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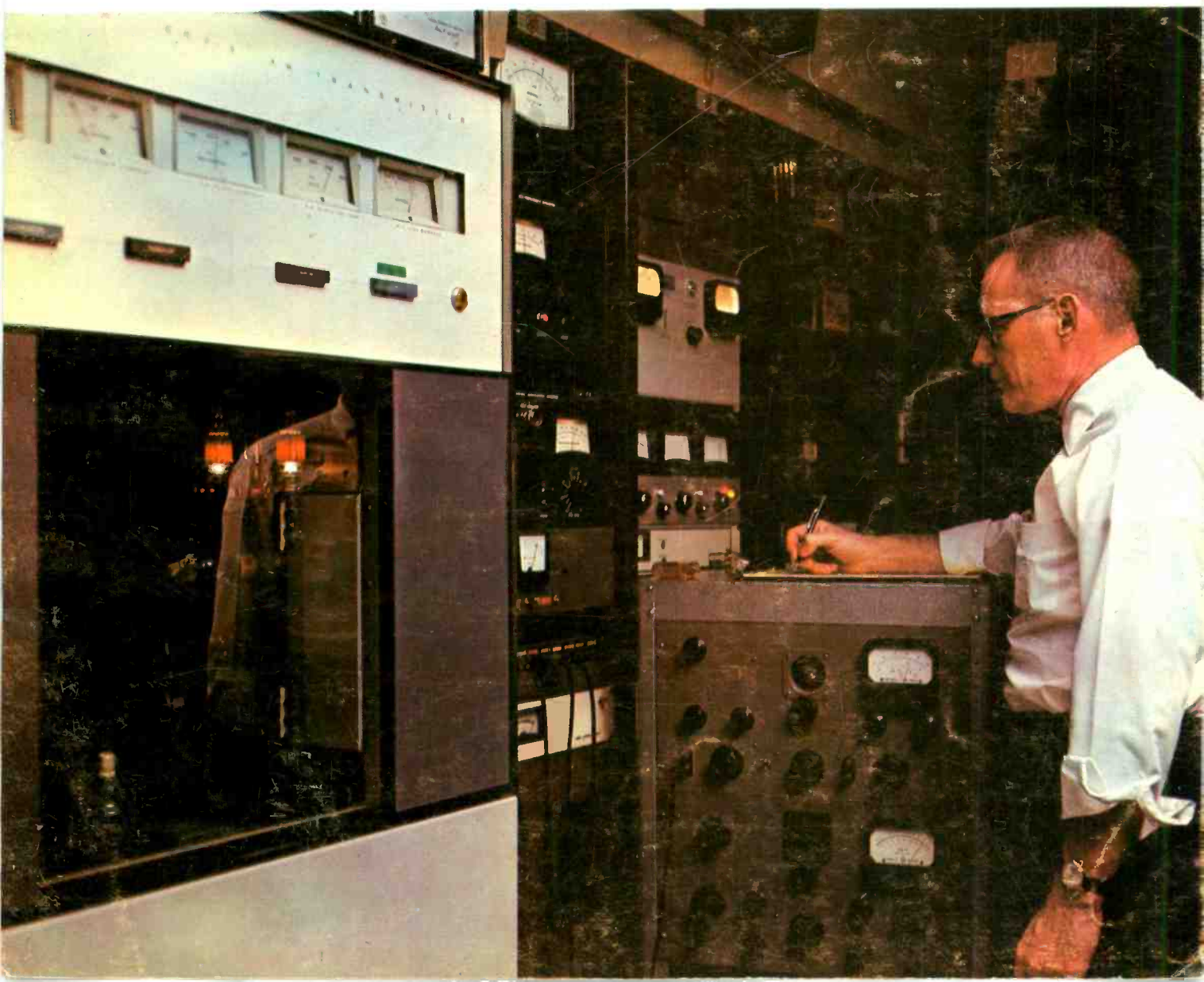
May, 1969/75 cents

Broadcast Engineering

the technical journal of the broadcast-communications industry

FM Proof of Performance, Page 13



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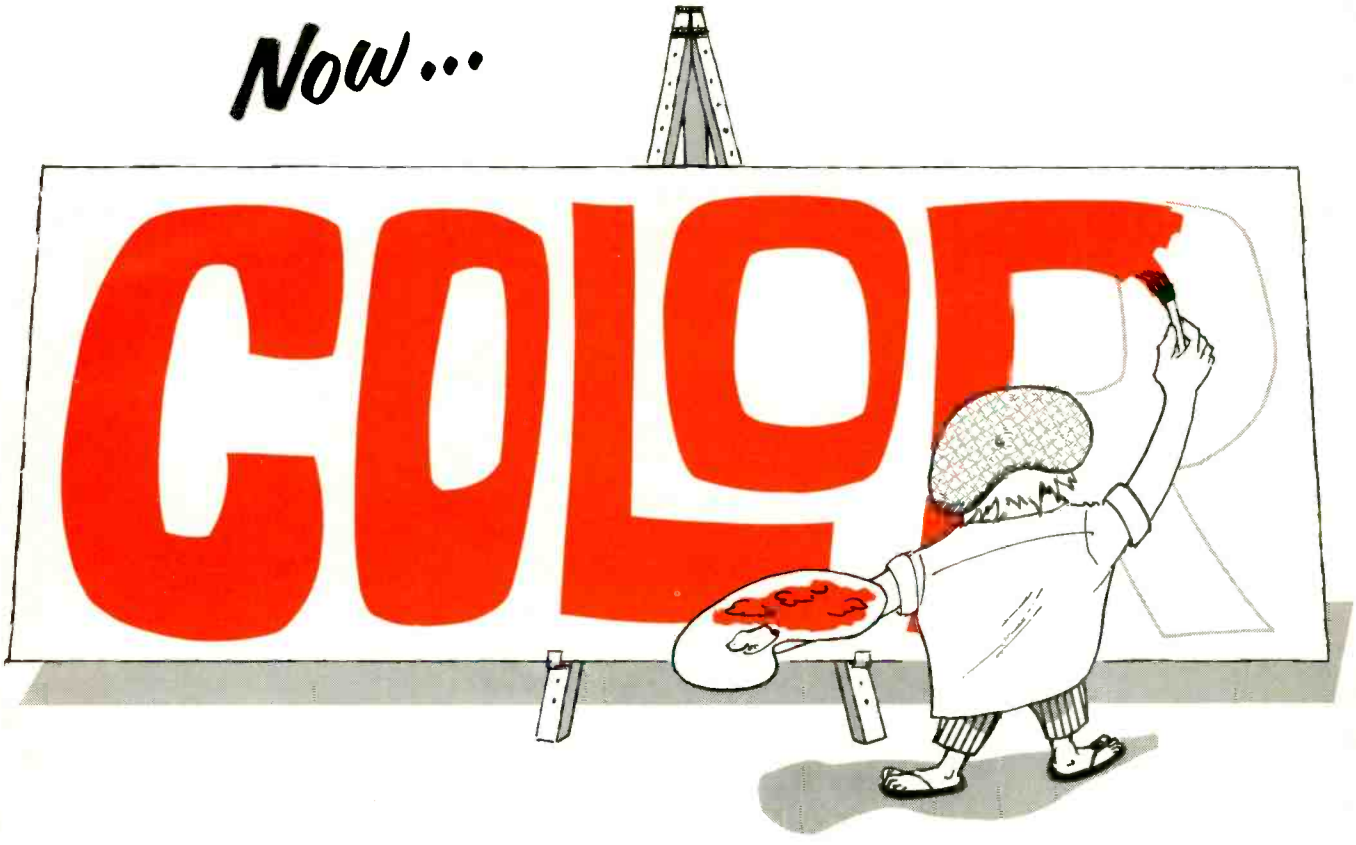

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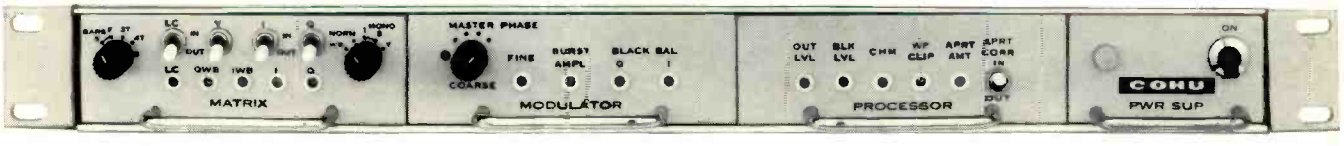

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May, 1969 • Volume 11, No. 5

Broadcast Engineering

The technical journal of the broadcast-communications industry

in this issue...

ABOUT THE COVER

Patrick Finnegan in the process of pulling a Proof of Performance test. In view of growing violations in this area, Broadcast Engineering begins a 3-part series in this issue on Proof. See article on page 13.

DEPARTMENTS

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LETTERS
TO THE EDITOR

Dear Editor:

Mr. King makes some very valid comments, and some rather serious errors in his letter to the editor in the February issue. I agree that it is no longer an absolute necessity that a First Engineer be on duty at a directional station due to modern automated equipment, but I wonder if a basic point is being overlooked. The average Third Class licensee is by no means over endowed in the technical aspects of a radio operation and he really should not be expected to know the difference between a phasor and a capacitor. His job is to provide something to transmit. Herein lies the basic problem.

At a top 40 station, the jock is pretty heavily taxed to keep up with the load impressed upon him, what with program logs, spots and such. It would require great stress on the announcer's part to take the directional readings accurately and still do his job well. Also, and probably more important, the announcer has no idea what he is actually reading and therefore is prone to make mistakes and fail to detect potential trouble in the system.

The question is now raised, how about autologgers? This is fine and good, but it fails to interpret readings and to note potential maintenance areas. All it can do is sound an alarm for a condition that has gone completely out of tolerance. Then the announcer must locate the First Phone man to correct the problem. This is usually at the expense of air time and is an aggravation to all concerned.

I also am in favor of a modified and stiffened test for the First Phone license. To eliminate the "bargain basement beauties" from the ranks of engineers, I would suggest re-arranging the test so that more weight is placed on interpretive and practical matters. This would require the person taking the test to be able to apply what he knows and would tend to eliminate some of the rote memorization that takes place at present. It also would help insure that the engineer on duty is able to cope with the problems that he will inevitably face from time to time.

However, I do not feel that the purely technical and engineering questions be dropped altogether, because I feel that the engineer should be able and qualified to design the majority of specialized equipment that he may need (such as amplifiers, remotes, etc.) to carry out his job. A revision of the test to combine the practical and the technical in a working blend, therefore, would be the best way to assure that engineering personnel are competent.

Thomas Tcimpidis
Chief Engineer
WRLB, Long Branch, N. J.

George Lemmon
Chief Engineer, WLRW
Champaign, Ill.

