracy is ± 0.1°. The equipment employs nuvisitorized and transistorized circuitry enclosed in completely shielded plug-in modules.

Audio and Radio Equipment

With stereo FM on the upswing, you can expect to see a great many displays of transmission equipment, cartridge tape devices, stereo consoles, microphones, phono gears, and monitors. Notice the considerable acceptance of transistorization among audio manufacturers. FM broadcasters will see many exhibits showing exciters, generators, modulators, and monitoring instruments for stereo stations. And the influence of magnetic tape cartridges will be quite evident from the large number of companies displaying cartridge equipment.

Automatic Tape Control, Inc.

One company active in cartridge equipment manufacture is Automatic Tape Control, Inc. A newly introduced item to be on display at ATC's booth is the PD-150/190 & AD-150/190 single cartridge player (Fig. 3) and record amplifier combination. The playback and amplifier units are of solid-state design throughout, featuring plug-in modules; and both playback and record amplifiers meet proposed NAB standards. Of prime

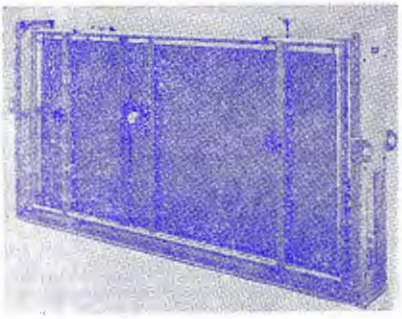


Fig. 4. Series 140 reverberation unit.

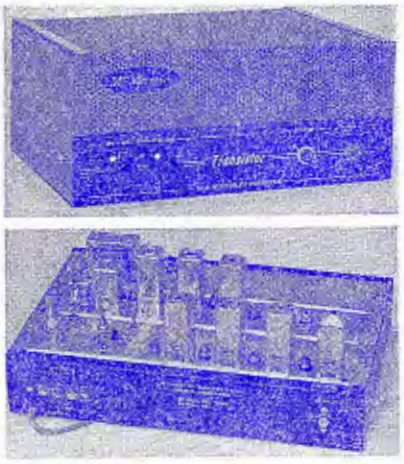


Fig. 5. TR66 SCA multiplex FM tuner unit.

importance is the direct capstan drive which helps eliminate speed problems and provides high timing accuracy.

Also on display at ATC booth 24W will be many of the company's previously introduced products, including automation equipment, a multiple cartridge handler, and a systems programmer. Of special interest are the FCC approved program logging devices, and a special demonstration of ATC's System Programmer.

Fairchild Recording Equipment Corp.

Although complete information is not available at this time, we do know of one item which will be introduced at the Fairchild Recording Equipment exhibit.

A new two channel audio console, designated "Integra Model A," is to be unveiled. Providing ten complete mixing input positions, this board features built-in equalization and compression circuits.

Other featured products, though previously introduced, are the "Dynalizer," "Conax," and a series of limiters. Fairchild equipment will also be on display—and demonstrated—at the booth manned by Rust Corp. of America.

ITA Electronics Corp.

FM equipment will highlight the ITA booth at this year's show. Two FM transmission devices are to be demonstrated.

The FM-10D Exciter and SG-1D Stereo Generator are the newest in the company's line for stereo. Used together, the equipment provides a stereo signal, stable and flat in response. Distortion is less than 0.1% from 50 cps to 15 kc, while separation is maintained at 35 db.

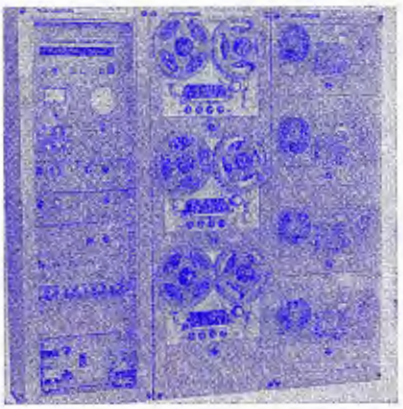


Fig. 6. Complete stereo automation system.

Gotham Audio Corp.

In the special audio effects category, Gotham Audio Corp. will have the EMT 140 series reverberation unit in demonstration. Available for both single channel and stereo, the device employs electro-mechanical-acoustic principles to develop controlled resonances and delays. The active mechanical element is a specially designed steel plate excited by a moving coil system. Reverberation time can be adjusted manually at the unit or remotely controlled from the console and/or from several other locations, while it is monitored on a panel meter calibrated in seconds. With a range between 1 and 4 seconds, the system has a s/n ratio greater than 60 db on manual control and greater than 40 db with remote control. A demonstration disc recording of the device will be available.

The full line of Neumann condenser microphones will also be featured at the exhibit; visitors will witness a demonstration of the Model SM-2 stereo microphone.

McMartin Industries, Inc.

Booth 51, with McMartin Industries in attendance, will be filled with FM and audio equipment. Featured items will include a new transistorized SCA multiplex receiver and a tuner, Models TR-88 and TR-66 (Fig. 5) respectively. Featuring stereo filtering, crystal control, automatic muting, and modular design, the tuners boast sensitivity of 1μv for 30 db quieting on the main channel and 3μv for 25 db quieting on the subchannel. The frequency response is 30 cps to 8 kc, while distortion is 1.5% @ 100% modulation; crosstalk is —55 db.

Also to be shown for the first time at the show is the company's "Selective Programmer" which enables the simultaneous operation of background music and any number of specialized announcements on a single SCA subchannel. Another new device is the TBM-1500 FM Stereo/SCA Multiplex rebroadcast receiver designed to permit direct retransmission of stereo FM and/or SCA multiplex without demodulation.

Schafer Electronics

The byword at the Schafer Electronics exhibit (booth 56W) will be automation. Featured items include the Model SA-100 Automatic Spot Locator and the 800 Stereo Program Automation System (Fig. 6).

To be demonstrated for the first time at the show, the SA-100 is a random selection device for operating a professional tape machine. By means of a pair of switches on a remote control box 100 commercials or other announcements may be selected and cued automatically, ready for airing. The equipment is also for use with an automation system, wherein a memory allows preselection for hours of advance automatic operation.

A complete automation system for monaural or stereo, the Model 800 provides automatic preset operation of

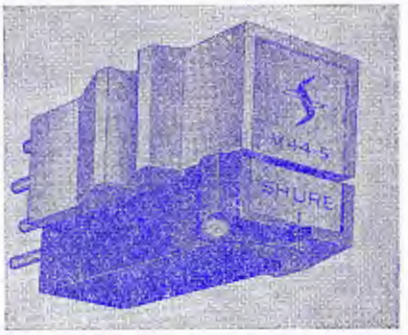


Fig. 7. M44-5 Dynetic phono cartridge.

music, announcements, and commercials in the desired sequences. An operating installation will be demonstrated as will a Model 300 and 400-RA remote control system for AM and/or FM transmitters.

Shure Brothers, Inc.

Highlighting the Shure exhibit will be a new line of specialized broadcast microphones. Included are the 570 lavalier and 576 omnidirectional probe. The display will include several new phono cartridges such as the Models V-15, M44, and M44-15° Dynetic phonograph cartridge (Fig. 7).

The 576 dynamic is a slender, light weight instrument with smooth response from 40 cps to 20 kc and connections for both 50 and 150 ohm inputs; the power level into either impedance is —60.0 db. A companion model is the 570 dynamic lavalier, designed for applications where a very small wearable microphone is required. Frequency response is 50 cps to 12 kc, tailored for lavalier use.

Previously introduced, but recent additions to the Shure line will also be on display. These include the 545 Unidyne III dynamic microphone, the SME series 2 tone arm, and several items designed for use with transcriptions.

Sparta Electronics Corp.

Booth 53W is designed as the focal point for Sparta Electronics Corp.'s participation in the show. The company will unveil and demonstrate at least five new products.

A new 400 Series tape cartridge system will be one of the highlights of the exhibit. Of table-top design, the equipment is available in both record/playback and playback-only units. All are transistorized and may be converted quickly

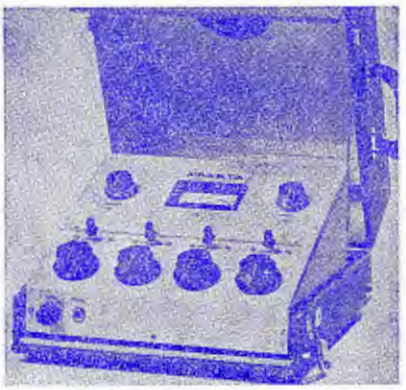


Fig. 8. A-10 portable stereo console.

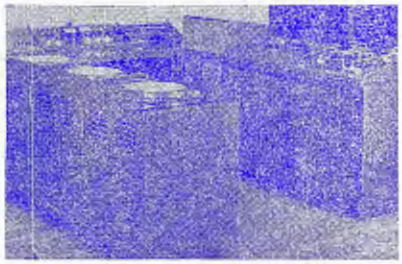


Fig. 9. SS4000T master control package.

into playback or record/playback by exchanging the front panel assembly.

Another new device in the tape cartridge line is the BP-11 battery operated portable tape cartridge playback. Completely self-contained, this unit is fully transistorized and has a built-in charger which may be operated while the unit is used on AC. A third cartridge item is the CP-6 portable program delayer. Expressly designed for applications which require a 5 second or longer delay in a program — such as live interviews — the device allows the operator to censor objectionable content. To round out the "Sparta-Matic" cartridge tape line, the Model 300 Double-Deck "Timecaster" will be introduced. This unit allows a time jingle to be played while another is cued up in a standby condition.

A fifth new product, not in the cartridge line, is the A-10 stereo console (Fig. 8) designed along the same physical line, as the present A-10 monaural console. This equipment is completely transistorized having plug-in modules comprising four stereo inputs: one microphone, two turntables, and one auxiliary. In addition the line amplifiers are of plug-in design as are the microphone preamps; line balancing input transformers are included for all channels, and there is a provision for battery operation.

Visual Electronics Corp.

In the field of radio and audio, Visual will have both components and complete systems on display in booth 15E. New products in two lines of cartridge tape equipment and a complete packaged control room will be introduced.

The McMurdy Radio Industries, Ltd., SS4000T Solid State Packaged Master Control (Fig. 9) provides all control room and studio facilities required for the operation of an FM or AM station, in one integrated complex. Complete with a dual-channel console, three turntables, five power amplifiers, power supply, two-way talkback facilities, announce-booth control turrets, and all the associated equipment necessary for operation, the system can be expanded for any specific application.

In the cartridge tape field is the Spotmaster 500A-DL Delayed Programmer

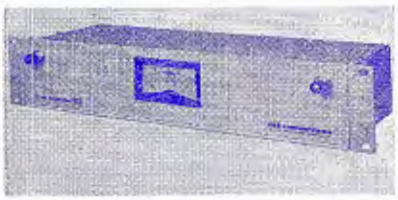


Fig. 10. Automatic audio peak controller.

for recording and playback. This unit is intended to continuously delay program material for periods of six seconds to sixteen minutes. A facility for monitoring and deleting program material during actual air time is thus provided.

Another cartridge tape item—this one using an endless-loop **reversible** cartridge — is the KRS Stact Broadcaster, a multi-deck machine with one reversible recording/playback deck and five playback only decks.

CBS Laboratories

A new transistorized audio level device will be shown at the CBS Labs booth, among the many devices on display.

The Automatic Peak Controller 100 (Fig. 10) is the first fully transistorized equipment to do the job of peak limiting amplifiers.

Television Camera, Studio, and Recording Equipment

A wide variety of television equipment will be on display. Note the prevalence of solid-state cameras for remote applications, and the many associated devices for studio and control room use. Several items for video recording are also to be shown.

Boston Insulated Wire & Cable Co.

Television camera cable will again be the main attraction at the Boston Insulated Wire & Cable Company's booth 65W. New this year is an 82-conductor color camera cable (Fig. 11).

The new cable is designed to fit existing connectors and offers improved flexibility and performance characteristics. The eight coaxial lines included are insulated with polytetrafluoroethylene to eliminate cold flow and soldering heat problems. The coax lines have a nominal impedance of 50 ohms and a capacitance of 30 pf/ft. Included also in the cable are: 3 No. 16 AWG lines, 4 No. 14 AWG lines, and 67 No. 22 AWG lines, all within an overall shield. The outside cable diameter is a small 1.260" approx.

Other camera cables to be shown are the 25 conductor Commercial and Industrial TV Camera Cable with tetrafluoroethylene-insulated coax lines, and the 33 conductor Domestic TV Camera Cable mating with British cameras. In addition to descriptive material on cables, a new connector catalog for BIW TV-37C connectors mating with Marconi cameras will be available.

GPL Division, General Precision, Inc.

New at booth 12E, where GPL will exhibit is to be the Precision 800 vidicon film chain. This device, which boasts 800 line resolution (600 line in corners), automatic exposure control, nuvistor video preamp, and many other features, is an economical system which can deliver high quality reproduction.

Intended for applications in television broadcast and closed circuit systems, the Model PA-580 includes a Precision 800 camera and ccu, a field lens, a three-input mirror multiplexer, plus a cabinet base and support hardware (Fig. 12). Video bandwidth of the unit is 12 mc and the horizontal scan frequency may be 15,750 or 20,250 for 525 and 625 line systems respectively.