Dear George:

The following information comes in response to your letter which appeared in the March issue of

New

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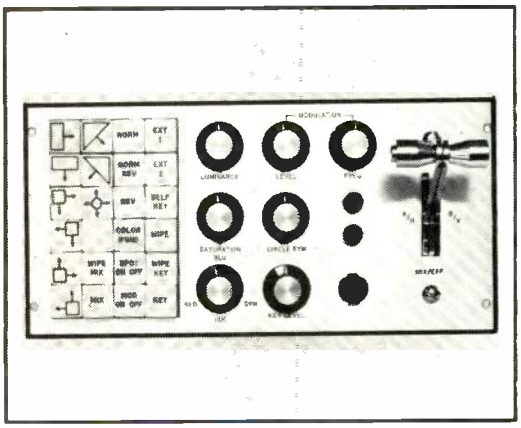

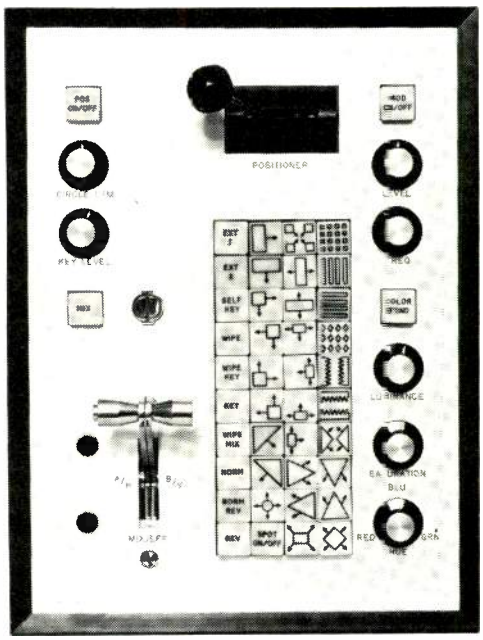

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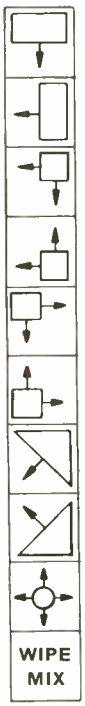

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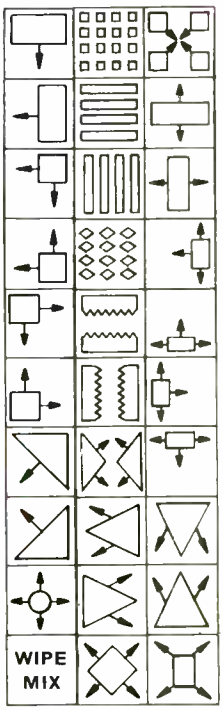

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Circle Item 5 on Tech Data Card

Broadcast Engineering. Hopefully it may be of some help.

We have used a crystal controlled oscillator to drive a 40 watt, 60 cps power amplifier, running all our station clocks, since July, 1961.

This system operates off a trickle charged 300 AH, 12 volt accumulator to keep the clocks operating despite all-night power failure. The system does not vary more than a second per month.

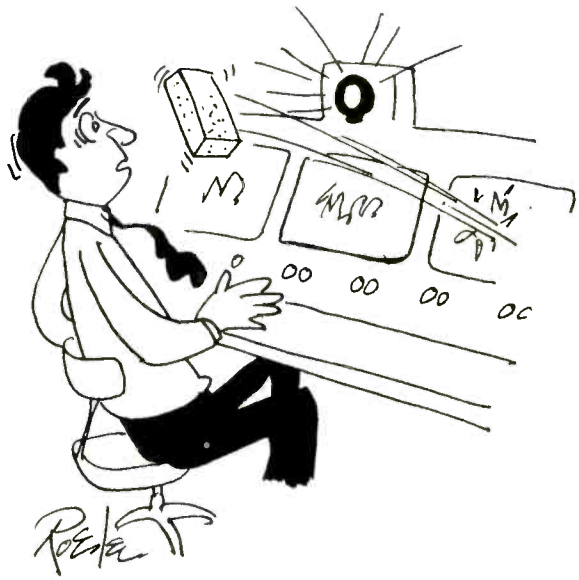
The "Clock Inverter A-40" was built at our request by Tele-Radio Systems Ltd., 1015 Finch Ave. W., Downsview, P.O., Toronto, Ontario, Canada, for a cost of less than $500. We use any good 60 cps clock, depending on our needs: Penwood numecrons at control position, regular dial types in offices and lobby. We find that some clock backlash can be a problem, so a good quality clock is desirable.

Clock adjustment is made by interrupting the clock feed if clocks are fast, or driving the amplifier off a vibrator at about twice the line frequency if they run slow.

Your clocks, however, must all have nearly the same "coasting time" for this system to operate well. Otherwise, some will end up with a partial correction. We use manual resetting for our rare corrections.

The system has proven to be very reliable, trouble free and inexpensive, and seems the best for small station operation since it uses regular technical talent for operation and maintenance, avoiding special techniques and costly or hard-to-get equipment.

Yours very truly,
Marcel Chabot
Technical Director, CHAU-TV



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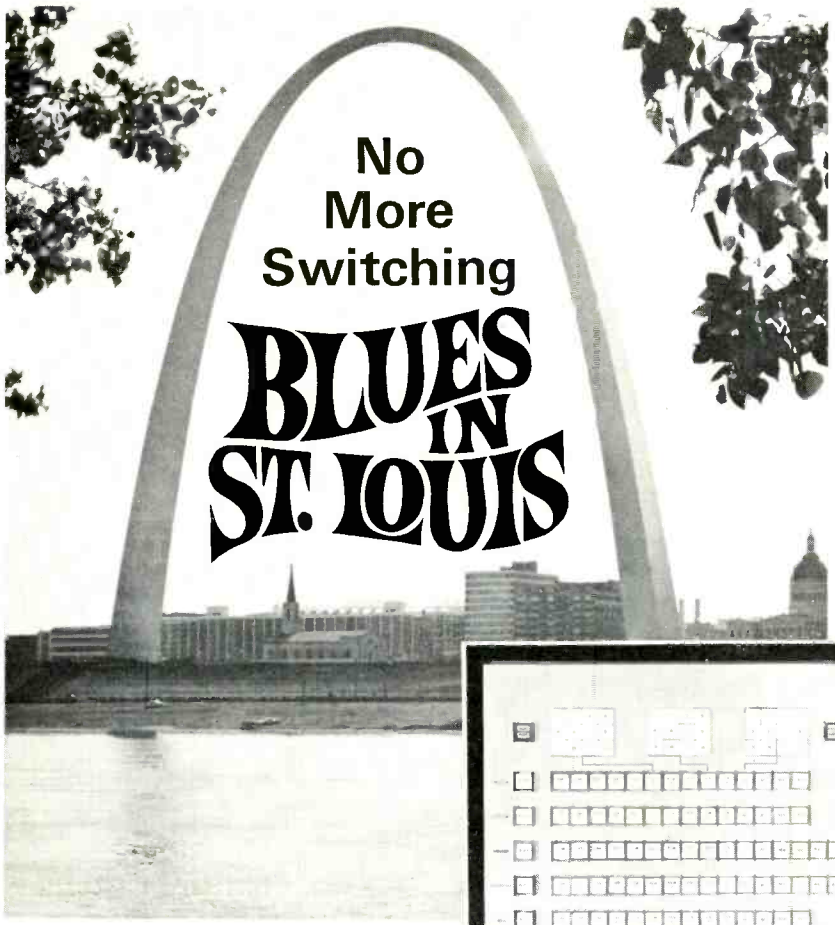

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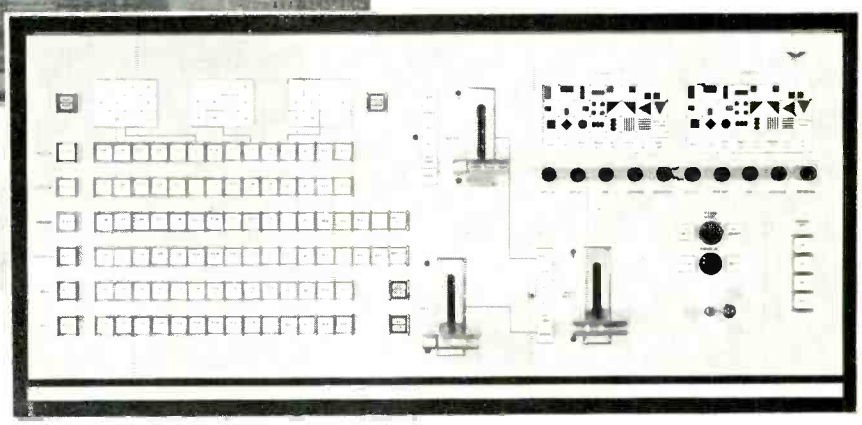

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INDUSTRY NEWS

FCC Asks For More Anti-Smoking Spots

New York City television stations WNBC-TV and WNEW-TV, have been called on by the Federal Communications Commission to provide "greater effort" in their presentation of anti-smoking spots during maximum viewing periods. WNBC-TV is owned by the National Broadcasting Company, Inc.; WNEW is owned by Metromedia, Inc.

In letters to the licensees, the Commission asked them to submit within 60 days, statements of future policies for presentation of anti-smoking messages and a report on implementation of the policies within four months.

The Commission action was in response to complaints by John Banzhaf, III, and ASH, Action on Smoking and Health, against WNBC-TV, and a complaint by a Bronx man against WNEW-TV. The complaints in both cases alleged a failure to comply with the requirements of the Commission's cigarette advertising policy (Applicability of the Fairness Doctrine to Cigarette Advertising, 9 FCC 2d 921 (1967). This policy requires broadcast licensees presenting cigarette commercials to "devote a significant amount of time to informing the listeners of the other side of the matter . . ." Banzhaf also asked for revocation of the WNBC-TV license.

The Commission told NBC that while a review of the facts indicated a disparity between the number of cigarette commercials and anti-smoking messages, "when your total performance in the test weeks is considered, we cannot say that the disparity is so great . . . as to require a conclusion that your overall performance has been deficient." The Commission noted, however, that during the sample weeks there appeared to be "a concentration of anti-smoking messages outside of the hours of maximum viewing, in contrast to cigarette commercials, which were heavily represented in these periods." It pointed out that anti-smoking messages were broadcast within the 7:30 to 11:00 p.m. period on only five of fourteen days "although a great number of cigarette commercials were broadcast during the period. . . ."

Metromedia was informed that "if the matter were viewed on the basis of the entire broadcast day there would be no basis to the complaint." During the sample period, however, the Commission pointed out, "although the vast majority of your cigarette commercials were broadcast during the hours which you define as 'prime time,' comparatively few of your anti-smoking messages were broadcast during these hours, and none were broadcast on 13 of the 30 days."

The Commission said that its policy took into consideration the fact that parity between cigarette commercials and anti-smoking messages cannot be required during peak viewing hours and that implementation required "sensitive balancing." It emphasized however,

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Circle Item 7 on Tech Data Card

that, without setting mathematical formulas, and recognizing that the stations have made substantial efforts to meet their obligations, "we believe that greater effort is called for during the period of maximum viewing."

FCC Socks WNUS For Rules Violation

The McLendon Corp., licensee of AM station WNUS at Chicago, Ill., has been notified by the Commission of its apparent liability for forfeiture of $5,000 for violations of the terms of the station's license and Section 73.87 of the Rules.

Radio station WNUS is a Class III-A station authorized to operate on 1390 kHz, with 5 kw, unlimited time, with separate directional patterns for daytime and nighttime. The station license specifies average hours of local sunrise for the months of October, November, December, January, February and March as 6 AM, 6:45 AM, 7:15 AM, 7:15 AM, 6:45 AM, and 6 AM, respectively, Central Standard Time.

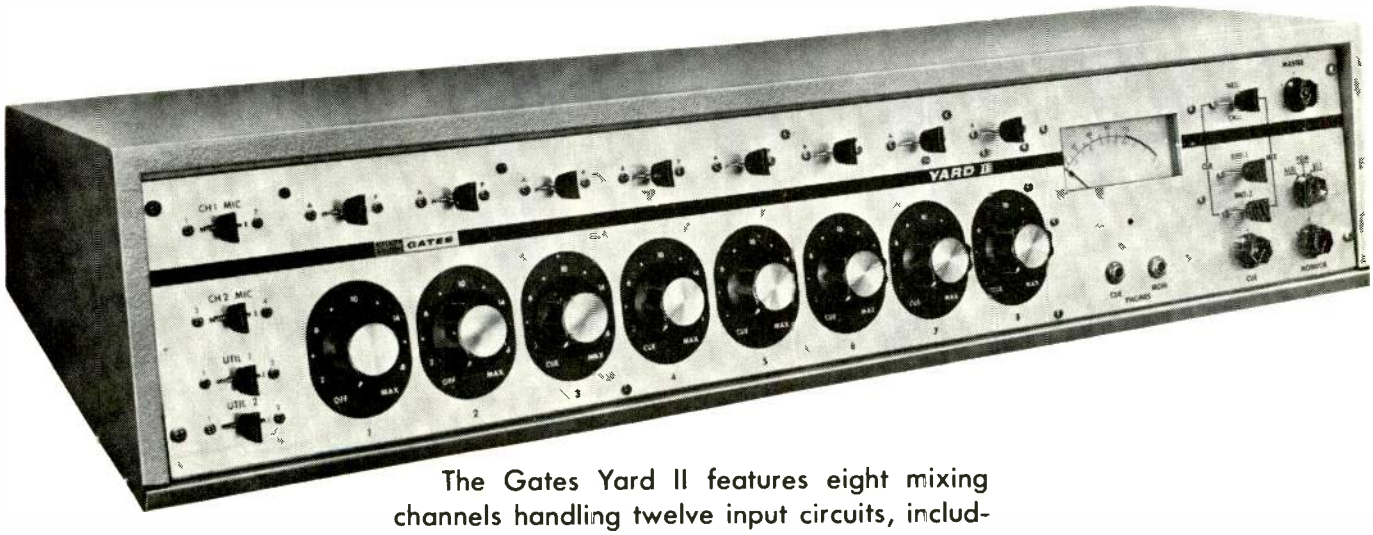
On March 21, 1968, WNUS was cited in an Official Notice of Violation for non-compliance with Section 73.87 in that the station had been operated with its daytime directional pattern commencing at 4:00 AM, CST, instead of the average hours of local sunrise as specified in its license. The violation occurred daily from October 28, 1967 through March 15, 1968.

The licensee in its reply to the Official Notice conceded that the violation had occurred but said it was due to the failure of its former chief engineer to take the action required to implement a Commission Rule amendment.

FCC Grants Waiver To Journal CATV

The Journal Company of Milwaukee, in March, requested waiver of permissible service requirements of Section 74.1030 of the Rules in order to permit CARS microwave station KZV-46 to relay a special two-hour program to Wausau, Wisconsin. The request was granted by the FCC.

New from Gates... the Yard II eight channel all silicon transistorized audio console.



The Gates Yard II features eight mixing channels handling twelve input circuits, including four microphones, five medium level inputs and three external lines. Plus, two unwired utility keys for unsurpassed versatility. Faders are the reliable open-type step attenuators that can be easily serviced.

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The reason for the waiver request was a debate telecast the latter part of March between David Obey and W. John Chilsen, the only qualified candidates in a special April election to select a new Congressman for Wisconsin's Seventh District. The Debate was sponsored by the Political Science Department of the University of Wisconsin at Stevens Point. Stevens Point and Wausau are the two major cities in the Seventh District.

The Journal Company, licensee of KZV-46, which operates CATV systems in Stevens Point and Wausau, believed that the opportunity to compare the views and positions of candidates should not be missed by Wausau residents. The company said at the time that it believed no television station would carry the debate live, but that live coverage would be carried on the Stevens Point CATV system, and with grant of waiver, via KZV-46 to the Wausau CATV system.

Send your news of the industry directly to: Ron Merrell, Editor, Broadcast Engineering, 1014 Wyandotte, Kansas City, Mo. 64105.

FCC 1968 Annual Operations Report Is Off the Press

The Federal Communications Commission has recently issued the 34th Annual Report of facts and figures on its operations during fiscal year 1968. The report contains 162 pages and covers over 300 subjects in 11 major categories. Brief descriptions of all important Commission actions during the fiscal year are included, as well as a special section describing how the FCC's system of hearings operates, a chronological list of highlights, a wide range of statistics including broadcast and common carrier financial data, and Safety and Special Radio Services licensing breakdowns.

The following facts are examples of the Report contents: At the end of fiscal year 1968 there were more than 7200 broadcasting stations of all types on the air in the United States with revenues of over 4 billion dollars. There were more than 2,000 CATV systems serving 2.8 million homes, and the American people were using over a hundred million telephones. Almost 2 million stations were licensed in the two-way radio services with well over half a million applications being processed annually.

Listed in an Appendix to the Report are FCC publications, broadcast authorizations since 1949, a listing of all Commissioners who have served on the FCC since its establishment and the addresses of all field offices, among other things. Frequently used terms and abbreviations first introduced in the 33rd Annual Report have been revamped and amplified in this new edition, and information in the Report has been updated to include developments up to the time of printing.

The Annual Report has a new, larger-paged format for ease in reading and handling. The Commission does not distribute copies, but they may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402, for a price of $1.50.

FM PROOF OF PERFORMANCE

Part 1 of a 3-part Proof Series

By Patrick Finnegan Engineer, WLBC, Muncie, Ind.

The annual "Proof" requirement, not only on FM but on AM and TV as well, was brought about by FM itself back in 1946. The superior quality capability of the FM modulation process, along with its greater spectrum space and receiver noise suppression, placed a greater importance upon the quality of the audio equipment feeding the transmitter. Of what use the greater quality capability of the new modulation process if it is not used? Thus, emerged the introduction of the system approach—measurement from microphone terminals input to transmitter output.

System Approach

Before taking up a Proof, the engineer should consider his own FM system as it is in use and how he can apply the "mike input to transmitter output" concept to making a meaningful Proof. FM stations operate in several different ways, such as: full-time automated stereo or monaural; full-time live, stereo or monaural; or a combination of these ways. A full-time automated station should have a small console arranged so that programming can go on live should the automation system fail.

All FM stations are required to make a standard monaural Proof. Should a station also broadcast part of the time in stereo, then it must make an additional stereo Proof.

Thus, the pre-arranged method for operating monaural—even if only the standby live setup for a fully automated station—should be used to run the monaural Proof. The reason for bringing up this point is the fact that levels and impedances are important. It is especially pertinent when one starts strapping left and right audio channels together or using half of the stereo system for monaural. Strapping two 600 ohm inputs in parallel will effect the match with the driving impedance as well as the signal levels. Mismatch will cause response problems at the higher audio frequencies.

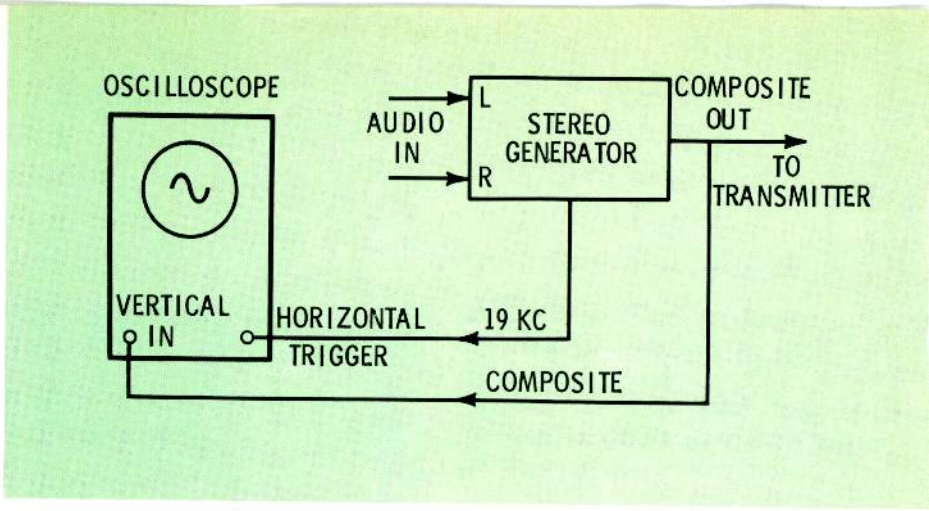


Fig. 1a Feed composite stereo from the generator to the vertical input of the scope.

The stereo system levels, response and phase are most important. It is not enough that each channel measures within specs individually. The left and right channels should be as nearly identical as possible. This identity should hold for all audio frequencies in the band 50cps to 15kc. Any deterioration will show up as poor separation of the channels.

Matrixing action in the stereo generator and in the receiver detector is the reason for the requirement of identity of the left and right audio channels. The matrix in the stereo generator algebraically sums the left and right channels (L + R) to modulate the main carrier for monaural receivers. At the same time, it provides a difference signal (L — R) to modulate the subcarrier. The stereo receiver matrix restores the left and right channels. Therefore, if there is a difference of levels, phase or response of the audio channels, complete addition or subtraction cannot take place in the matrix. The remaining audio signal component then shows up in the other channel and reduces the separation.

Equipment Required

Audio Signal Generator. This should be one of good quality, which has low inherent noise and distortion.

Transmission Measuring Set. Proof measurements work somewhat in reverse, that is, the modulation percentage is held constant while the input level is adjusted to compensate for the pre-emphasis as well as system irregularities. Some accurate means must be provided, therefore, so the input levels can be metered accurately. Some audio generators have built into them and as an integral part, a meter and calibrated pads to use for this purpose. A separate instrument is available called a "Transmission Measuring Set" made up of calibrated pads and metering, so that a straight audio generator may be used. The engineer may set up his own adjustment and metering methods. The important things to remember when building up a "home-brew" method are low noise, distortion and phase, plus accurate level measurement to the station input.

Noise and Distortion Analyzer. This instrument is a must.

Wide Band Oscilloscope. A good quality oscilloscope makes the job of setting up the stereo generator much easier and with more accurate results, especially in setting up correct phase.

Stereo Modulation Monitor. All stations broadcasting in stereo are now required to have a stereo modulation monitor in operation, except the few who have had the period extended. The monitor manufacturers have made the majority of required stereo measurements relatively easy because of the built-in metering, switching and fixed pads. These monitors will also supply the necessary monaural functions. There is one caution in regard to monitors. Make certain the monitor detector is adjusted for the type of switching action of the stereo generator modulator. If the generator at the station is using square-wave switching, the monitor must be adjusted for square wave and not for sine wave. The reverse is also true. Should the monitor not be adjusted for the type generator switching, poor separation measurements will be indicated on the monitor.

FCC Rules

Before starting on a Proof, one should review the pertinent sections of the FCC Rules. Parts 73.254, 73.317 and stereo standards are in 73.322.

The FCC has made a recent clarification of the term "annual." The Rules now read, "Once each calendar year." Also, each Proof cannot be more than 14 months apart.

Since a Proof must be made within the four month period preceeding the license renewal application filing date, it is well to schedule making the Proof each year in these months. At license renewal time, this requirement will be easily met without making an additional Proof.

Preliminary Tests

Many measurements must be made, so it is well to try a few spot checks first. Response, noise, distortion and separation checks at 100cps, 1kc, 10kc will provide a good indication of what to expect and if all appears to be in order. Problem areas will usually show up in these spot checks, and correc-

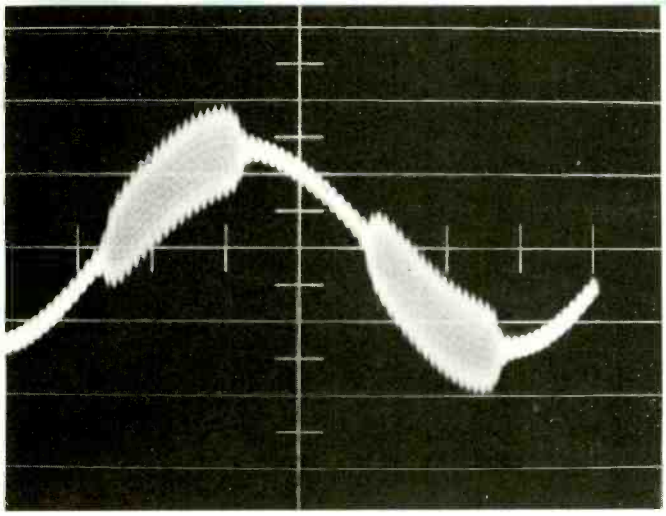


Fig. 1b One cycle of 19 hz pilot. Low level of 400 cps modulation on left channel only. Modulation appears in 1st and 3rd quadrants of pilot.