Fig. 11. Color cable with 82 conductors.

Although previously introduced, the Precision 800 Viewfinder camera system will be on display. Designed for broadcast and educational applications, the equipment is specially useful in remote pickup situations. It features 6000 to 1 light compensation, built-in 8" electronic view finder, and a complete camera control unit which provides control voltages, deflection signals, focusing current, intercom, and operating power for the camera through a single cable.

Gotham Audio Corp.

In addition to the audio equipment on display at booth 59W, Gotham Audio will unveil to users in the United States the EMT Vid-E-Dit. This unique device, shown in Fig. 13, is an electronic video tape editor and splicer for 2" quadriplex (transverse) recorded tapes. The completely self contained unit consists of a cathode ray tube display of control track with frame pulses and audio cue track information, plus a precision splicing bed with all necessary splicing equipment and accessories.

This singular device has two rotating heads, electronics for processing pulses, and an internally generated tach pulse to compensate for edit pulse drift. The splicing equipment includes a precision guillotine knife and bed, tape holddown and advance mechanism, twin vacuum pumps for securing tape ends, edge trimming knives, bottom tape light, splicing tape dispenser, and a splice smoothing roller.

Kliegel Bros. Universal Electric Stage Lighting Co., Inc.

"Shedding light on the subject" will be Kliegl Bros. in booth 1E, where a wide variety of studio and stage lighting equipment will be on display and demonstrated. Kliegl equipment will also be used to illuminate the live camera areas in the G.E., Ampex, EMI, and Sarkes Tarzian display areas. The lighting equip-

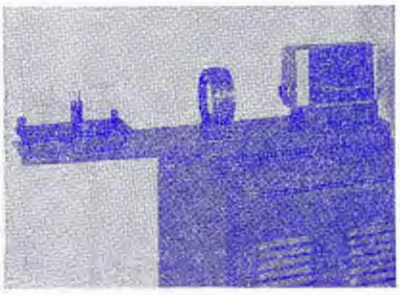


Fig. 12. Vidicon film chain Model PA-580.

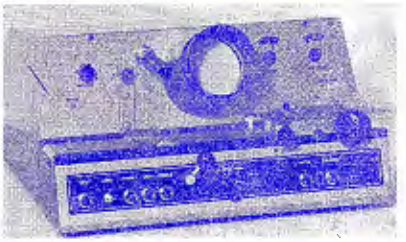


Fig. 13. Electronic video tape editor.

ment will thus be demonstrated in typical examples of good studio lighting practice.

New for this year from Kliegl are two items, a quartz-iodine lamp and preset lighting control system. The former is the 1000 watt "Q-Lite." Mounted in a miniaturized fixture, it can out perform a 1500 watt scoop yet be barn-doored with as sharp a cutoff as a fresnal. Being focusable, it can be used in certain spot applications.

A system for grouping and setting the intensity of studio lights tailored for the requirements of television production is the company's "Klieg-Peg Pre-Set System." The system, shown in Fig. 14, provides extreme flexibility in preset operation.

Machtronics, Inc.

Portable television tape recorders are to be featured at booth 71W, where the Machtronics exhibit will hold forth.

The fully transistorized MVR-15 machine (Fig. 15) will be on display and demonstrated. Using 1" tape, the unit is completely self contained with all electronics circuitry on printed plug-in cards which are easily accessible from the front of the machine through a drop-down panel. Standard equipment includes built-in circuitry for remote operation, two separate and equal audio tracks, audio only capability, dubbing circuit, tape timer calibrated in minutes and tenths of a minute, and an elapsed time meter.

The MVR-15 weighs approximately 78 lbs. in its portable carrying case. It

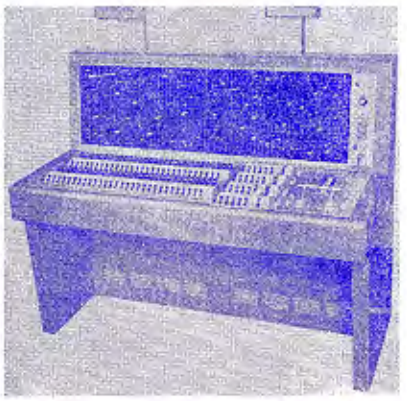


Fig. 14. Preset studio light controller.

measures 24 7/16" by 10⅜" by 13 7/32". Operating specs include the following: tape speed 7.5 ips; freq. response ± 3 db 10 cps to 3.5 mc; s/n 40 db or better; differential gain less than 10%.

3M Company

The 3M company will display its "Scotch" brand sound recording tapes and video tapes at booth 21W during the show. Professional sound tapes to be included are triple-length, standard lengths, extra length and extra strength, and low print tapes for mastering and duplication.

Samples of "Scotch" brand television recording tape used for commercial broadcast, industrial TV, closed circuit TV, and special video instrumentation applications, will be on display.

Sarkes Tarzian, Inc.

The newest addition to Sarkes Tarzian's line of solid-state cameras, the transistorized image orthicon camera, will highlight the company's display at the show.

This I.O. camera (Fig. 16), designed for both studio and remote applications, features absolute black pedestal stability which can actually free one man from the camera crew. The universally adaptable lens turret is designed to take a full complement of lenses including the heaviest zoom or telephoto, 35mm remote iris, standard 35mm, or 16mm. Built in is an 8" switchable viewfinder on which the operator can mix his camera output with external signals to achieve a perfect matched dissolve.

Other cameras to be on display include solid-state studio units and a solid-state film camera chain adaptable to any type of vidicon tube. Sarkes Tarzian will also exhibit other solid-state equipment for the broadcaster at the NAB booth. To be shown are a modular switcher, vertical interval switcher, automation switching equipment, sync generator, and STL microwave relay.

Telescript, Inc.

In the field of camera equipment, Telescript will be showing the Shibaden 5820 image orthicon. Developed by the laboratories of NHK, Japan Broadcasting, the tube offers high quality with considerable economy.

Stable under light conditions from bright sunlight to dark shade, the I.O. features low noise and high resolution. An interesting point is the 50 hour guarantee and the 500 hour prorated warranty. Typical specifications of the tube are: heater 6.3v @ 0.6 amps; inter-electrode cap. 12 pf; magnetic deflection and focusing; length 15 3/16" ± ¼"; deflecting coil min. inside diameter 2 ⅜"; photocathode volts −550 max; illum. 50 ft candles max.; target volts 10 max.

Television Zoomar Company

Another booth where lenses are the main attraction is the one manned by Television Zoomar, 8E.

Highlighting the exhibit will be the Angenieux - Evershed Mark II zoom lens. This enclosed unit has complete facilities for accurate local and remote control. It is shown in Fig. 17 mounted on a BBC camera.

Also a planned feature at the Zoomar booth is the Angenieux Zoomar 10-2-1 B zoom lens system. This f/3.8 lens zooms from 36mm to 350 mm (1⅜" to 14") providing a ratio of 10 to 1. Three convertors are available to adapt the system for ranges up to 57". The transmission rating is approximately 80%, T/4.5,

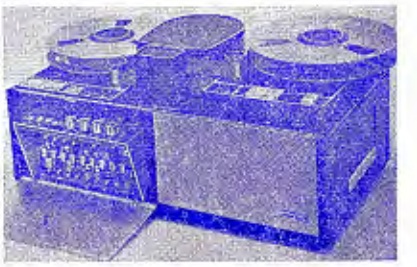


Fig. 15. MVR-15 portable TV recorder.

with complete color correction and resolving power. To remote control the zoom and focus of the lens on an unattended camera an electronic drive is attached to the unit (in less than one minute). The camera operator can override the remote control with the zoom rod.

Visual Electronics Corp.

In the television field, Visual Electronics plans to show their Mark 10 image orthicon zoom camera (Fig. 18). This completely self-contained unit features a 10 to 1 zoom ratio.

A single lever controls the lens—push to zoom, turn to focus. The light weight of 58 lbs. complete is obtained through full transistorization and compact design. Resolution, gray-scale rendition, and s/n are all applied to the full limit of the 3" image orthicon. The camera operator uses a simplified remote control panel which consists of: iris control, pedestal, gain, electronic lens cap control, and intercom level.

Television Signal Devices

As in the other categories, that of TV signal transmission will be highlighted by a great number of hybrid and transistorized devices for modernizing and improving control rooms.

CBS Laboratories

Three solid-state video distribution amplifiers will be on display at the CBS Laboratories booth. These consist of sync-add, clamp, and sync-separate units.

The new four-output video distribution amplifier (Fig. 19) has a unique sync-add feature. It provides high resolution distribution of color and black and white video signals.

A unit that provides synchronous clamp action and is particularly suited for color broadcast applications, is the

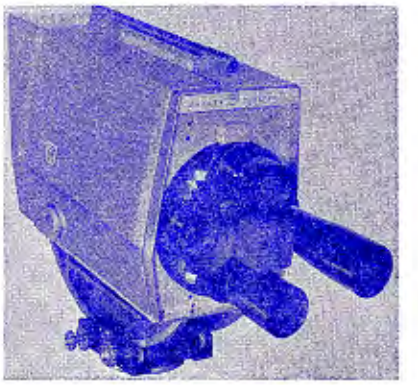


Fig. 16. Solid-state I.O. studio camera.

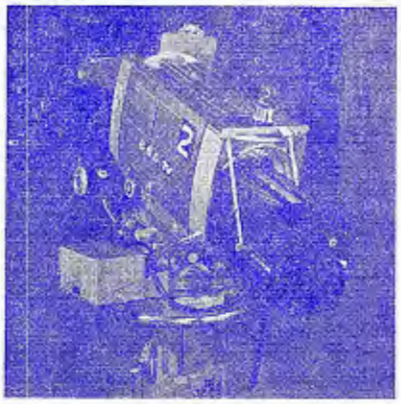


Fig. 17. Angenieux-Evershed zoom lens.

clamp-distribution amplifier. This device has four outputs and a self-clamp feature.

The third new amplifier is the four output sync-separator distribution unit which is intended for applications where removal of sync is required. Since this amplifier will remove the sync without effecting the color burst, it is specially suited for color use.

Chrono-Log Corp.

The latest model of the STEP system for TV automation will be shown at booth 50W by Chrono-Log Corp.

The STEP system, Sequential Television Equipment Programmer, is designed to automate the panic period that occurs while switching during breaks (Fig. 20). The sequences are predetermined, but completely variable, by inserting pins in a 3" by 15" pinboard. The pins are inserted into the board through a template which may be retained for record purposes or reused if the same sequence is to run again. As the system runs through a sequence, the entire action is monitored on a display screen where readouts show in words what the next step will be, and in numbers how much time remains indicating minutes and seconds.

The system automatically sends "start," "show," and "stop" pulses to six film projectors and two video tape units. It also sends "show" and "advance slide" pulses to three slide projectors; "audio on" pulses to a microphone, turntable, tape unit, or the audio channel corresponding to the chosen video source.

Conrac Div., Giannini Controls Corp.

At their booth 7E exhibit, Conrac intends to introduce a new "performance-stabilized" video monitor. The device is designed to display subtle picture shifts which are often difficult to see.

The CZB series monitors (Fig. 21) utilizes 29 transistors, 11 tubes, and numerous rectifiers to combine several features in an 8" unit; the device is also available in 14" and 17" sizes for rack mounting and field use. Full regulation, keyed clamps, controlled feedback loops, and a variety of new circuit configurations are included. A front panel switch allows the operator to shift the picture one line at a time while increasing the horizontal time constant to spot tape recorder hunting. In another position, the switch displays a pulse cross pattern as the brightness is automatically increased for better observation of the sync pulses.

Other of the company's monitors and equipment to be on display include: the AV12E television receiver, CFD17 regulated monitor, CKD14 cabinet monitor, CLD14 rack mount monitor, CMC high resolution monitor, CNB8 compact broadcast mointor, CPA series picture and pulse cross monitor, CTA8 monitor with scope housing, CVA23 industrial 23" display monitor, CWA10 kinescope recording monitor, CYA17 color monitor, and the WVA series industrial regulated monitor.

International Nuclear Corp.

International Nuclear will be exhibiting their Model VS22-10 video crossbar switcher booth 31W. Completely transistorized, with plug-in amplifiers and dual power supplies, this device handles full switching functions in a television station. The VS22-10 provides instant accessibility to any ten of 22 program sources.

All amplifiers and power supplies are solid-state. Metal contact reed relays are used in the switching circuits, eliminating necessity for compensation to correct for high contact capacitance. Specs of the switcher are: adjacent channel crosstalk —60 db to 1 mc, —50 db @ 3.58 mc; freq. response ± 0.5 db to 8 mc; noise —60 db; differential gain less than 1% @ lv out; differential phase less than 1° @ lv out.

Miratel Electronics, Inc.

Transistorized monitors are the planned featured items at booth 33W where Miratel Electronics is to hold forth. A full line in various sizes and configurations will be on display. New items to be introduced are pulse-cross transistorized monitors, and a compact scope-monitor combination (Fig. 22) with space provided for a choice of waveform monitors.

Miratel monitors feature fully regulated high and low voltage power supplies, externally switchable underscan, modular construction, provisions for external and internal sync, and tally light relay circuit.