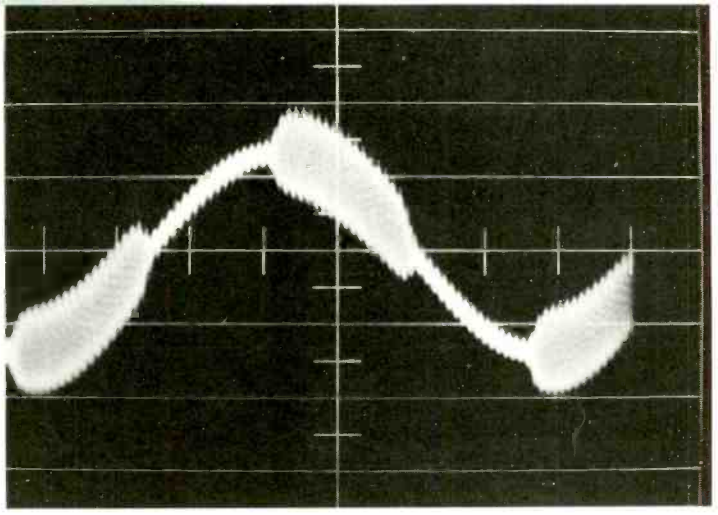


Fig. 1c One cycle of 19 Hz pilot. 400 cps modulation on right channel only. Modulation now appears on 2nd and 4th quadrants of pilot.

tions can be made before attempting a complete set of measurements which may have to be done over. Correct the faults first, then make the full run.

The most important stereo test to make first is correct phasing. Incorrect phasing will cause many peculiar readings. Poor phasing will cause poor separation, but if phasing is 180 degrees out, it will reverse the left and right channels.

There are several ways to check phasing, but two are given here. For 180 degree phasing, this is the most accurate method. Feed composite stereo from the generator to the vertical input of the oscilloscope. Trigger the oscilloscope horizontal sweep with the 19kc pilot direct. Adjust the horizontal sweep for a full cycle of the 19 kc pilot. Now feed the left audio channel of the stereo generator a small amount of 400 cps. Do not use too much modulating level as this will override the 19 kc display on the oscilloscope display.

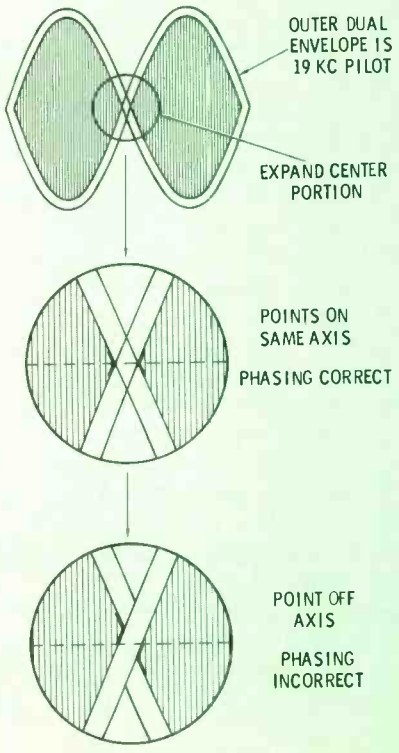


Fig. 2a Adjust the horizontal sweep for the "butterfly" pattern.

Fig. 2b Inner points in shaded areas will be on same axis if phase is correct.

Fig. 2c Phasing incorrect. Note that points are not on the same axis.

With phasing correct, the 400 cps will appear on the 1st and 3rd quadrants of the 19kc sine wave display. Now feed the 400 cps to the right channel, and the 2nd and 4th quadrants of the 19kc sine wave will contain the 400 cps. This test proves that the audio channels and stereo generator are not reversed in phase.

The monitor phasing can now be checked simply two ways: feeding the left audio channel—the monitor should read on the left channel and the tone be heard on the left channel. Feeding the right channel—all conditions will appear on the right.

The foregoing test is important, especially if any of the audio equipment has been removed for service, the stereo generator itself, and monitor, or if there have been any wiring changes. It is a quick, simple, and most of all an accurate method.

Smaller amounts of phase shift can be checked in another way, but make certain the oscilloscope and hookup are not introducing any phasing changes of their own.

Feed an out of phase (L = —R) 400 cps signal to the left and right audio inputs. Measure the composite output of stereo generator on the vertical input of oscilloscope. Adjust the horizontal sweep for the "butterfly" pattern. Now expand the horizontal sweep to see the crossover point better. The two inner shaded areas will have a point towards each other at the center of the display. The points should be on the same axis if the phase is correct.

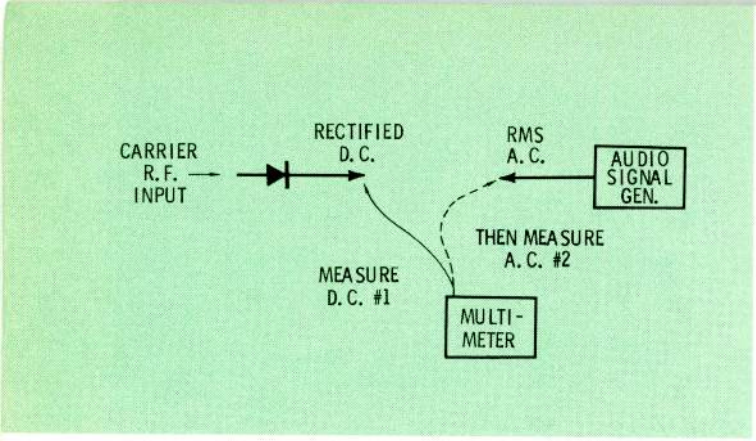


Fig. 3a Additional test setup for measuring noise.

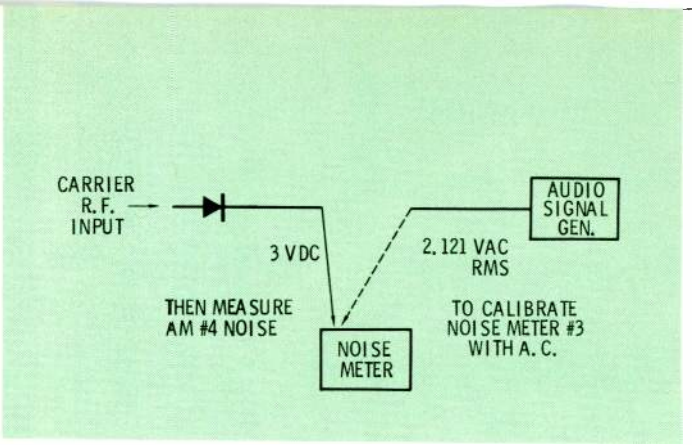


Fig. 3b Remove the AC and feed the rectified carrier DC voltage to the noise meter.

If not correct, the points will be on different axis. Adjust the generator phasing control until they are on the same axis. Expand and center the display on the oscilloscope to see if any changes occur in the pattern. If changes do occur, the scope is introducing some phase changes of its own.

Proof Readings

Now that preliminary tests have been made, test equipment and station equipment faults corrected and phasings made correct, the remainder of the Proof is a matter of making correct measurements. Do the monaural Proof first. How you feed the system monaurally will depend upon how it normally operates. If the station operates part time monaural, part time stereo, feed it in the monaural mode. If operation is full-time live, both channels can be fed together at the same time as in the stereo mode, with the exception that the pilot and subcarrier are turned off. Remember to use correct levels and impedance matching of the inputs. Switch off any AGC or limiting action. Check the monitor instruction manual on how to make the measurements. It is beyond the scope of this article to describe the operation of the various stereo monitors.

Standard Monaural Measurements Required:

Response measurements at 100%, 50%, 25% modulation for at least these audio frequencies: 50 cps, 100, 400, 1kc, 5kc, 7.5kc and 15kc. (1kc is reference.) (Do not use de-emphasis in the response measurements).

Distortion measurements at 100%, 50%, 25% modulation at the same audio frequencies. At the 50% and 25% modulation values, no distortion measurements are necessary above 5kc. (use de-emphasis in the measuring equipment for these measurements).

FM noise, and AM noise.

Limits: Response must fit within the standard pre-emphasis curve as given in the Rules. Distortion is 3.5% to 100cps, 2.5% 100cps to 7.5kc, 3% 7.5 kc to 15 kc. FM Noise —60 db, AM Noise —50db.

Additional Test Setup

If the monitor does not have provisions to measure AM Noise, a simple setup of equipment can accomplish it for you. A peak reading detector is needed, which may be a tube diode or a crystal diode. Couple the RF output of the transmitter to this rectifier, enough so that you can get 3 to 5 volts DC from it. Measure this rectified DC on a regular workbench type multimeter. Compute 0.707 of the value of DC voltage you measured. This gives the RMS AC voltage needed to calibrate the Noise meter. Use the audio generator at a frequency of 60 to 100 cps. Adjust the generator output to the AC value just computed, measured on the multimeter AC scales. Now feed this AC calibrating voltage to the noise meter. Remove the AC and feed the rectified carrier DC voltage to the noise meter and measure noise in the usual manner.

(Example: The rectified RF carrier DC voltage measured 3v DC. The required output of the audio calibrating voltage is then 2.121 v AC RMS).

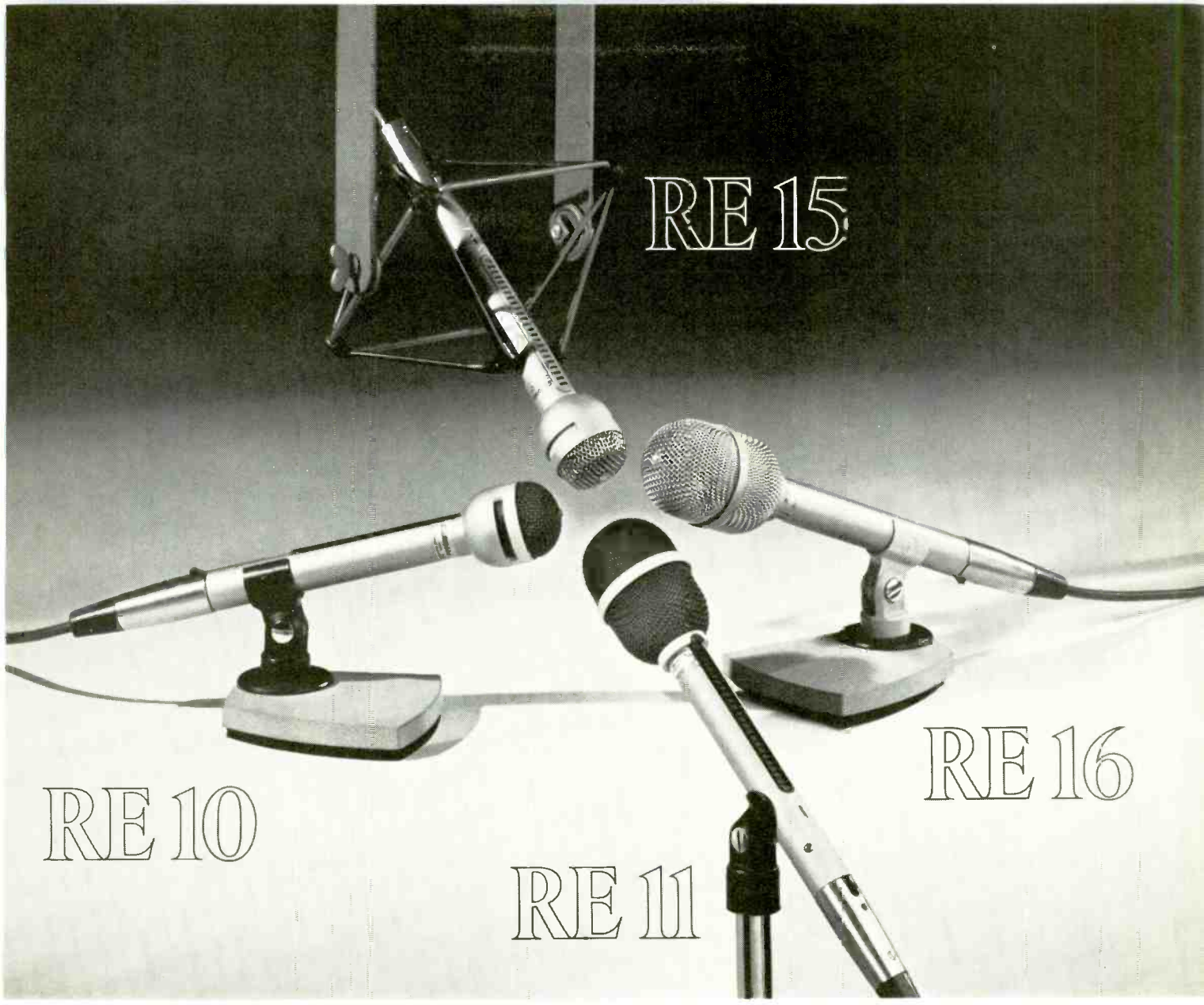
Stereo Proof:

The same measurements required in the monaural proof are now required of the left audio channel and the right channel, each measured separately and results recorded. The same limits apply. There is this difference: the pilot and subcarrier must be on with pilot modulating the main carrier 10%. Thus the audio only modulates the main carrier to 90%. The total modulation will be 100% (90%+10%), 50% (40%+10%), 25% (15%+10%). For left channel measurements (according to the monitor in use) connect the noise and distortion analyzer to the left distortion output, making sure the de-emphasis is switched in. The opposite holds true for the right channel.

The following are stereo only measurements:

Separation: Depending upon the monitor in use, these can be taken at the same time the response and distortion measurements are made and at each of the modulating frequencies 50cps to 15kc. Make separation measurements only at 100% modulation and not the 50 or 25% modulations. Limits: —29.7db at each frequency. A greater separation figure is desired.

Cross Talk: Feed in phase audio (L=+R) at 400 cps to the left and right audio channels and modulate 100% (90%+10% pilot). This causes all modulation to appear on the main channel and nothing in the sub-carrier channel. Read the crosstalk (according to the monitor) of main channel into subchannel.



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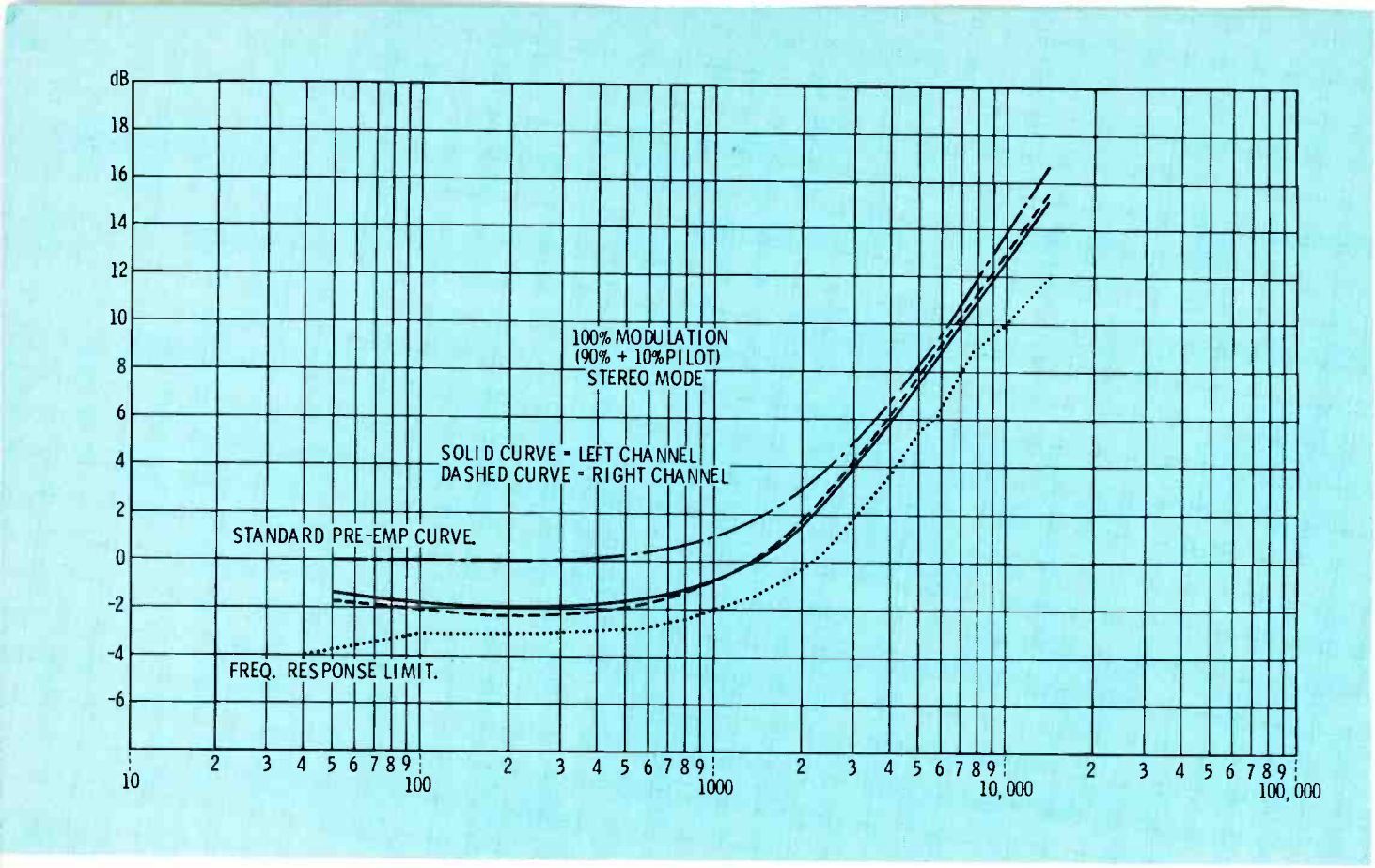

Fig. 4 Method of plotting both channels on the same graph.

Next, feed out of phase audio (L=—R) into the left and right audio channels and again modulate to 100% (90%+10% pilot). This causes all the modulation to appear in the subchannel. Read the crosstalk (according to monitor) of subchannel into main channel. Limit: In both cases, crosstalk should be at least —45 db.

Subcarrier Suppression: Suppression of the 38kc subcarrier is to be measured both with and without modulation.

First, without modulation: remove all modulation from the transmitter including the 19kc pilot. The subcarrier (38kc) must be operating. Now measure the amount of 38kc subcarrier appearing in the main channel (as per your monitor).

Next, with modulation: Modulate transmitter 100% (90% + 10% pilot (by feeding out of phase audio signal (L=—R) to left and right audio channels. The modulating frequencies should be at 5kc, 7.5kc, 10kc and 15kc. Measure the subcarrier appearing in the main channel.

Limit: 1% modulation or —40 db.

Final Measurements:

For both the monaural and stereo Proofs, sketch a block diagram of the system, showing the audio levels at major points in the system. Separately, show what the audio input level was for 100%, 50% and 25% modulation. This is the level to the preamplifier input.

Packaging

After all the measurements comes the paper work! For the response and distortion measurements on stereo, one can save paper and time by plotting both channel results on the same graph. That is, left and right channels at 100% plotted together, etc. This will give a quick overall view of the system results also. For the other measurements, a separate sheet is desired. Show the equipment arrangement if it is different, and also describe the method used. When plotting a left and right channel on the same graph, one channel should be drawn in a solid line and the other in a dashed line.

If one is careful to get a good clear explanation of his methods down in the first Proof, the whole Proof can be used as both a guide and manual the next time around. It will show all the required measurements, their limits, and the levels, techniques and hookups.

Each engineer has his own preference on the forms to use, how to draw them up, display his graphs and diagrams. My preference is to file the monaural Proof first, followed by the stereo Proof. In the stereo Proof, the order is carried through as in the monaural; that is response curves followed by distortion plots, etc. The whole Proof should have each page numbered, and either the engineer signs and dates on each page or a front title page. As a final touch, my preference is a manuscript binder bought at a department store for about 10¢. This binds and covers the whole Proof into a neat package.

One final word on the Proofs. File them at the station in a readily accessible place so they can be available for the FCC inspector when he makes the station inspection.

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Collins' new 212V-1 Audio Console, with its 8 mixers and 2 metered program channels, increases a station's capability for high fidelity AM and FM, TV broadcast ng, and program control.

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COMMUNICATION / COMPUTATION / CONTROL

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NAB Convention Report

As the nearly 6,000 delegates to the 47th annual NAB convention swamped the Shoreham and Sheraton Park hotels, there was an air of expectancy. What would the NAB opponents say about censorship, about multiple ownership and about the NAB—NCTA struggle prompted by FCC proposals.

Senator John O. Pastore gave broadcasters an unexpected boost when he lashed out against "FCC harassment" of broadcasters at license renewal time, calling it a disturbing trend. "If the broadcaster is doing all that is required of him," said Pastore, "he should not have his license up for grabs."

He termed CBS's decision not to participate in the NAB prescreening "unfortunate" but noted that CBS president Frank Stanton has assured that the network would intensify its efforts to control violence and sex on the screen.

Pastore gave the NAB Code a powerful boost in his address and reminded that "the Code is a step away from government regulation and a step on the way to self regulation."

Cox Attack

Meanwhile, FCC commissioner Kenneth Cox was telling his audience at the Shoreham that government regulation is and always will be necessary if the public interest is to be served.

Cox warned that the FCC would have to put more emphasis on diversity of ownership if the courts rule against the fairness doctrine. And he added that while the FCC would not evaluate the good or bad of the network convention coverage, it would continue to scrutinize broadcasters for staged news and news management.

And in commenting on license renewals, Cox attacked the stand taken by Wasilewski. Standing in the hotbed he has created by encouraging local groups and individuals to challenge existing licenses at renewal time, Cox said the NAB president's stand was inviting immunity to challenge for broadcast stations.

FCC Commissioner H. Rex Lee . . . Electronic media's vast potential "largely untapped."

Wasilewski Hits Ownership Limit

Vincent Wasilewski hurled charges of his own. "There is," he said, "little factual support for any across-the-board rule which would limit ownership of stations to one type of facility in any given market. There is no evidence of widespread abuses to justify such action. And if abuses occur, they can be handled on a case-by-case basis."

Wasilewski continued, "We must be individually responsible in the operation of our own stations, and we must be collectively responsible through the NAB Codes. The power to set standards and enforce them rests not with the NAB, but with you."

Touching on the CATV issue, he rejected the charge that the NAB wants to kill CATV. Acknowledging CATV's "dangerously destructive potential," Wasilewski said that CATV can and does provide a valuable service to an important segment of the American people. He added that some CATV operators have sought to go into direct and unfair competition with broadcasters whose signal they receive free of charge.

David H. Polinger, WTFM . . . "FM radio can now and in the future, best be served within the framework of an all-radio philosophy."

NAB FM Chairman Pulls Switch on FM

David H. Polinger, WTFM in New York, told an FM session that FM radio can now and in the near future best be served within the framework of an all-radio philosophy. Polinger is chairman of the FM committee of the NAB.