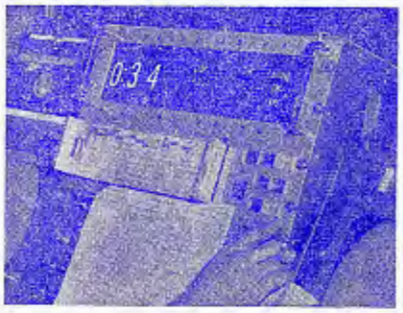


Fig. 20. STEP television break switcher.

Telemet Co.

Equipment for television signal processing will be the featured at the Telemet booth, 2E. To be introduced are several transistorized units: 3507C1 EIA generator, 3153A1 "Sync Lock," 3601A1 V1 keyer, 3514A1 color standard. Also to be shown is a new Color Flying Spot Scanner, the Model 600AR.

Typical of the new transistorized units is the Model 3507-A1 EIA sync generator, pictured in Fig. 23. This equipment provides horizontal and vertical drive, composite sync, and blanking signals all in accordance with EIA Standard RS-170. The unit has been designed for both program and test purposes, and may be supplied to meet CCIR or other television standards.

The Model 600-AR color flying spot scanner is designed to produce high definition color signals from 35mm transparencies. Intended for television broadcast applications, the equipment operates in accordance with EIA and NTSC standards, with resolution approaching 600 lines.

Vital Industries

The Vital Industries display in booth 43W will consist of video processing equipment. Newly introduced devices are the Model VI-1000 video stabilizing amplifier, and the Model VI-30 clamper amplifier.

To be featured at the display, but not newly introduced are the Model VI-10

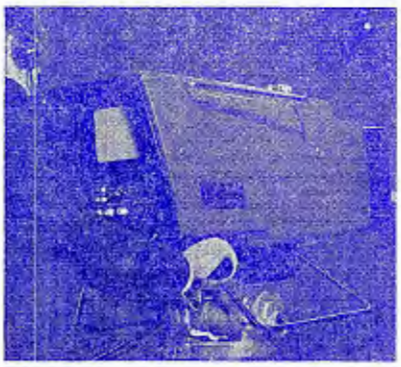


Fig. 18. Transistorized I.O. zoom camera.

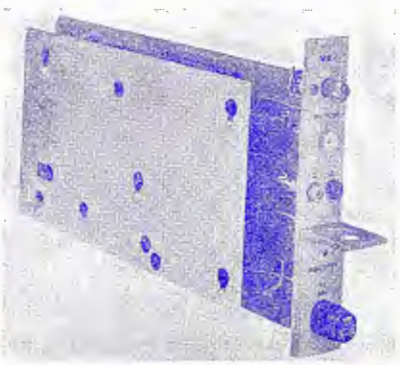


Fig. 19. Sync-add distribution amp.

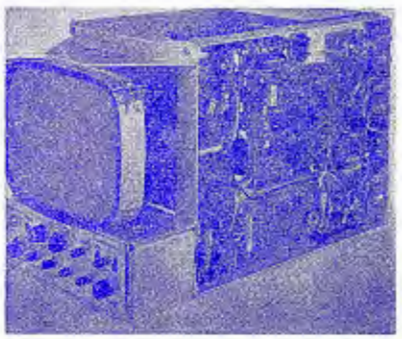


Fig. 21. Transistor/tube video monitor.

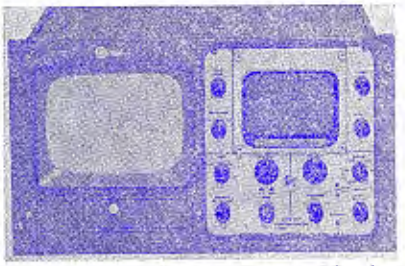


Fig. 22. Scope/video monitor combination.

video distribution amplifier, and the Model VI-20 pulse distribution amplifier.

The VI-10 is a completely transistorized system providing four isolated outputs, compact plug-in modules, individual regulated power supplies, and low differential gain and phase distortion. The four modules are mounted in a standard rack frame which occupies 1¾" of rack space (Fig. 24).

Test Instruments and Devices

A variety of test equipment, from voltmeters to complex phase monitors, will be on display.

Marconi Instruments, Div. English Electric Corp.

A full display of precision test instruments for radio and television applications is planned for the Marconi booth. Both new and previously introduced equipment will be on display. A paper, "Determination of Intermodulation and Noise in Multichannel Systems using Noise Loading Techniques" will be available.

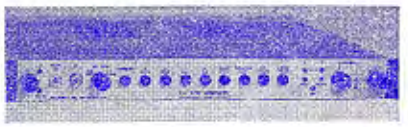


Fig. 23. Transistorized sync generator.

A typical instrument in the Marconi exhibit is the Model 2331 distortion analyzer, shown in Fig. 25. This unit covers fundamentals from 20 cps to 20 kc, is fully transistorized, and has two switchable bandwidths of 20 or 100 kc. Distortion measurements down to 0.05% from 200 cps to 6 kc and 0.07% throughout the remainder of the band are provided.

Telemet Co.

Telemet Co. will round out their exhibit of video equipment with a group of video test instruments. These include a dot grating generator Model 3512-A1 (new this year), a video transmission test signal generator Model 3508-A1, a multiburst generator Model 3501-A1, a stair-step generator Model 3502-A1, sin² pulse and window generator Model 3503-A1.

The first of these, Model 3512-A1, is a fully transistorized device which provides video signals for accurately adjusting linearity in picture monitors, cameras, and monoscope generators; it is also for converging tricolor kinescopes.

Vitro Electronics

Test equipment to be featured at the Vitro booth includes the SDM-520 Spectrum Display Monitor. This instrument,

Fig. 24. VI-10 distribution amplifier.

designed specifically for FM and TV, permits station engineers to hear and see the characteristics of their main carriers and subcarriers. Featuring a 5" scope display with RF tuning from 54 to 260 mc, the monitor provides broadcasters with a tool for determining sideband or subcarrier attenuation, locating spurious radiation, and identifying sources of interference. The instrument also serves as an excellent modulation deviation monitor. Along with the spectrum unit will be displayed the complete Nems-Clarke line of field intensity meters, phase monitors, and rebroadcast receivers. ▲

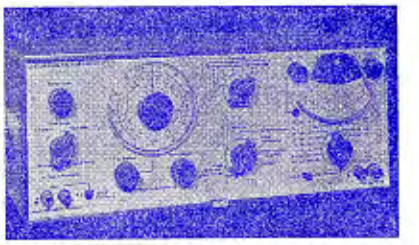


Fig. 25. Distortion factor meter TF 2331.

Agenda, 18th NAB BROADCAST ENGINEERING CONFERENCE

Conrad Hilton Hotel, Chicago, Ill., April 5-8, 1964

Monday Morning, April 6

10.30 AM Joint session with management for conference opening.

12:30 PM Engineering Conference Luncheon — James D. Parker, Dir. TV RF Engrng, CBS, presiding; F. C. McLean, Dir. of Engrng, BBC, speaker.

Monday Afternoon

Orrin W. Towner, Dir. of Engrng, WHAS, Inc., presiding.

Wilson Raney, Chief Engr, Cowles Bcsting Service, Inc., coordinator.

2:30-2:40 PM Opening of Engineering Conference — Governor LeRoy Collins, Pres., NAB.

2:45-3:25 PM CBS New York Bcst Center — Richard S. O'Brien, Dir. of Engrng; K. Blair Benson, Dir. of A-V Engrng; Joseph A. Flaherty, Dir. of Tech. Facilities Planning; (all CBS TV Net).

3:30-3:55 PM Some Recent Improvements in Vidicon Tubes and Associated Circuitry — I. T. Saldi, Senior Vidicon Engr, Pickup Tube Operation, G. E. Tube Dept.

4:00-4:25 PM An Improved Method of TV Signal Sync — J. Lewis Hathaway, NBC Development Engrng Dept.

4:30-5:00 PM Sound Pickup and Reverberation — Stephen F. Temmer, Pres., Gotham Audio Corp.

Tuesday Morning, April 7 — RADIO

Russel Pope, Chief Engr, Golden Empire Bcsting Co., presiding.

William S. Dutters, Dir., NBC Allocations Engrng, coordinator.

9:00-9:25 AM High Island—NBC/CBS — Lester A. Looney, NBC Engrng, and Ogden L. Prestholdt, Dir. of Engrng, CBS Radio.

9:30-9:55 AM How to Make a Satisfactory FM Stereo Proof-of-Performance — Collins Radio Co.

10:00-10:25 AM — Radio Automation — Don W. Clarke, Mktng Mngr, Continental Electronics, Palo Alto, Calif.

10:30-10:55 AM Exciting Several AM and FM Stations on a Single Series-Fed Tower — Ronald T. Miyahira, Chief Engr, KGMB, Honolulu.

11:00-11:25 AM Vertically Polarized FM Antennas and Power Dividers — E. S. Gagnon, Gates Radio Co.

11:30-12:00 N Automatic Emergency Switching for Radio Transmitters — Frederich L. Zellner, Jr., ABC.

Tuesday Morning, April 7 — TELEVISION

Frank Marx, Pres., ABC Engrs, presiding.

Malcolm M. Burleson, Vice Pres. for Engrng, Post-Newsweek Stations, coordinator.

9:00-9:25 AM A New TV Programmer — Mario W. Conti, Indiana General Co.

9:30-9:55 AM CBS-TV Lighting Film — J. Flaherty, Dir. of Tech. Facilities Planning, CBS TV.

10:00-10:25 AM A Device for Deriving Sync, driving pulses, and Mixed Blanking From any Composite Source; A Solid State Pulse Delay Unit — Herb Schubarth, Asst. Chief Engr for TV, Mullins Bcst. Co.

10:30-10:55 AM An Electro-Photographic Film Recorder — Albert W. Malang, Chief Video Facilities Engr, ABC Engrs.

11:00-11:25 AM Plumbicon Color Tube — Dr. E. F. DeHaan, North American Phillips.

11:30-12:00 N A Report of Color TV Camera Development — Dr. H. N. Kozanowski, Mngr, TV Product Advanced Development, RCA.

12:30 PM Engineering Conference Luncheon — Leslie S. Learned, Dir. of Engrng, Mutual Bcsting System, presiding; Frank K. McCune, Vice Pres. of Engrng Services, G. E., speaker.

Tuesday Afternoon, April 7 — NO SESSIONS

Wednesday Morning, April 8

William S. Duttera, Dir., Allocations Engrng, NBC., presiding.

James H. Butts, Dir. of Engrng, Mullins Bcsting Co, coordinator.

9:00-9:25 AM A Higher Level of Performance in Video Tape Recording — Charles P. Ginsburg, Ampex Corp.

9:30-10:30 AM FCC Presentation — panel.

10:30-10:55 AM Cartridge Tape Design to Meet NAB Recording and Reproducing Standards — C. B. Meyer, Engr, Projector and Audio Recorder Engrng, RCA.

11:00-11:25 AM Vertical Integral Test Signals — Sheldon Jenkins, AT&T.

11:30-12:00 N A New Field Television Camera—James L. Wilson, Dir. of Engrng, NBC.

12:30 PM Engineering Conference Luncheon — Clyde M. Hunt, Chairman, Bcst Engrng Conference Committee, presiding; Dr. G. C. McVittie, Dir. University of Ill. Observatory, Speaker.
Presentation of Engrng Achievement Award — George W. Bartlett, Dir. of Engrng, NAB.
Acceptance of Award—John H. DeWitt, Jr., Pres., WSM, Inc.

2:30 PM Joint Session with Management.

If you'd like fan mail like this...

"I'd like to report that your FM transmission is far superior to previous broadcast. In fact, WGMS-FM is the strongest station on my auto FM radio." Mr. DW, Rockville, Md.

"I have long advocated the use of circular polarization... The improvement is more striking than I had expected. Auto-FM reception at a distance... has a substantial advantage." Mr. RJC, Bethesda, Md.

"Terrific! Reception: very good. *Improved.*" DCF, Timonium, Md.

"I find it excellent and much improved, and reception ever so much better than it used to be before you installed your new antennas." Mrs. WE, Fairfax, Va.

"We were not able to get your station before. We receive your music, etc. perfectly clear." Mr. ALC, Spotsylvania, Va.

"WGMS-FM in Washington, D. C. comes in clearly even in very poor locations. A check with a portable FM receiver indicates that you have a strong vertical component in your signal and this is apparently the answer. You can't imagine the difference between your signal and virtually all others — regardless of distance or strength, in the car... much better reception... I can only guess that you are intentionally radiating both a horizontal signal — like the one all along — *and* a vertically polarized component as well. Believe me, I couldn't have asked for more." Mr. EDH, Frostburg, Md.

...Add Collins' vertically polarized antenna

The above is only a small part of the mail received by WGMS-FM in Washington, D. C. after they updated with Collins Type 300 vertically polarized antenna.

You too can take advantage of this "circular polarization" technique. Here is what the Type 300 can do for you:

Fills in shadow areas • Reduces null effects • Improves fringe area reception • Vastly improves car radio reception • Provides redundancy when used with two power amplifiers • Maintains FM stereo quality • Improves SCA operation.