Pressing his point, he called for the dissolution of his committee. As Polinger put it, FM broadcasters are radio broadcasters in the fullest sense of the word. The time is now for FM stations "to find solutions to those problems and needs which they share with all radio while, at the same time, asserting those technical differences which make it unique."

Polinger added that there is no longer a fundamental difference between similarly formatted AM and FM stations. Buoyed by recent FM home set penetration and rising station revenues, he hit the old question: isn't FM really AM but with a better signal?

The other nagging problem is how to get automobile manufacturers to install AM-FM radios in every car leaving Detroit. And meanwhile, at the National Association of FM Broadcasters Convention, the same point had been made by association president Abe Veron. He called for passage of all-channel radio legislation which has been introduced in both houses of Congress to close the FM auto gap.

FCC Commissioner Robert T. Bartley told the NAB that the strength of FM stations lies in the fact that they are locally oriented. He said the FM broadcasters must conscientiously try to determine the needs of their communities. This, he insisted, is not the same thing as finding out what people want to hear.

Satellites to Home 10-15 Years Away Says NASA's Jaffe

Leonard Jaffe, speaking at an engineering luncheon, said that we are 10 to 15 years away from satellites broadcasting directly to home receivers. The holdup at this point is the development of space transmitters that will deliver extremely high ERP.

The results of space communications progress would not replace existing or future commercial TV stations. Jaffe said they would supplement programming with live weather forecasts, but more important, they would be of great value in raising standards in education and social structures of underdeveloped countries.

With the exception of the guess at when this could take place, the talk was a near repeat of the cover story by **Broadcast Engineering** in November, 1968.

Awards

At the same luncheon, Lew Hathaway was given the NAB Engineering Achievement Award. The presentation was made by George W. Bartlett, NAB's vice-president for engineering.

The Distinguished Service Award went to John E. Fetzer at the opening assembly. A Citation of Recognition was given to long-time radio personality Arthur Godfrey at the radio management assembly.

Nixon, Goldwater Address NAB

President Nixon dropped into the NAB convention, but he had little to say about any of the current broadcast issues. Instead, he talked about his concept of the presidency and its operation.

But Nixon did briefly refer to his experiences with the industry. He called himself, "the world's leading expert on what TV can do for a candidate and to a candidate." Talking from experience, he continued, "It is a matter of fact and statement of truth, without question, that this is one of the most powerful groups I could address in the nation."

Senator Barry Goldwater, as well known to many for his years as an amateur radio operator as a politician, spent his address time coming to grips with the war in Vietnam. He said that anyone who knows history knows you can't fight a limited war.

Both sides, he said, must agree to fight only so hard. "Never in my life have I heard of a war being fought like that." Pointing to the Paris peace talks, Goldwater suggested, "Either we have some talk about peace or we're going to go ahead and win this war."

NAB Sessions Feature FCC And Tech Data

Those engineers who missed the NAB convention this year missed quite a lot. They missed the crowd, the safari into the city of exhibits and the session that often featured talks on new equipment.

But typical of conventions of this type, some of the best came at the last when tired feet and red eyes prevailed. It was about an hour before one of the last sessions was to begin when it was discovered that some equipment needed for the demonstration had been stolen from the exhibit area. After a frantic search for replacements, the session on AM Light Line Modulation Monitors got underway.

Led by Fred Zellner, NAB Aural Overmodulation Subcommittee chairman, the session centered on the research that has been going on in the development of light indicating modulation monitors.

Four separate light monitors were spread across the demonstration table. Once fed with a program source, it soon became obvious that here were modulation monitors that could easily be read far beyond the normal few feet. Collins, for instance, used colored light, so that a glance at the colors lit would give a quick reference to the percentage. Others used a horizontal string of white lights, ending with a few red ones to indicate over 100 per cent.

As the audience watched intently the sequential flashing indicator lights, it was announced that an on-the-spot comparison revealed that the light units were more accurate than the VU meter on the same line. It looked a lot like four Thunderbirds signalling for a right hand turn.

The FCC/Industry panel was full of the typical holes in communications that occur when FCC representatives face the industry. Somehow one always comes away without the answers needed or the satisfaction expected.

This time one of the major questions asked was what constitutes remote transmitter operation. The answer was that the transmitter must be in view of the operator. Ingenious staffs can find ways to solve this problem. Mirrors can be used, transmitters can be viewed on monitors, and they can be located at the end of long halls so that they are still in sight.

As pointed out by panel member Ross Beville of Broadcast Electronics (Silver Spring, Md.), the Rules do not make clear what should be seen. When transmitters were being built with look-in front panels, constant direct viewing made more sense. But the Rules still do not state just what must be viewed.

The FCC members of the panel, Wally Johnson, Harold Kassens and Lloyd Smith agreed that engineers need to take more initiative to interpret the rules where they are not specific and detailed. Otherwise, they might become too detailed, creating further restrictions.

But typical of the FCC moves on panels is to pass the buck or to ice it. One engineer in the audience hit the point. He said that the FCC makes the rules, then inspectors write up the station when the rules are not complied with. In other words, we don't need more rules, rather, clarification of the existing rules.

Then when Lloyd Smith was asked why TV was required to pull only an original proof of performance, he answered by saying that he was not aware of the history of this decision. "It may be a case," he said, "where we need to take a serious look at this thing."

Al Chismark, chairman for the panel, did get a specific answer when he asked about calibration of the power output meter. Smith replied that, "Our new rules require

Richard M. Brown, KPOJ and past chairman of the NAB's Radio Code Board (r.), passes chairmanship to WFLA's John Alexander (l.) and receives committee gift.

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that the power meter be calibrated at 80, 100 and 110 per cent."

Smith said that there was an exception to these rules. Some of the older transmitters could not crank up to 110 per cent, so the new rules do provide for them calibrating at a power between 100 and 110 per cent. He added that some kind of permanent marking should be made on the face of the meter.

Then came the question of sign on and sign off. Must the station use kilohertz and megahertz instead of the old kilocycles and megacycles? The FCC's Harold Kassens gave a "no" to this and went on to say that there is nothing in the rules that says a station must use a long sign on or sign off format, including a prayer and the national anthem. Instead, he said, all that is required is the name of the station and the location. Of course the FCC must understand the reason behind a three to five minute opening and closing, regardless of minimal requirements.

Other unanswered questions to the Commission included program quality on network lines and audio compression voided by recording techniques at commercial recording studios.

Inside Sessions

Charles W. Rhodes of Tektronix, Inc., told a radio-TV assembly that the VIT and APL are highly misunderstood. Speaking on measuring color TV distortion, Rhodes said, "Experience with vertical interval test signals in evaluating network transmissions has brought to many engineers' attention that variations in average picture level cause variations in the signal transmission and cause successive measurements made on a VITS basis not to be in agreement to the extent anticipated."

He said that some operators have criticized the VITS technique as unreliable mainly because they do not understand that average picture level, APL, variations in program signal are the cause of measurement uncertainties. "The fact is," he said, "that VITS only demonstrates that transmission quality does not vary during a program."

APL, by Rhodes's definition is the average value of a picture signal, integrated over the time interval of a frame.

Howard H. Ham, Jr. of Moseley Associates, Inc., described a new method for sending composite FM stereo signals from a broadcast studio to the transmitter.

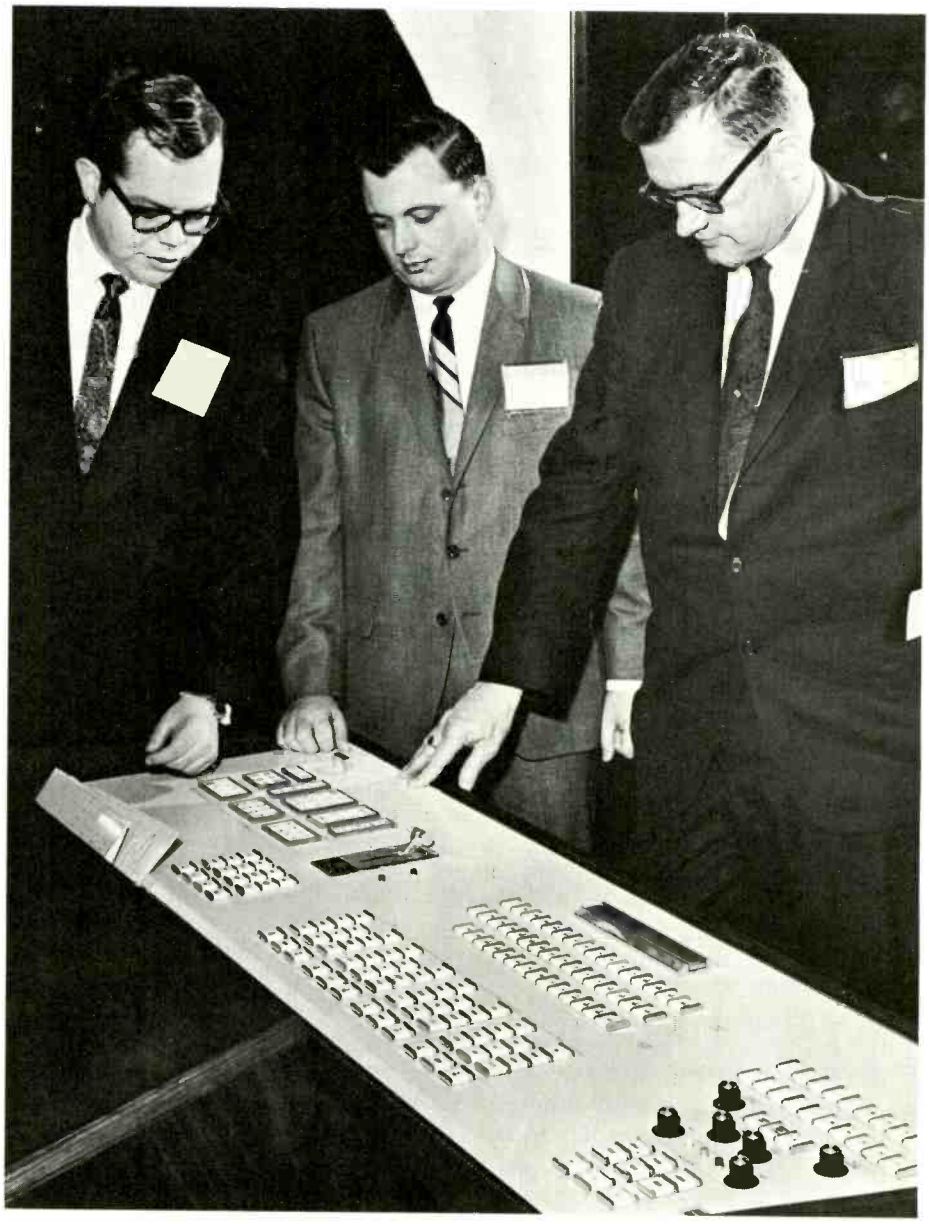
Ham said, "The ever increasing popularity of aural STL's in the 942-952 MHz band serves to point out the fact that there are many advantages in using an aural STL." The obvious and most often considered advantage of an STL system, said Ham, is cost.

"The fact that stereophonic generating equipment can be located at the studio site simplifies the considerations of maintenance and adjustment," he said. "The dual STL," Ham continued, "offers the obvious advantage of redundancy and has, in addition, slightly greater versatility in terms of selection and use of subcarriers.

During the NAB FM day, FCC Field Engineering Bureau chief **Curtis B. Plummer** said that every station should have a preventative maintenance program in order to avoid equipment breakdown.

Noisy gauges, improper gain control or a sloppily run station are examples of a station that lacks a maintenance program.

And Plummer also noted that stations causing interference to television signals create an unfavorable image in a community. This problem, he said, should be evaluated before a station begins operation.



ABC-TV engineers J. Baker and H. Dobrcaski check out console. Sarkes Tarzian's Jim Moneyhun (at left) explains switching.

If interference is being experienced, the FM station should take steps to rectify it.

Plummer said the station should know what is needed to solve the problem and that they should educate the local servicemen. He added that he was not advocating that a station pay for adjustments to the sets.

Serge Bergen, a consulting engineer from Washington, told a technical radio assembly that, "tremendous progress has been achieved in the speed, reliability, and scope of application for computers."

He said that directional antennas, the effect of parameter variations, distance-bearing computations, predictions of AM contours, and FM and TV channel assignments are typical examples of problems solved by computers. Use of computers leads to better analysis of technical problems in broadcasting.

Chairman Hyde Tells NAB That Fairness Is Must

Rosel H. Hyde, chairman of the FCC, told a closing NAB audience that broadcasters had served the public well, but he warned that the times demand extraordinary service. "There is war abroad," he said, "and strife at home. We have not resolved the racial conflicts facing the nation. Rather, we are told that we are a year closer to a tragic division."

Included in this service is the need for the continuance of the Fairness Doctrine. Hyde insisted, "If the license can be used solely for presentation of the licensee's viewpoints, the obvious corollary is to consider what limitations on ownership would be appropriate if licenses had unfettered power to propagandize."

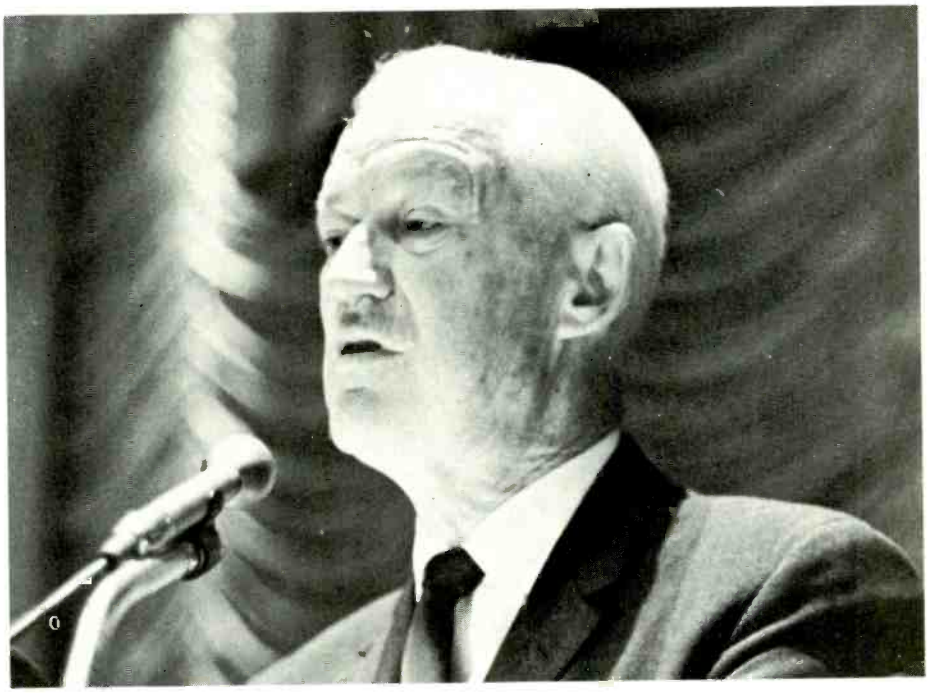
But throughout his address, Hyde praised the broadcast industry for their public service. However, he warned that the preservation of freedom lies in its exercise. Hyde continued, "There is no public good in a merely negative insistence that you be left alone. The public's good lies in your honest reporting and the forum you provide for robust debate on public issues. Your effectiveness in meeting these public needs will be your strongest shield against any impairment of the right of free speech on radio and television."

Hyde concluded by saying that the most significant contribution which broadcasters could make to the public interest in the area of elections would be to offer reduced rates to the candidates.

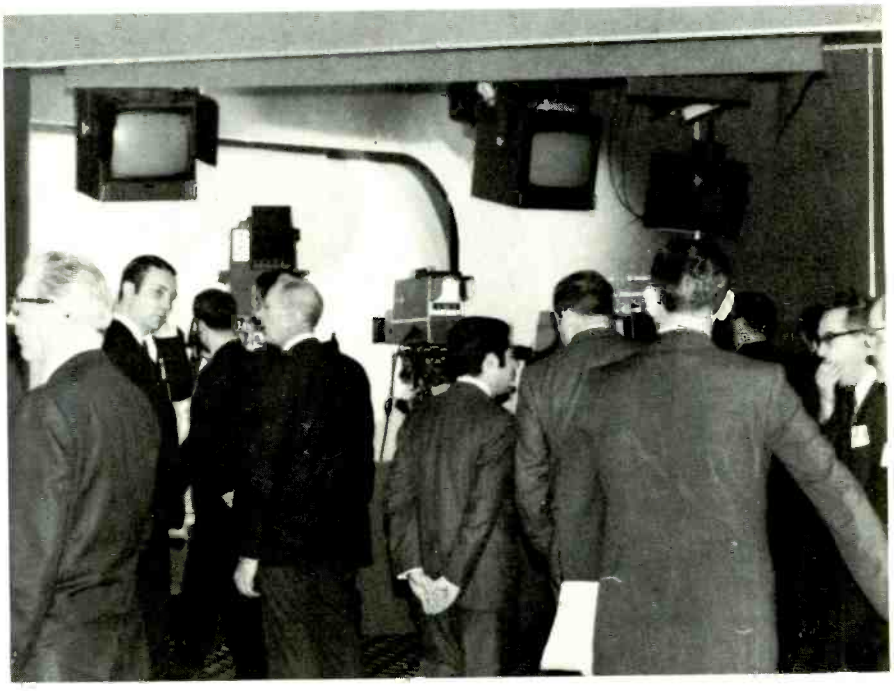
Father Donald F. X. Connolly gave an NAB invocation to end all invocations. Part of it went like this:

"Lord, keep our motives clear, our determination intact, and our goal to make ABC mean 'Always Better Content'; to make CBS mean 'Cause Bigger Smiles'; to make NBC mean 'Never Belittle Challenge'; and to convince the FCC to seek inspiration rather from Aaron the overseer than from Moses the lawmaker."

Fr. Connolly is the coordinator for the National Catholic Office for Radio and Television.



FCC Chairman Rosel H. Hyde . . . "In the hours of crisis, such as the recent assasinations of national leaders, you have served the nation with the greatest distinction."



Crowds of people and monitors looking . . .

Replacing An FM

By Marvin J. Beasley*

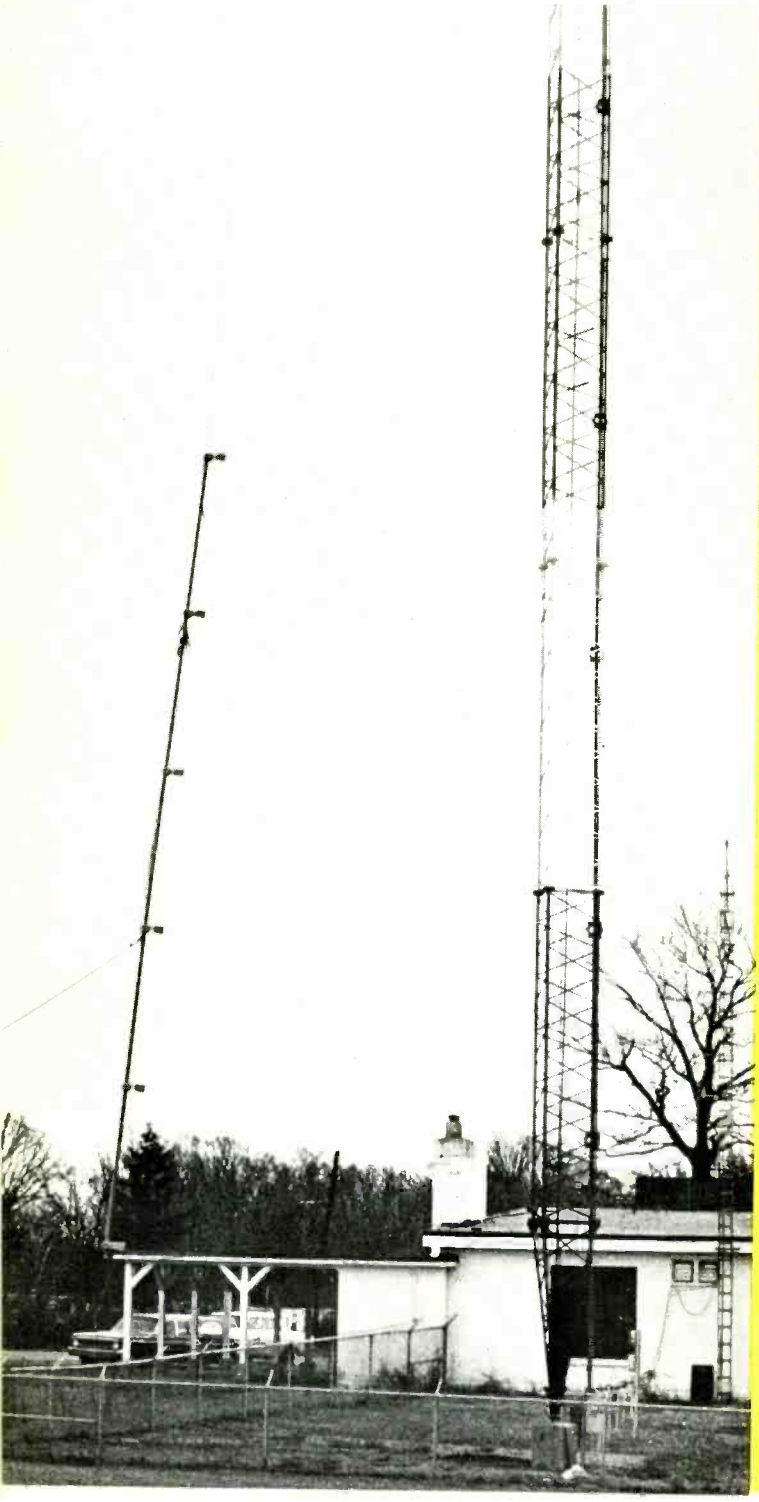


Fig. 1 Fully assembled Cycloid leaving the ground.

Fig. 2 Antenna nearing its final mounting position.

Fig. 3 Thinwall conduit wore enough to come loose from its compression fitting.

Antenna / Part 2 of a 2-Part Series

In Part 1, obtaining a construction permit and organizing a work schedule was discussed. Actual construction, post-construction and paper work will be covered in detail in this part.

If you have your CP from the Commission by the time the antenna arrives, confirm the tentative schedule made with the antenna construction firm and the company contracted to perform the AM antenna resistance measurements. Check all shipments against the original orders to insure that all necessary parts are on hand for construction to begin. Don't forget accessory items such as rigid conduit for additional wiring, a variac to control de-icer voltage, isolation choke, and special transmission adapters to fit the temporary antenna if used. Hold another "think session"; more items will probably have to be added to the list already compiled.

After the construction schedule is finalized, advise the programming department so the listeners can be informed that improvement will be made in the near future. And add an extra day to the contractor's estimate for construction time.

Starting Replacement

When the construction crew arrives and is ready to begin working, instruct the announcer on duty to "sign off." An appropriate announcement should be made as to the reason for leaving the air.

If operation on a temporary antenna has been approved, make the changeover and resume operation. Notify the FCC engineer in charge of the district that construction is commencing under your CP number and that AM power is being measured by the indirect method. Include any other pertinent information. I would suggest sending a telegram and requesting a copy from Western Union for your files.

A member of the engineering staff will need to be present during construction. At times, the engineer will feel like an errand boy, since many small electrical and mechanical items are purchased locally. Many construction crews are afraid to make a decision involving anything out of the ordinary, so a staff member will have to make the decision for them. The engineer's responsibility will include preventing damage to other equipment by the workmen.