The Type 300, which costs no more than your present horizontal bays, is easily installed on your existing tower and is compatible with your transmitter. Delivery within 45 days of receipt of order. Contact your Collins Sales Engineer today.

COLLINS RADIO COMPANY • Dallas • Cedar Rapids • Los Angeles • New York • International, Dallas

Actual installation, WGMS-FM

COLLINS

Circle Item 21 on Tech Data Card

Third Class Endorsement

(Continued from page 32)

an effort to train his voice for most effective radiocommunication. His voice should be loud enough to be distinctly heard by the receiving operator and it should not be too loud since it may become distorted and difficult to understand at the receiving station. He should articulate his words and avoid speaking in a monotone as much as possible. The working distance range of the transmitter is affected to some extent by the loudness of the speaker's voice; if the voice is too low, the maximum distance range of the transmitter cannot be attained and if the voice is too loud the distance range may be reduced to zero due to the signals becoming distorted beyond intelligibility. In noisy locations the operator sometimes cups his hands over the microphone to exclude extraneous noise. Normally, the microphone is held from 2 to 6 inches from the operator's lips.

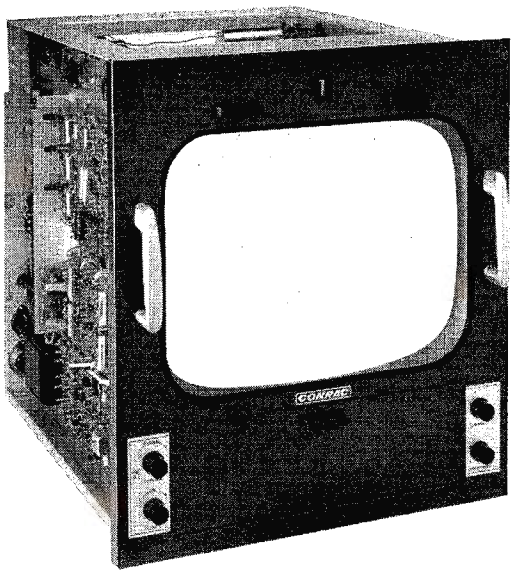
It is important in radiotelephone communications that operators use familiar and well known words and phrases in order to insure accuracy and save time from undue repetition of words. Some radio operating companies, services, networks, associations, etc., select and adopt standard procedure words and phrases for expediting and clarifying radiotelephone conversations. For example in some services, "Roger" means "I have received all of your last transmission"; "Wilco" means "Your last message received, understood, and will be complied with"; "Out" or "Clear" means "This conversation is ended and no response is expected"; "Over" means "My transmission is ended, and I expect a response from you"; "Speak slower" means "Speak slowly"; and "Say again" means "Repeat".

Often in radiotelephone communications a "phonetic alphabet" or word list is useful in identifying letters or words that may sound like other letters or words of different meaning. For example "group" may sound like "scoop", or "Bridge" may sound like "ridge". A phonetic alphabet, or word list, consists of 26 words each word beginning with a different letter for identifying that particular letter. If the letters in "Group" are represented in a phonetic alphabet by George, Roger, Oboe, Uncle and Peter, the word "Group" is transmitted as "Group, G as in George, R as in Roger, O as in Oboe, U as in Uncle, P as in Peter".

In making a call by radio, the call sign or name of the called station is generally given 3 times followed by the call letters of the calling station given 3 times.

In testing a radiotelephone transmitter the operator should clearly indicate that he is testing, and the station call sign or name of the station, as required by the rules, should be clearly given. Tests should be as brief as possible.

If a radio station is used only for occasional calls, it is a good practice to test the station regularly. Regular tests may reveal defects or faults which, if corrected immediately may prevent delays when communications are necessary.



WHAT COSTS $2450, FITS A 19" RELAY RACK, AND PUTS RED, PINK, BLUE, VERMILLION, MAUVE, CYAN, BEIGE, YELLOW, SEPIA, AQUA, ORANGE, LAVENDER, MAGENTA AND GREEN WHERE BLACK AND WHITE USED TO BE?

CONRAC'S 17" COLOR MONITOR

The Conrac CYA17 puts color where your black and white monitors used to be; right in 21 vertical inches of a standard 19" rack or console.

The CYA17 weighs less than 100 pounds (101 transistors and 21 tubes).

Are there more features? We've just scratched the surface. See it at the NAB Show. Or request a CYA17 data bulletin.

CONRAC DIVISION Glendora, Calif.
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Circle Item 23 on Tech Data Card

Technical repairs or adjustments to radio telephone communication stations are made only by or under the immediate supervision and responsibility of operators holding first or second-class licenses.

When a licensed operator in charge of a radiotelephone station permits another person to use the microphone and talk over the facilities of the station he should remember that he continues to bear responsibility for the proper operation of the station.

If an operator wishes to determine the specifications for obstruction marking and lighting of antenna towers, he should look in part 17 of the Rules and Regulations of the F C C. If he wishes to determine the specifications for a particular station, he should examine the station authorization issued by the Commission.

* From FCC Special Study Guide

Element 9 Hints

Element 9 is concerned almost entirely with broadcast procedure. The operator will be expected to know certain FCC definitions and terms related to broadcasting. Most of these are already part of his vocabulary. A principal concern will be to make meter readings accurately and if necessary make interpolations and conversions between various units of frequency, current, and voltage. It is important that the operator be able to read an ammeter and a voltmeter because of their importance in monitoring transmitter operation and in determining transmitter power input and output. The operating power of each station must be maintained as near as possible to its licensed power. Operating power shall not exceed limits of 5% above and 10% below its licensed amount, except under appropriate emergency conditions.

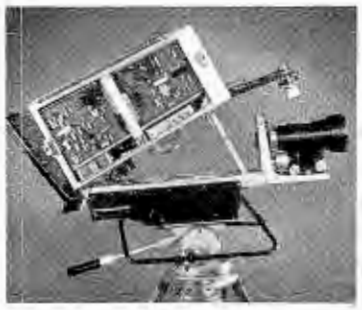
Of course, you must be able to read a frequency meter. An AM carrier must be maintained within 20 cps of its assigned frequency. An FM station transmitted frequency must be maintained within 2000 cps of the assigned center frequency.

The licensed operator must be able to read a modulation meter. The percentage of modulation must be maintained as high as possible consistent with good quality of transmission. In no case should less than 85% nor more than 100% modulation be maintained on negative peaks that recur during any selection being transmitted at the highest program level. The operator must turn off the transmitter in case faulty operation occurs in the remote-control equipment or if improper control or inaccurate meter readings result.

The applicant can expect log-keeping questions. Become familiar with both program and transmitter logging procedure. These logs must be made available to an FCC inspector upon request at any reasonable hour. Refresh your memory on the latest station identification requirements before taking the examination. If you have not already been briefed on emergency action conditions (EBS), read up on this activity as it pertains to radio broadcasting.

Conclusion

In summary, FCC radio licensing is important; the information you will learn in preparing for the examination is essential. The examination is not difficult. A small amount of outside reading, discussions among station personnel, and some extra effort in better understanding of the activities about your broadcast station will give you the desired knowledge. ▲



VISUAL ZOOM IMAGE ORTHICON camera

The first new concept in TV cameras since the industry began... Mark 10 Visual Zoom Camera. This camera combines the utmost in *production flexibility* with *superior pictures* and *low operating expense*. Here's how: ■ built-in 10-to-1 Zoom Lens; small, maneuverable, light weight; for studio or remote ■ 3" I.O. with easy lighting, crisp pictures, improved S/N; high sensitivity; requires less lighting, less air conditioning ■ long, stable operation; simple set-up; less maintenance through Solid State circuitry ■ manufactured in New York of standard U.S. components with nationwide field service.

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Circle Item 25 on Tech Data Card

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5 INCHES

ANDREW HELIAX is now available in a 5 inch size, adding to the range of applications of this low loss, *flexible* coaxial cable. Produced in continuous splice-free lengths. Type H9, 5″ HELIAX is ideally suited for high power installations to 826 kw peak power, frequencies to 950 Mc.

Available in ⅜″, ⅞″, 1⅝″, 3″ and 5″ sizes, there is a HELIAX RF cable system, including fittings, from one source to meet your requirements. Write or call your Andrew sales engineer for complete information.

5 easy steps for assembly of connector to Heliax Flexible Coaxial Cable

Step 1 Cut Heliax squarely. Assemble gasket and clamping body to outer conductor.

Step 2 Cut outer conductor with a tin snips to facilitate 90° flaring.

Step 3 Flare outer conductor back against the clamping body.

Step 4 Assemble inner connector to the center conductor.

Step 5 Assemble flare ring, O ring, anchor insulator. Thread outer body onto clamping body.

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Circle Item 26 on Tech Data Card

A Preview of the 95th SMPTE

Technical Conference

Applications are in and the booths are reserved for the 95th Technical Conference of the Society of Motion Picture and Television Engineers (SMPTE). The meeting will be held April 12-17, 1964, at the Ambassador Hotel in Los Angeles.

The great emphasis is expected to be on the latest in television equipment, as was the case at the exhibit during the SMPTE's West Coast conference in the spring of 1962. Also to be exhibited is new equipment in the fields of motion pictures, photo-instrumentation, and high-speed photography. Below is a list of the manufacturers who will exhibit, and their assigned booth numbers.

Exhibitors Booths at the 95th SMPTE Technical Conference

Ampex Corp.—TV and audio tape recording equipment. **111**

Arriflex Corp. of America—Motion picture cameras and accessories. **201-202**

Bach Auricon, Inc.—Motion picture cameras and accessories. **108**

Bell & Howell Co.—Printers, laboratory equipment, and cameras. **143-144-145**

Birns & Sawyer Cine Equipment, Inc.—Motion picture and TV studio equipment. **129**

ColorTran Industries, Inc.—Motion picture and TV studio lighting. **203**

Andre Debrie of America—Printers and film processing equipment. **234**

DuKane Corp. — Audio-visual equipment. **222**

Eclair Corp. of America—Cameras and accessories. **106-107**

Frigidheat Industries, Inc. — Thermostatic controls. **134**

Gamma Scientific, Inc.—Spot photometer. **216**

Gordon Enterprises—Photo-instrumentation and high-speed photography equipment. **119-120**

Gryphon Co.—Laboratory equipment. **101**

Hi-Speed Equipment, Inc.—Film processing machines. **127**

Hollywood Film Co.—Film editing and laboratory equipment. **140-141-142**

Houston Fearless Corp. — Film processing machines. **115**

Kollmorgen Corp.—Projection lenses. **221**

L-W Photo Products, Inc.—Analysis projector and cine pulse cameras. **208**

Macbeth Instrument Corp. — Laboratory test equipment. **210-227**

Magnetic Sales Corp.—Sound recording equipment. **114**

Metro-Kalvar, Inc.—Film stock. **204**

D. B. Milliken Co.—Photo-instrumentation and high-speed photography equipment. **102**

3M Co.—Sound recording equipment. **135**

Mole-Richardson Co.—Motion picture and TV studio lighting and special effects. **113**

Motion Picture Printing Equipment Co.—Printers and laboratory equipment. **126**

Moviola Mfg. Co.—Film editing and library equipment. **235-236**

Neumade Products, Inc.—Film editing and studio equipment. **112**

Newman & Guardia Ltd.—Film processing machines. **118**

Oxberry Corp.—Animation equipment. **105**

W. A. Palmer Films, Inc.—TV film recorder. **110**

Photo Research Corp.—Exposure meters and photo-optical equipment. **109**

Photo-Sonics, Inc.—Photo-instrumentation and high-speed photography equipment. **138-139**

Plastic Reel Corp. of America—Reels and cores. **218**

Precision Laboratories Div.—Film editing equipment. **217**

Prestoseal Mfg. Corp.—Film editing equipment. **121-122**

Producers Service Co. — Special effects printer. **123-124-125**

Quick-Set, Inc. — Tripods, dollies, and other camera mounting equipment. **103-104**

Research Products, Inc.—Special effects printer. **136**

S. O. S. Photo-Cine-Optics, Inc.—Motion picture and TV equipment. **220**

Splindler & Sauppe, Inc. — Audio-visual equipment. **209**

Stancil-Hoffman Corp. — Sound recording equipment. **219**

Sylvania Electric Products, Inc. — Motion picture and TV studio lighting. **213**

Traid Corp. — Photo-instrumentation and high-speed photography equipment. **137**

Treise Engineering Co.—Film processing equipment. **133**

XeTron Div., Carbons, Inc.—Xenon projection lighting. **228**

Zoomar, Inc. — Photo-optical and photo-instrumentation equipment. **116-117**

SMPTE Technical Conference Activities

John M. Waner, chief color consultant for Eastman Kodak Co. in Hollywood, has been named program chairman for the 95th Technical Conference of the Society of Motion Picture and Television Engineers (SMPTE). The semiannual conference will be held April 12-17, 1964, at the Ambassador Hotel in Los Angeles. Mr. Waner is serving under the Society's editorial vice-president, **Herbert E. Farmer** of the University of Southern California's Department of Cinema, and SMPTE's papers committee chairman, **C. Loren Graham** of the Kodak Color Technology Dept. in Rochester, N. Y. **Rodger J. Ross** of Canadian Broadcasting Corp., Toronto, is associate program chairman for papers from abroad.

Topics and topic chairmen for papers to be presented are:

Cinematography — Viscous Processing; Roderick T. Ryan, Eastman Kodak Co., Hollywood.

Color and New Photographic Materials; Jack P. Hall, General Film Labs, Hollywood.

Instrumentation and High-Speed Photography; John H. Waddell, Douglas Aircraft, Santa Monica, Calif.

Laboratory Practices; James W. Kaylor, MGM Laboratories, Culver City, Calif.

Medical Photography; Sy Wexler, Wexler Productions, Los Angeles.

Motion Pictures — Television and Education; Howard Stucker, Los Angeles State College, Los Angeles.

Projection Practices; Don V. Kloepfel, General Film Laboratories, Hollywood.

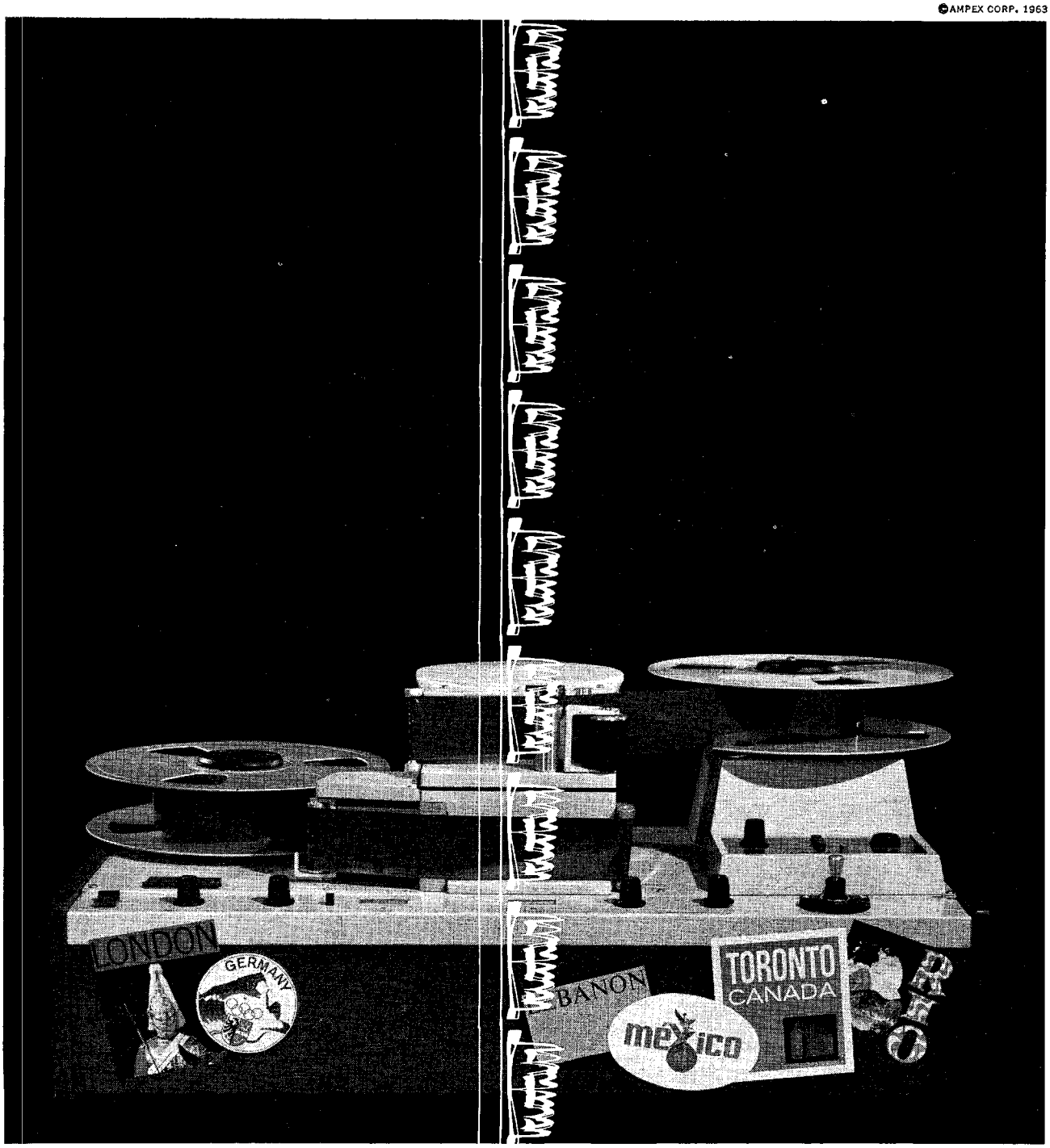
Short Film Subjects; Lewis Mansfield, Consolidated Film Industries, Hollywood.

Small-Format Films; Robert Colburn, Geo. W. Colburn Film Laboratory, Chicago.

Sound; Robert C. Lovick, Eastman Kodak Co., Rochester, N. Y.

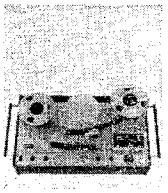
Television Engineering Developments; Henry Ball, RCA, Burbank, Calif.

Television Production; Edward P. Ancona, Jr., NBC, Burbank, Calif.



What portable VTR kicked around the world a year and came back as good as new? The AMPEX

A test model never has a moment's peace. This one—the forerunner of our VR-660—was bumped, bounced, dropped and banged on four continents. By experts. But when it came back there was only one thing we had to do to get perfect performance: plug it in. And there's good reason for that. The backbone of the Ampex VR-660 is a single, unit-designed casting at the center of the machine. Every assembly that has anything to do with tape movement or position is mounted to it (so all critical tolerances can be referenced to a common surface). This top plate is all important,



AMPEX

that's why we make it out of the most rigid, rugged cast aluminum available. Without that strength in the center, the VR-660 would be just another portable. With it, it's the most rugged little VTR that ever joined a mobile unit. Weight? 96 lbs. Price? just $14,500. For complete information call your Ampex representative. Or write the only company providing recorders, tape and core memory devices for every application—as well as Marconi television cameras and accessories: Ampex Corporation, 401 Broadway, Redwood City, Calif. Term leasing and financing available.

Circle Item 28 on Tech Data Card

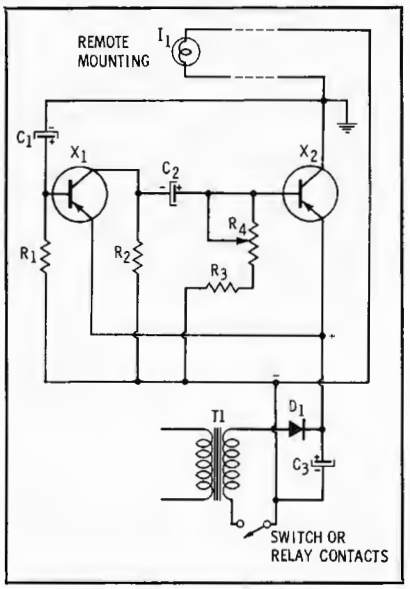
ENGINEERS' EXCHANGE

Transistorized Light Blinker

by Lynn M. Bradley, Chief Engineer, WROY & WROY FM, Carmi, Ill.

To meet the need for flashing lights to attract the operator's attention in emergencies, I built the transistorized light blinker shown in the diagram. The silent operation of the unit allows it to be used in control rooms and studios where microphones are live.

The circuit, instantaneous in operation, is built in a small chassis box using two "universal" transistors and a handful of parts. As with all free-running multivibrators, operating frequency is determined largely by the coupling-components values. Because of the low frequency desired here, and the characteristic low impedance of transistors, the capacitors must be quite large. The range of our unit is from about one quarter of a cycle to several cycles per second.

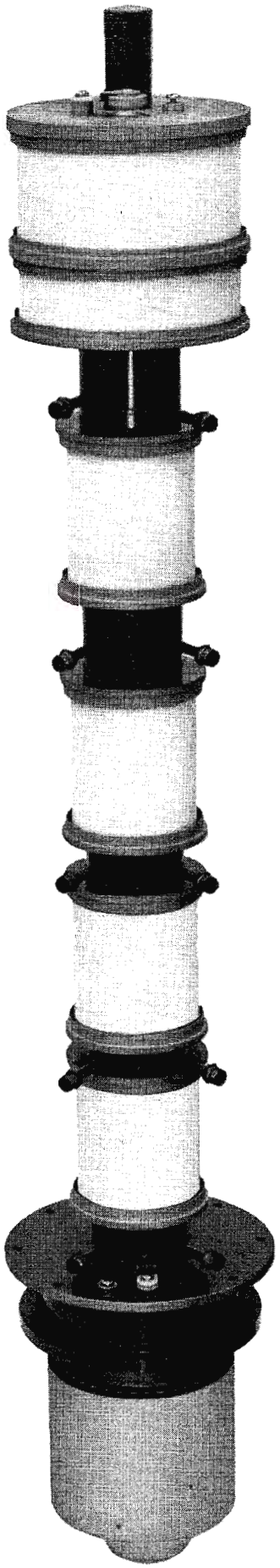


The use of transistors other than those in the parts list may necessitate changes in the coupling components. If the base bias resistance is too small, it will be impossible to cut off the transistor with the charge on the coupling capacitor. In this case, the light will remain on (a shorted transistor will produce the same effect).

Notice the power transistor is mounted directly on the chassis, which serves as a heat sink. This means the negative side of the power supply must be insulated from the chassis to avoid shorting out the lamp. Another method is to use an insulating mica wafer and silicone grease between transistor and chassis; B— could then be grounded. A third solution, the one used in our units, is a separate chassis for the power supply.

The potentiometer can be almost any on hand, 10K or above. The usual setting is about 8500 ohms for 2 or 3 cps. Less resistance increases the frequency; more decreases it. The 3.9K resistor limits the collector current when the potentiometer is set at minimum. If variable frequency is not desired, a single 12.5K resistor will give satisfactory results.

Total drain on the power supply is from 100 to 200 ma depending on the setting of the frequency control. The 1000 mfd capacitor charges to the peak of the trans-



NEW IDEA FROM EIMAC:

vapor-phase cooled UHF-TV klystron with 50% less cooling apparatus

The tube at left is the country's first vapor cooled power klystron: Eimac's 4KMV100LA. It produces an output power of 25 kw peak sync and cuts the cooling apparatus needed by half. There's no pump, no rotating parts. The vapor cooling system operates on its own steam. That means operating noise is reduced—by the tens of decibels. And maintenance cost is cut by as much as one-fifth. This new Eimac vapor phased cooled UHF-TV series offers all this—plus excellent linearity characteristics, high gain and an ample 1 db bandwidth. For details about this new series of vapor-cooled klystrons and our new application Bulletin Number 11, "The Care and Feeding of Vapor-Phase Cooling," wire collect today: High Power Microwave Marketing, Eitel-McCullough, Inc., San Carlos, Calif. Subsidiaries: Nat'l Electronics, Geneva, Ill.; Eitel-McCullough, S. A., Geneva, Switz.

Eimac

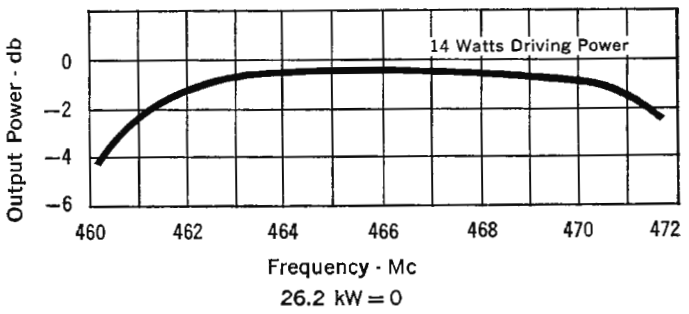
EIMAC 4KMV100LA CHARACTERISTICS

Eimac Vapor Phase Cooled UHF-TV Power Klystrons

	Frequency	Power Output	Beam Voltage	Beam Current	Eimac Vapor-Phase Cooling Circuit Assembly
4KMV100LA	470-610 Mc	25 kW	16 kV	3.8 A	H-183
4KMV100LF	590-720 Mc	25 kW	16 kV	3.8 A	H-184
4KMV100LH	720-890 Mc	25 kW	16 kV	3.8 A	H-185

4KMV100LA

BANDWIDTH DATA



Circle Item 30 on Tech Data Card

Parts List

Item	Description
C1	30 mfd @ 25v electrolytic capacitor
C2	50 mfd @ 25v electrolytic capacitor
C3	1000 mfd @ 25v electrolytic capacitor
R1	1500 ohm, ½ watt resistor
R2	220 ohm, ½ watt resistor
R3	3900 ohm, ½ watt resistor
R4	10K potentiometer
X1	PNP germanium alloy transistor, 2N217, 2N319, 2N321, or equivalent
X2	germanium power transistor, 2N256, 2N301, 2N555, or equivalent
D1	750 ma silicon diode
T1	117v/12v @ 1 amp. transformer
I1	12v pilot lamp & socket assembly

former voltage, about 17 volts, giving good brilliance to the lamp while retaining long life. We haven't had to replace the lamp in over six months of service. Less capacitance, however, would probably work.

Temperature compensation of the transistors is unnecessary for two reasons—only one transistor conducts at a time and the operation is intermittent, with the unit remaining on for only short periods. The power transistor is adequately cooled by the chassis heat sink.

We use a pair of the units to indicate when the transmitters go off the air. The supply transformers (T1) are installed across filament transformer primaries in the transmitters. Both lamp circuits are connected in series with contacts on the plate contactors which close when plate power is cut. Thus, the lamps blink until the transmitter filament supplies are turned off. The pilot lamp assemblies are mounted on the console panel and do a good job of alerting the operator in cases of trouble.

The BA-6A Zero-Set Control

by Richard R. Haskey, Chief Engineer, KGUD-AM & FM, Santa Barbara, Calif.

I have encountered a number of RCA BA-6A Limiting Amplifiers in my travels, and all seem to have one quirk—instability of the zero-set control for the gain-reduction meter. The equipment uses a 4-watt wire-wound potentiometer for this control, R-47. I have converted several using an Ohmite Type-AB pot, number CLU-1011. This is a 100-ohm carbon unit which affords smooth, stable, control of the gain reduction meter zero reading. The fact that the replacement is rated at only two watts instead of four seems to make no difference. The units in which I have replaced the controls have been in constant use for over a year with no trace of any trouble.

One other minor characteristic of these amplifiers is the rapid demise of the filament rectifier. I have replaced the original selenium rectifier, SR1, with the usual 750-ma TV-style silicon diode and have achieved excellent results with little or no deterioration of the filament voltage over long periods of time. Again, the fact that the original part was rated at 780 ma and the replacement at 750 ma seems to have no consequence.

BL-T1
7¼" high x 9¼" deep x 15½" wide

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Circle Item 32 on Tech Data Card

SCA Service

(Continued from page 17)

However, this last adjustment should be made only after the set has had a chance to warm up.

Next, go to the subchannel section; peak the oscillator and zero the discriminator (Fig. 3). Now, listen to the signal . . . Crosstalk? Go back to the **main channel** discriminator, for crosstalk is not produced in the subchannel section of a properly designed set. While listening to the audio, vary the main channel's discriminator secondary ever so slightly. Try detuning the IF coils just a little. However, make note of the original settings so you can go back to them. We have found cases where a slight shift of the main discriminator **primary** adjustment would give good results.

After minimizing crosstalk, set the tone controls of the receiver or amplifier. You'll note that most of the objectionable hash is of a high frequency nature. In background music applications, high frequencies can be reduced considerably before the sound becomes objectionable.

It might seem from the foregoing that crosstalk is a small problem. So here is something to think about. In any SCA signal, **there is always crosstalk;** it's a matter of degree. The crosstalk may be 20 or 50 db down. In the absence of subchannel audio, it is always possible to turn up the audio gain and hear **something.** Assuming that the transmitter is clean the installer's job is to reduce crosstalk at the receiver as much as possible. Remember that an amount which is objectionable in one installation may not be in another because of different noise conditions and room acoustics. The installer who turns up the gain, sticks his ear into the speaker cone, and says "I can hear crosstalk," is only asking for an earache.

This is why modern transmitters have muting circuits . . . to kill the subcarrier in the absence of audio. As a matter of fact, many receivers have their own muting to kill audible noise in the absence of carrier.

While the foregoing discussion points out some of the major problems, it does not cover them all. Nothing short of a book could do so. But, perhaps a few newcomers to SCA can profit from some of our mistakes and successes. ▲

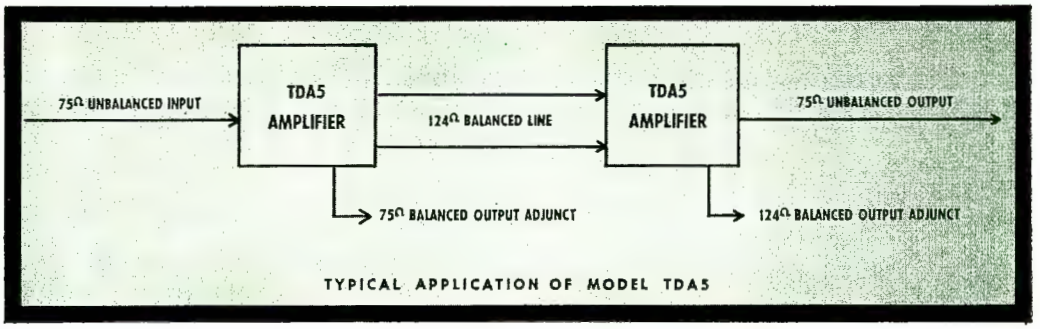
Balanced or Unbalanced Signals are "Duck Soup" for the TDA5 Distribution Amplifier

The versatile Model TDA5 Balanced/Unbalanced Video/Pulse Distribution Amplifier meets the requirements of long balanced, 124 ohm cable runs as well as unbalanced coaxial cable runs.

Completely solid-state, the TDA5 is a modification of the popular TDA2. It has been used extensively by telephone companies and TV stations. Two inputs are provided, selection of which is made by a front panel switch.

The balanced input is the bridging type. It may be terminated in 124 ohms. The unbalanced input is also high impedance and may be terminated in 75 ohms. The two output stages provided may be operated simultaneously, one being balanced at 124 ohms, and the other unbalanced at 75 ohms.

The TDA5 is designed for rack mounting. It requires only 1¾ inches of panel space. All signal connectors are standard 83-series, arranged across the rear chassis. Type 2N1143 transistors are used throughout. They are socket mounted on the front panel. Test points are provided and the regulated power supply is an integral part of of the amplifier.



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INTERNATIONAL NUCLEAR CORPORATION

608 Norris Avenue Nashville 4, Tennessee

Circle Item 34 on Tech Data Card

Directional Antenna

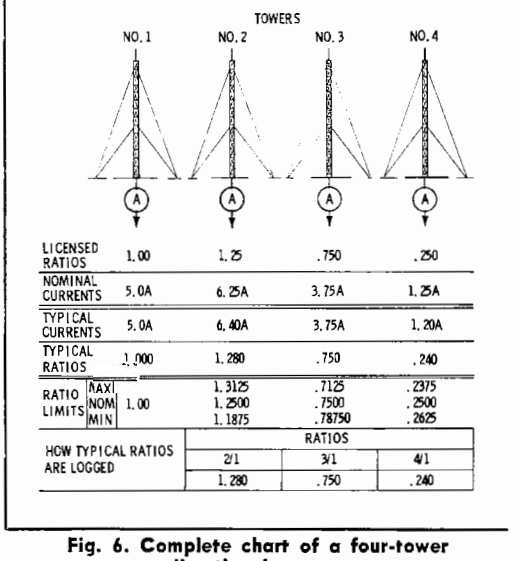
(Continued from page 32)

Using a slide rule to compute current ratios is most helpful, and is easily done by use of the C and D scales. The base or remote base current is spotted on the D scale. The reference tower current value is found on the C scale and is set directly above the D scale reading. The ratio is then read under the C scale index—that is, it is read under the 1 that appears at the end of the C scale. If the C scale (slide) has been moved to the right, the ratio reading is found under the left hand index; and vice versa.

Fig. 6 shows a four-tower array with a chart of current ratios as specified by the station license. The chart also shows **typical** base current readings and ratios. In the typical readings, the ratio of tower 3 is at the exact licensed value, while the ratios of towers 2 and 4 are respectively higher and lower; however, all are within the 5% limits. Also shown in the chart are the ratio limits permitted by the license.

Monitor Points

Directional antenna monitoring points are geographic locations, at some distance from the station, which were selected during initial antenna tuneup as points from which to measure the station's strength regularly. These points are determined by the station's protection and coverage requirements. In selecting these points, care is given to finding a spot that is free of re-radiation or other undesirable ef-



		TOWERS			
		NO. 1	NO. 2	NO. 3	NO. 4
LICENSED RATIOS		1.00	1.25	.750	.250
NOMINAL CURRENTS		5.0A	6.25A	3.75A	1.25A
TYPICAL CURRENTS		5.0A	6.40A	3.75A	1.20A
TYPICAL RATIOS		1.000	1.280	.750	.240
RATIO LIMITS	MAX	1.00	1.3125	.7125	.2375
	NOM		1.2500	.7500	.2500
	MIN		1.1875	.78750	.2625

HOW TYPICAL RATIOS ARE LOGGED	RATIOS		
	2/1	3/1	4/1
	1.280	.750	.240

Fig. 6. Complete chart of a four-tower directional sytsem.

Fig. 7. Instrument for monitoring patterns.

fects. A monitor point should be accessible and unlikely to be changed for a long period of time. Public parks and similar areas are often used.

After antenna tuneup is completed and the station is on the air, signal strength is measured periodically at the monitor points to determine the stability of the pattern and that the pattern meets the shape requirements. Field intensity measurements are made with an instrument like that shown in Fig. 7. This instrument displays its readings directly in millivolts per meter.

Usually the station license will require that monitor points be measured on a regular basis and that a record be kept of all measurements, showing the date, time, monitor point number, and field strength. For some simple antenna systems, where the protection requirements are not critical, the FCC may not require regular measurements. In this case, the field intensity is measured as a matter of maintenance. The station license will list the monitor points, give a description of their location, and specify a maximum value of field intensity at each point.

Conclusion

Thus you see directional antenna operation is simply a matter of understanding the factors that can affect the pattern, checking the pattern regularly, and taking steps to locate and remedy any malfunction that may develop. If you are inexperienced, the responsibility for correcting the trouble may not be yours; but, armed with the knowledge in these two articles, you can certainly learn to operate and adjust directional antennas with the greatest of ease. ▲

NEWS OF THE INDUSTRY

Explosion Destroys Transmitter Building

Shortly after 2:00 PM on February 3, an explosion and fire caused by a defective oil furnace completely destroyed the interior of the **WHUT,** Anderson, Ind., AM transmitter building, and took the FM transmitter off the air. The heat from the four hour blaze was so intense that equipment such as turntables was almost unidentifiable in the remaining rubble. The FM transmitter, located in an adjacent building, was not harmed. Technical assistance and equipment were contributed by Anderson, Muncie, New Castle, and Indianapolis, Ind. stations. A new AM transmitter was at the site by 8:00 the following morning. There were no injuries — the transmitter engineer on duty was, fortunately, in the FM building next door taking meter readings at the moment of the explosion. Total damage was estimated at over $250,000.

Remote Control Div. Acquired

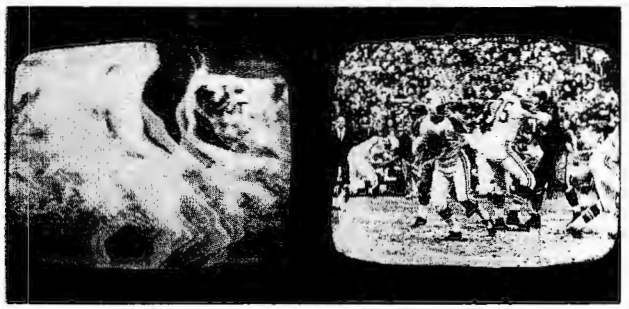
Fritz Bauer, president of broadcast equipment manufacturer **Bauer Electronics Corp.,** has announced the acquisition by Bauer of the **Strom Electronics Laboratories** remote control division. Bauer said that SEL equipment would be repackaged and sold under the Bauer name filling out a line that now includes AM transmitters, automatic logging devices, and other radio station equipment.

Purchase Announced

Rust Corporation of America emerged recently as the successor to **General Electronic Laboratories'** broadcast division. In a move that had been formulated over several months, the GEL Broadcast Division was absorbed by Rust. The company will continue to manufacture the GEL line of FM transmitters, stereo generators, and exciters. In addition, Rust plans call for an expanded product line; besides its remote control equipment, this includes "Autolog" automatic chart recorders, television studio lighting units, and associated broadcast equipment. The announcement of the Rust takeover was made by chief executive **Sal Fulchino.** Named as vice president and general sales manager was **John Wyman.** Both Fulchino and Wyman were executives in the GEL broadcast division.

Transistorized Telecast System

A transistorized broadcast system that gives television cameramen the mobility of spectators when covering news and sports events was demonstrated recently by **Sylvania Electric Products, Inc.** Called the "Newschief," the lightweight system includes a camera, audio/video transmitter, and a rechargeable battery pack. The transmitter and power units are housed in a lightweight case that is strapped to the cameraman's back. ABC employed these units to televise the 1964 Olympics in Innsbruck, Austria, during January and February. George C. Conner, senior vice president in charge of Sylvania's Home & Commercial Electronics Div., described the "Newschief" as a cordless, battery-powered system that transmits video and audio signals up to one mile by means of a solid-state microwave transmitter, which employs FM and operates in the 2,000 mc band. Weighing less than 30 lbs., the transmitter delivers about 1 watt to an omnidirectional antenna mounted on top of a 2′ mast that protrudes from the back-pack. The camera, a modification of Sylvania's award winning 800 line CCTV unit, measures 3″ x 4″ x 8″ and weighs about 5 lbs. including lens and viewfinder. It has been modified for broadcasting and is connected to the back-pack, which houses these plug-in modules: a complete EIA synchronizing generator, video amplifiers, sound amplifiers, and a video/sound transmitter. The "Newschief" is normally powered by a rechargeable nickel cadmium battery, but can be connected to a car or truck battery if an auxiliary source is required; total power consumption is 40 watts.



Pay-TV System Granted U.S. Patent

Teleglobe Pay-TV System, Inc., has been granted U.S. Patent No. 3,116,363 for one of its pay-TV systems, designed for use with centralized metering and billing. This patent describes a method for connecting the home pay-TV decoder externally to the TV set, between the TV antenna and the receiver. The method obviates removal of the back panel and tampering with the insides, thereby reducing service costs and complications resulting from connecting a decoder inside a set. The encoder at the transmitter is equally simple as all connections are

external to the broadcast equipment. The photograph shows the intensity of scramble received at the TV set when using the new encoding (scrambling) method on a sports slide at WNYC-TV, New York City-owned Channel 31, where a version of the Teleglobe Video Security System is employed (FCC approved), for police line-up purposes.

Prices Increased

Price increases ranging from 2.6% to more than 29%, and covering selected television broadcasting gear, were announced recently by **General Electric's** Visual Communication Products Div. **H. E. Smith,** manager of VCP, said the new prices result from the increased costs of developing and manufacturing high quality, reliable equipment in line with the demands of the industry, especially in the areas of transistorized monochrome and color television equipment. Affected equipment includes: PE-24B, four-vidicon color film chain, 2.6%; PE-25A, three-IO color studio camera, 3.9%; PE-22A, remote controlled vidicon, 6.3%; BC-31B, basic console, 29.4%; BA-7A, limiting amplifier, 23%; BA-29A, Unilevel amplifier, 9.6%; program amplifiers and other audio components, 9%. Monitor price increases included: TH-25A, 14″ cabinet mounted, 12.5%; TH-26A, 17″ cabinet mounted, 13.4%; all other monitor prices were increased from 5 to 13%.

Japan TV Set Owners Top 14.5 M

Television set ownership in Japan increased to the 14,524,659 mark by the end of September, 1963, according to the government-sponsored **Japan Broadcasting Corp.** (NHK). This reflects a jump of more than 4,000,000 new set owners since early 1962 when the 10 M level was reached. A key factor in the TV boom, according to NHK, has been the company's ability to maintain good reception throughout Japan which is 85% mountainous. This is accomplished through 166 unmanned, low-output, remote controlled microwave relay stations on mountaintops throughout the country. Each station is equipped with an auxiliary diesel-driven generator, which goes into operation in the event of a power line failure. The generator is started automatically by nickel-cadmium alkaline batteries developed by **Yuasa Battery Co.** with the cooperation of NHK.

PERSONALITIES

The **Viking of Minneapolis, Inc.,** sales force is now headed by **Richard L. Morris,** it was announced by **P. A. Rasmussen,** president. His appointment follows the resignation of former sales manager, **W. V. Drobny** who will represent Viking in the upper Midwest.

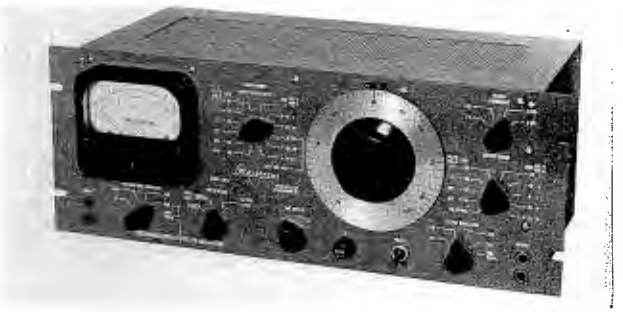
Hamilton-Landis & Associates, Inc., announces the appointment of **Barry Winton,** to be attached to the Washington office.

NEW PRODUCTS

Operating Impedance Bridge

Delta Electronics, Inc., has available the Model OIB-2 High Frequency Operating Impedance Bridge. This bridge can be inserted directly in any part of a high frequency antenna system to measure the "operating" impedance of individual radiators, network inputs, and transmission line terminals, **under power.** The transmitter or a high power signal generator may be used as a signal source. The power rating of the bridge is 1,000 watts. The bridge is particularly useful in the adjustment of multielement antenna systems where the insertion of a conventional bridge would upset the circuit, and in high interference areas where measurements with a conventional bridge are difficult or impossible. The insertion effect of the bridge is equal to 5″ of 150-ohm transmission line. An external detector jack is provided so that the bridge can be used with a lower power signal generator and sensitive communications receiver as a normal impedance bridge for antenna or laboratory RF measurements. The OIB-2 is designed for any frequency between 2 and 30 mc. It has resistance and reactance ranges of ± 500 ohms. The bridge is housed in a heavy deep-drawn aluminum instrument case, supplied with a detachable cover and carrying handle, and is priced at $695.

Circle Item 66 on Tech Data Card



Instrument Categories Established

Frequency accuracy is the basis of a new system of instrument classification introduced by **Waveforms, Inc.** Users of the company's oscillators and transmission measuring sets can select the level of frequency accuracy required for a particular application; they merely state whether they want instrument performance that is "precision" or "precision plus." "Precision" instruments have a frequency accuracy of 3%, while "precision plus" instruments are 1% accurate. Other specs, such as frequency response and distortion, are comparable. Both types of instruments have the same physical appearance, virtually identical circuitry (a modified bridged-T oscillator circuit) and are built with the same standard of workmanship. Their major difference, frequency accuracy, is achieved

by individually calibrating the output dials of the "precision plus" instruments. An example is the Model 452A transmission measuring set which has a frequency tolerance of 1% and combines measuring and generating devices in one instrument with a single set of interlocking controls. No correction of readings is required for different settings of input or output impedances.

Circle Item 67 on Tech Data Card

Cloth Tape Cleans Heads

A cloth tape, impregnated with a special formulation, which plays through a tape recorder just like a regular tape and automatically cleans the heads, has been developed by **Robins Industries Corp.** To clean a tape head, the tape recorder operator runs this ¼" impregnated tape, which is found on its own reel, through the machine. Dirt, oxides and plasticizers, which normally accumulate on a tape head and are the most frequent causes of distortion and increased background noise, as well as poor recording and poor playback characteristics, are removed. The price of the tape is $2.75.

Circle Item 68 on Tech Data Card

DC Power Supplies

A series of four transistorized DC power supplies especially designed for use with communications equipment has been introduced by **Sorensen,** a unit of **Raytheon Co.** The versatile QB-50 supplies are designed for such applications as computer circuits, communications equipment, test and instrumentation devices, and laboratory use. Four models, all rated at 50 volts DC, are available in 25, 50, 100, and 200 watt capacities. Maximum output currents are 0.5, 1, 2, and 4 amps, with the output adjustable over

a 2:1 range. Regulation is within ±.01% (line and load combined) and ripple is less than 300 mv rms. The transient response time of 25 μsec, or less, permits rapid recovery from abrupt changes in input voltage or output load. Featuring constant current, programmability, and remote sensing capability, the Sorensen QB-50 supplies can be used in either series or parallel operation (up to 20 in parallel or four in series).

Circle Item 69 on Tech Data Card

Solid-State Microwave Switches

Three solid-state microwave switches for use with low-power RF are available from the **Westinghouse Electronic Tube Div.** They feature small size, rugged construction, reliable operation, and long life, while requiring no DC bias. The EX-5329 features a switching speed of one nanosecond. Having an isolation rating of as high as 40 db, it is for operation at frequencies in the C band. Broad frequency range is the outstanding feature of another switch, the WX-5385. It is for operation between 1.7 gc and 5.5 gc, with a switching speed of 10 nanoseconds and a minimum isolation rating of 23 db. The third switch, WX-5080, features high isolation—8p db minimum. Its frequency range is 5.4 to 5.9 gc, and it has a switching speed of 40 nanoseconds. All of the switches are equipped with type TNC connectors, with other connectors available on special order. Each has a 1″ by 1″ cross section, and can be operated at temperatures as low as —55° C. The video and RF impedance of the switches is 50 ohms.

Circle Item 70 on Tech Data Card

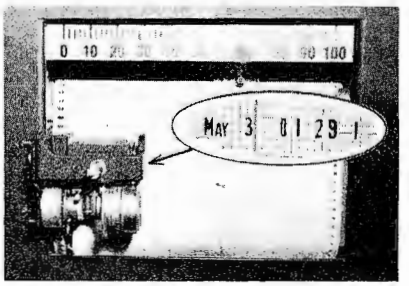
Circle Item 47 on Tech Data Card

Circle Item 46 on Tech Data Card

Video Monitor

The **Maryland Telecommunications, Inc.,** video monitor is designed to produce pictures of greater than 800-line resolution in closed circuit or studio television system applications. (In an 800-line television system, pictures are displayed with 3 to 4 times the clarity of a home television receiver.) Special video circuits ensure pictures with no black or white smearing. Modular in construction, the monitor features epoxy fiberglass etched circuits. By observation of picture presentations, faults can be isolated quickly to the Video-Sync module, the Vertical Output module, or the Horizontal module. The monitor can be easily repaired without removal to a repair shop. Input video and sylchronizing signals may be looped through to additional monitors or may be terminated. All MTI monitors are compatible with standard EIA or random interlaced cameras.

Circle Item 71 on Tech Data Card

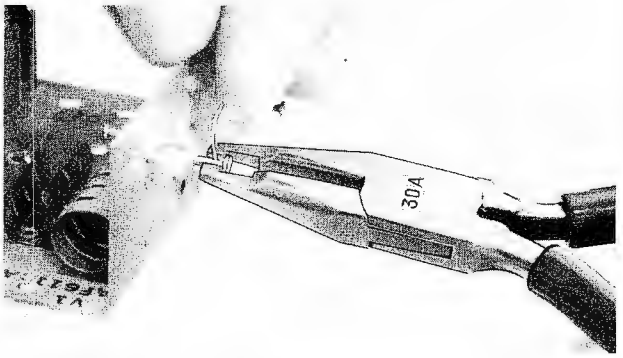


Date, Time, Code Number Stamp for Strip Charts

Users of chart recorders can now obtain a printed record of the date and time that either of two units were energized, two limits exceeded, two channels recorded, or any two actions took place. This can be done with a new time-and-date Identichart, with two-position code number or letter, offered by **Royson Engineering.** Model RI-21, which mounts on the front door of industrial strip chart recorders, is AC solenoid operated. The standard model prints No. 1 when the solenoid is deenergized and No. 2 when energized, in addition to the date and time, on the chart paper. Other numbers or letters can be supplied on special order. Control of the printout is by pushbutton or automatic

operation. The device fits easily on new recorders, or it can be supplied in kit form for field installation. The kit includes a Plexiglass window to replace the recorder glass window and a Plexiglass cover for the Identichart.

Circle Item 72 on Tech Data Card



Wire Wrap Plier

Hunter Tools has announced that they are now marketing a special plier that wraps fine wires around terminal lugs, quickly and efficiently. The tip of the plier is hollowed out and nests firmly around the lug, a twist of the wrist and the job is complete. The box-joint cushion-grip plier can be adapted for almost any terminal. The unit sells to the industrial user for $10.10.

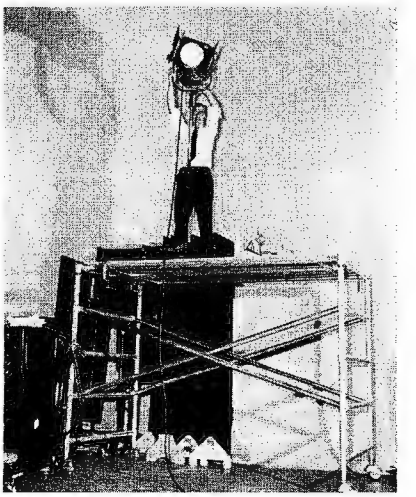
Circle Item 73 on Tech Data Card

Microwave Tower

A heavy duty tower, specifically designed for microwave installation and other heavy duty broadcast uses, is available from **Rohn Mfg. Co.** This tower is constructed in an equilateral

triangular pattern with 3½′ sides; the tower legs vary in tubular steel from 2″ to 4″ to meet requirements of the installation. Completely hot-dip galvanized, the tower is available for installations up to 800′ when the proper size and weight of the tubular steel components are used. It can be specifically tailored to meet the exact needs of the antenna to be installed.

Circle Item 74 on Tech Data Card



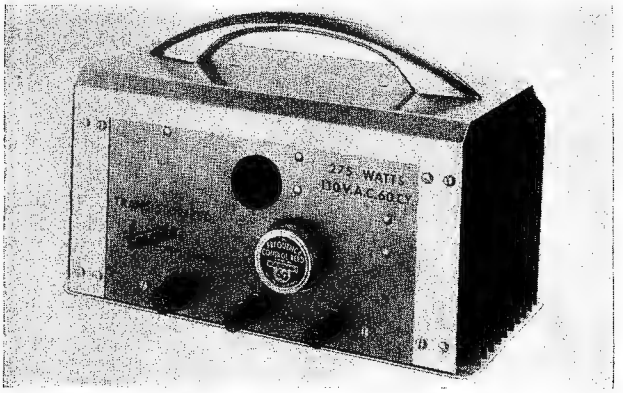
Aluminum Span Scaffold

A lightweight aluminum scaffold, manufactured by **Up-Right Scaffolds,** serves as a highly efficient, mobile light platform in the production of commercial motion pictures at MPO Videotronics, New York City. Easily rolled, and positioned securely with locking casters, the 10′ span aluminum scaffold, 6′ high, provides a rigid surface for hanging and holding lights. These units can be quickly disassembled and stored in a small area. The 12 scaffolds used in the studio require no maintenance and represent a considerable savings over wooden scaffolds.

Circle Item 75 on Tech Data Card

Battery Inverter

The **Terado Corp.** announces a new source of electricity called the Continental Power Inverter. Model 50-191 is a



solid state device that changes the low voltage of any 12 volt car or truck battery to 110 volts, 60 cycles AC, providing up to 300 watts of power without auxiliary engines or generators. It will operate lights, (fluorescent or incandescent), tape recorders, test equipment, drill presses, soldering irons, office machines, and other electrical devices. The frequency is maintained by the use of a tuning fork or reed and is kept accurate within ½ cps regardless of changing load or variation of input voltage. Price is $139.13.

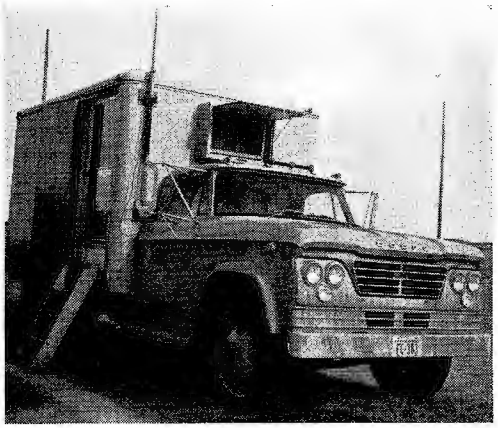
Circle Item 76 on Tech Data Card

Remote Pickup Antenna

The **Herb Kreckman Co.** is offering two completely grounded ground-plane antennas suitable for remote pickup use. Model GP-41A mounts on 1¼″ pipe threads and has a vertical element constructed of ¾″ aluminum pipe which extends 2′ below the ground-plane for mounting. Both models, factory cut and tuned to the customer's frequency, are fed with RG-8/U coax. Precise impedance match is obtained by the use of a capacitive gamma match which is completely enclosed and grounded.

Circle Item 77 on Tech Data Card

April Preview



FCC FM/TV Enforcement Unit

Description of an FCC built mobile monitoring unit.

•

Hi Voltage Silicon Rectifiers in Transmitters

Solid-state rectifier applications in high voltage, high power circuits.

•

Practical Aspects of Modern Cartridge Tape Recording

The techniques for getting the most out of your cartridge tape systems.

•

Maintenance of Mountain Top Translators

Performing efficient servicing in remotely located installations.

•

Plus: Several more features, and the ever popular Engineers' Exchange! You'll keep up to date with News, Products, Tech Data, Book Reviews, and other current items.

•

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ENGINEERS' TECH DATA

BROADCAST ENGINEERING Tech Data service is currently being converted to computer processing—please allow 60 to 90 days for material requested this month to reach you. Thank you.—The editors.

AUDIO & RECORDING EQUIPMENT

90. ALTEC LANSING—Brochures describe theater speaker systems, speech-input equipment, and playback systems.
91. AMERICAN ELITE—Line of Telefunken ELA M250/251E microphones is listed in catalog.
92. ATLAS SOUND—Data sheet describes fully collapsible mobile microphone stand with 18' reach.
93. BROADCAST ELECTRONICS — Brochure contains specs, prices and installation data on tape cartridge system and devices.
94. CINE SONIC SOUND—Booklet details background music service, and describes complete background music studio.
95. CROWN—Two brochures set down details of solid-state professional tape recorder and line of tube machines.
96. RCA VICTOR—Physical and magnetic properties of "Red-Seal" audio tape are outlined on data sheet.
97. SPARTA—Catalog sheets list sizes and prices of tape cartridges and reloading service; bulletin discusses advances in cartridge performance.
98. VIKING—Set of brochures shows line of reel-to-reel tape machines, several cartridge handlers, and tape cartridges.

COMPONENTS & MATERIALS

99. AMPEREX—Condensed tube catalog lists types for applications in broadcast and recording.
100. BRADY—Illustrated catalog sheets show self-sticking wire and cable markers as well as write-on labels.
101. DYNAMIC GEAR—Precision stock gears and differentials are listed in catalog; design handbook has removable A-size drawings and actual test data.
102. ERCONA CORP.—Booklet describes miniature condenser microphones and data sheets illustrate lines of shielded and unshielded plugs, sockets, terminals, and circuit protection devices.
103. G.E.—Receiving tube selection chart lists characteristics of 59 types.
104. E. F. JOHNSON—Catalog presents line of heavy duty RF components for broadcast equipment.
105. ROBINS—XL connectors for audio applications are listed in catalog.
106. SWITCHCRAFT — Product bulletin describes single row phenolic jack panels which are 1¾" wide, and have 26 jacks.

POWER DEVICES

107. STACO—Brochure covers variable transformers in single, ganged, uncased, manual, and motor driven types.
108. TERADO—Catalog sheet describes inverter capable of powering a television receiver in car, boat, or plane.

RADIO & CONTROL ROOM EQUIPMENT

109. FAIRCHILD RECORDING — Set of technical bulletins describes group of specialized level control devices.
110. McMARTIN—Data sheet covers solid-state SCA multiplex tuners for background music service.
111. MOSELEY ASSOCIATES—Brochure presents 2 watt RF amplifier for AM broadcast monitors.

REFERENCE MATERIAL

112. CLEVELAND INSTITUTE—Career booklet describes electronics course which leads to 1st Class Radio Telephone License.
113. EICO—1964 catalog lists test instruments, communications gear, hi-fi components, and PA equipment.
114. HAYDEN—New catalog lists all books published by John R. Rider and Hayden Book Co.
115. ITT CANNON—Brochure discusses reliability and quality assurance capability of company.
116. PRECISION EQUIPMENT—Wall chart for engineers and others contains common and hard to find conversion factors.

STUDIO & CAMERA EQUIPMENT

117. INTERNATIONAL NUCLEAR — Transistorized camera amplifier is shown in illustrated brochure.
118. TELEVISION ZOOMAR—Flyers illustrate features of zoom lens for I.O. cameras, and servo remote control pan and tilt.

Professional Services

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.

The classified columns are not open to the advertising of any broadcast equipment or supplies regularly produced by manufacturers unless the equipment is used and no longer owned by the manufacturer. Display advertising must be purchased in such cases.

EQUIPMENT FOR SALE

Commercial Crystals and new or replacement crystals for RCA, Gates, W. E., Bliley and J-K holders; regrinding, repair, etc. BC-604 crystals. Also A. M. monitor service. Nationwide unsolicited testimonials praise our products and fast service. Eidson Electronic Company, Box 96, Temple, Texas. 9-61 tf

TRANSMITTING TUBES FOR SALE—Immediate Delivery on 6076 Power Tetrodes, at $235 each, 3X2500F3 — $170. 450TL—$35, 4-125A—$22.50, 872A—$5.25, 575A — $15.50. Also **SPECIAL HIGH QUALITY ENGLISH ELECTRIC** 6166—$840. All tubes are factory new, 1000 hour warranty, from the largest wholesale supplier of broadcast tubes. Inquire about our special quotes for complete spare tube kits. **CALVERT ELECTRONICS, INC.,** Dept. BE-3, 220 E. 23rd St., New York 10, N. Y. (212) OR 9-1340.

Will buy or trade used tape and disc recording equipment—Ampex, Concertone, Magnecord, Presto, etc. Audio equipment for sale. Boynton Studio, 295 Main St., Tuckahoe, N. Y. 1-64 tf

TRANSMITTING TUBE SALE: Completely Guaranteed. 5736—$110, 6623—$115, 891R—$275 (869B—$80), 1850A—$275. Write for complete price list. Thor Electronics Corp., 287 Morris Ave., Elizabeth, N. J. 07207. 2-64 2t

COLLINS 737 5 kw FM, less tubes, crated, $4,750 firm. S. A. Cisler, WLVL Louisville, Kentucky 585-4789. 3-64 1t

For Sale—General Radio Twin-T Impedance Bridge. Like new condition, asking $400.00. Make inquiries to Walter Williams, 590 West Utica St., Buffalo, N. Y. 3-64 1t

Best offer exceeding $250.00 takes this complete disc recording equipment package less cutting head. F.O.B. Arkansas City, Kansas. Like new condition. Instruction Manuals plus several blanks included. Rek-O-Kut "Master Pro" sixteen inch Model M-5S overhead lathe. Rek-O-Cut R-16H sixteen inch recording turntable. Presto A-93 recording amplifier. Contact Wayne Owens, 1407 North Fifth, Arkansas City, Kansas. 3-64 1t

Used Amtec $5,800.00, used Intersync —05 $3,750.00. Allen Electronic Corp., 937 Industrial Av., Palo Alto, Calif. 3-64 1t

RCA TS-30D Field Switcher in very good condition. Reasonably priced. Write 3614 Southwest Archer Road, Gainesville, Florida, or call 305 372-7254. 3-64 1t

For Sale—2-way Radios—new and used. All brands and models. Call or write for list: Becom Co., Seminary Hts., Weatherford, Texas. Phone—817-LY 4-5172. 3-64 1t

For Sale—UHF TV Xmtr & complete studio equip. camera—projectors—controls—etc.—80 hours on it—$28,500.00. Becom Co., Seminary Hts., Weatherford, Texas. Phone—817-LY 4-5172. 3-64 1t

GOVERNMENT SURPLUS. New 6 foot diameter aluminum parabolic reflectors solid surface. $175.00 ea. Radio Research Inst. Co., 550 5th Ave., New York 36, N. Y. 3-64 tf

AUDIO EQUIPMENT bought, sold, traded. Ampex, Fairchild, Crown, McIntosh, Viking. F. T. C. Brewer Company, 2400 West Hayes Street, Pensacola, Florida. 3-64 tf

Advertisers' Index

See You at NAB — Booth 51W

McMartin

No other FM MONITORS can do so much!

McMartin TBM-4000

FM/SCA MULTIPLEX MONITOR
FCC TYPE APPROVED ±3-116

This is the most versatile instrument available for monitoring all main channel modulation and SCA Multiplex operating characteristics. Compatible with FM stereo.
Direct meter readings of:

- Total Modulation
- SCA Modulation
- Crosstalk
- SCA Injection
- SCA Frequencies

McMartin TBM-3000

McMartin TBM-3500

FREQUENCY & MODULATION MONITORS
FCC TYPE APPROVED ±3-113, ±3-119

- The TBM-3000 is a completely self-contained frequency monitor and the TBM-3500 is a self-contained modulation monitor.
- The 3000 used in conjunction with either the 3500 or 4000 fulfills the FCC requirement for a station monitor.
- The TBM-3500 is completely compatible with FM stereo.

McMartin TBM-2500

RF AMPLIFIER FOR
REMOTE MONITOR OPERATION

The TBM-2500 will drive any combination of two monitors including other brands.

- Isolated high and low level outputs.
- Excellent stability and long tube life.
- 2 watt output with 1000 μv input.
- Complete with yagi antenna and coaxial cable.

McMartin

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In Canada Sold By: Canadian Marconi Company, Montreal 16, P. Q.

Circle Item 63 on Tech Data Card

Created by the hand of experience

RCA HIGH-SENSITIVITY VIDICONS

for B&W and color, live and film pickup

High effective sensitivity is combined in RCA vidicons with uniform signal-output capability, uniform background, broad spectral response, exceptional resolution capability, low lag characteristics, and high tube-to-tube uniformity. Each RCA vidicon type embodies the latest advances in the constantly changing technology . . . reflects the total research, engineering, and production capability of the world's broadest-based electronics organization. Ask your authorized RCA distributor of broadcast tubes today for complete list of RCA vidicon types and technical data.

AVAILABLE THROUGH YOUR AUTHORIZED RCA BROADCAST TUBE DISTRIBUTOR

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

The Most Trusted Name in Electronics

PARTIAL LISTING OF RCA VIDICON TYPES

Type	Application	Limiting Resolution (TV lines)	Description
4427	Special Military & Industrial Service	400	Very small, ½-inch diameter type for ultra-compact cameras. For new camera designs.
7038	Film	750	General-purpose type having good effective sensitivity.
7262A	Live	750-900	Short, sturdy tube having low heater-power (0.6 watt) requirement. Employs new "dark heater." Other characteristics similar to those of 7735A. For new camera design.
7263A	Live	750-900	Similar to 7262A but designed to withstand severe shock, vibration, and humidity.
7697	Live	750	Similar to 7735A but designed for optimum operation at lower target voltages.
7735A	Live	750-900	Similar to 7038 but has much higher sensitivity and higher "red" response.
8051	Broadcast film pickup & data transmission	1500	A 1½-inch diameter type having very high resolution capability. For new camera designs.
8134	Live & Film	600	Features electrostatic focus, magnetic deflection.
8507	Live	1000	High resolution type having separate mesh and wall electrodes. Requires camera modifications.