Start de-activating the old antenna. In the case of a Pylon, the internal harness should be removed and the slots shorted with heavy braid. If the Pylon has been in use for many years, it may be impossible to remove the harness. If the harness cannot be removed, careful and thorough grounding must be accomplished. The center conductor of the transmission line inside the antenna should be grounded at each bay feed point and at the point where the feed line joined the antenna harness.

The new antenna is sidemounted on the Pylon with the mounting brackets encircling the Pylon. The paint was scraped away to obtain a good bond between the Pylon and the new mounting brackets. The brackets around the Pylon have shorted out the slots, removing any possibility of resonance at this point. Regardless of the type of antenna, make certain that the metal under the mounting brackets is cleaned to allow a good electrical bond between the brackets and the mounting structure.

Flexible heavy braid for grounding and shorting the old antenna can be obtained from automotive supply houses. Do everything pos-

*Chief Engineer, WJBC, WBNQ, Bloomington, Ill.

sible to remove any resonance from the old antenna. It must appear as nothing more than a metal support structure for the new antenna.

Assembly

Most antennas and their associated harness are fully assembled on the ground and then raised into position. Figure 1 shows a fully assembled Cycloid leaving the ground. Figure 2 shows the antenna nearing its final mounting position. The de-icer wiring and conduit is also installed and checked on the ground. See that all bays get warm. If a thermostat is attached, its operation can be checked with the aid of one of the many "freeze-mist" solutions available through most electronic distributors. Of course, if the weather is below freezing, checking the thermostat is no problem.

If possible, the antenna and harness should be pressurized and checked for leaks before it is lifted into position. A special warning is in order concerning the use of conduit among the bays of the antenna. Experience has proven that thinwall conduit is not satisfactory where heavy vibration is anticipated. Instead, flexible plastic covered waterproof conduit and fittings should be used.

Conduit Problems

An example of what happens when a piece of thinwall conduit wears enough to come loose from its compression fitting is shown in Figure 3. The vibration wore the conduit to the point where the compression nut could no longer hold it. The loose end cut the de-icer wires and started swinging in the wind. The RF would then arc over to the conduit when it swung over near the Cyloid ring. Next, the RF would travel from the conduit into the heater elements inside the Cycloid. The result—heater elements destroyed in 4 out of 6 bays, and several hours of air time lost during heater replacements.

Figure 3 shows a short length of flexible conduit that was between the Cycloid bay heater and its junction box where the thinwall conduit connected. The RF burned through the conduit at this point. Unless the arcing is to ground on a Cycloid antenna, the power and SWR meter on the transmitter will not give any unusual readings. The only means of detecting the trouble is by blown de-icer fuses. If not in use, the only other sign will be a brilliant blue flash from the antenna when the arc occurs. Noise will not occur in the transmitted signal because the arcing is not to ground, but from one part of the antenna to another.

The thinwall conduit was replaced with flexible conduit, since vibration does not seem detrimen-

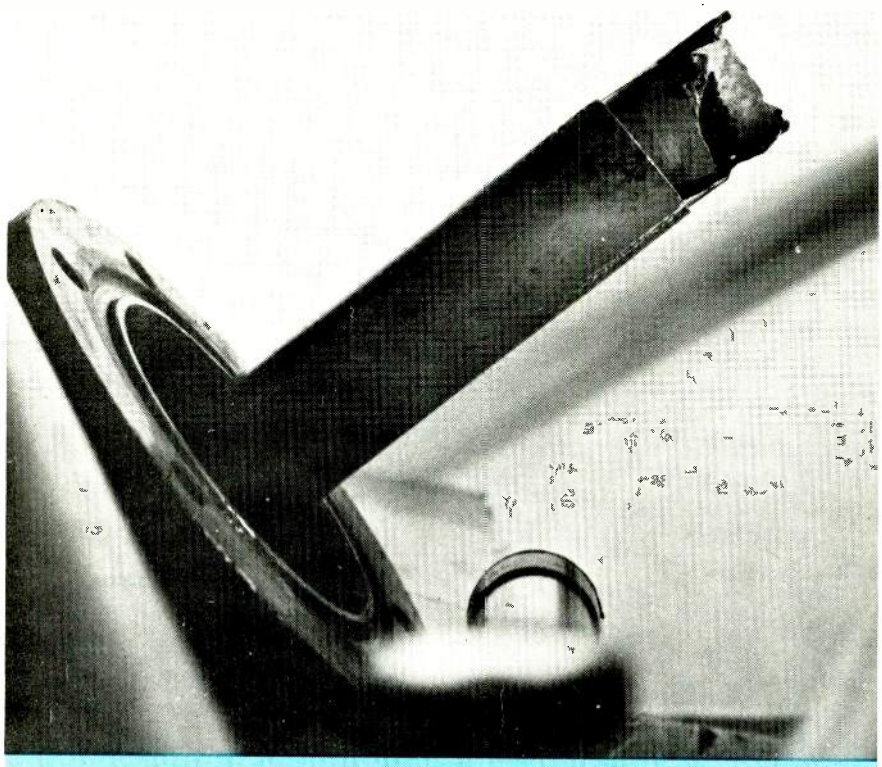


Fig. 4 Vibration damage.

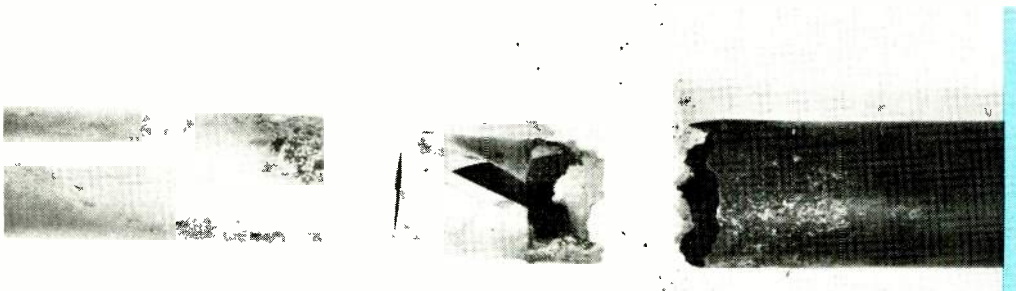


Fig. 5 Further damage due to vibration.

tal to flexible conduit. Regular rigid conduit can be used for the tower run. Insist that a weatherproof junction box be installed at least each 100 feet in the tower run conduit. The junction box makes initial wiring and installation easier and troubleshooting at a later date also is easier.

After the antenna is installed and ready to connect to the existing transmission line, an adapter section may be required that you do not have. Take a spare section of transmission line, cut the required length, and take it to a radiator or welding shop for assistance in brazing the required fittings. The ideal situation is to order the adapter section when the antenna is ordered.

Another example of vibration damage is shown in figures 4 and 5. The burned section of the line was located at the pivot point of the Pylon. The Pylon swings in a circular or figure 8 pattern in high winds. I surmise that the continual twisting motion at the joint caused enough wear to start an arc from insufficient bullet contact. The effect of the wear was degenerative. The more the wear, the more the arcing, until one end of the bullet and about two inches of center conductor disintegrated. The replacement antenna to transmission line adapter was constructed so that the pivot point of the antenna did not appear at a transmission line joint.

After Construction

After the construction is completed, do not sign a release until the complete installation proves satisfactory. Before testing the antenna, the isolation choke for the de-icers should be installed and the AC power applied. Use a variac to operate the de-icers at lower than rated voltages. The de-icers will operate when the temperature falls below a given point even without icing conditions. By lowering the voltage, extended life can be obtained from the heater elements. I usually operate the elements at approximately 80 volts.

The transmitter should be tuned at low power into the antenna. Then raise the power to the point where SWR measurements can be made. If the SWR is within tolerance, raise the power to maximum and keep close watch on the SWR during antenna performance testing. If refinements are necessary, the antenna manufacturer will field tune the antenna for a nominal fee.

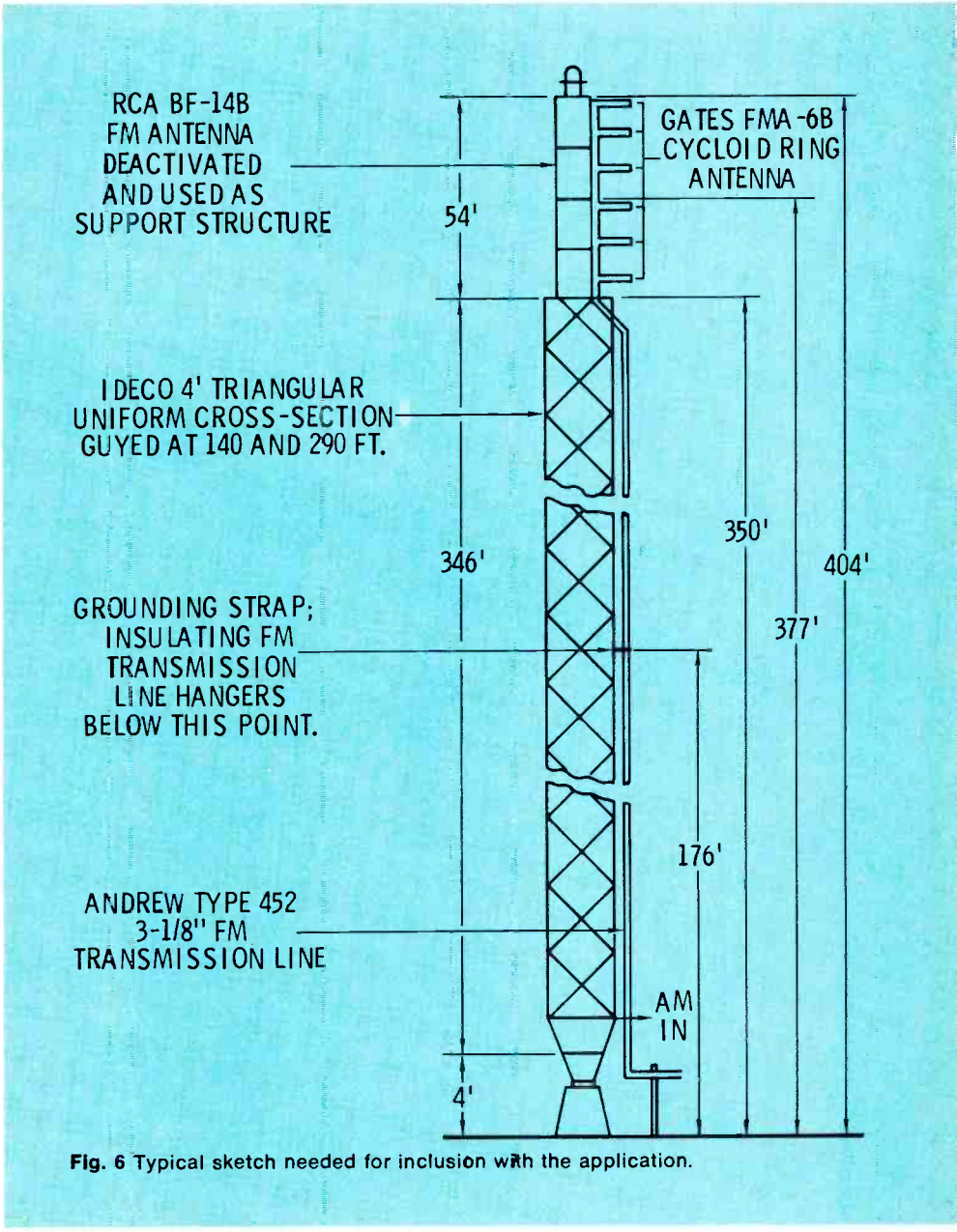


Fig. 6 Typical sketch needed for inclusion with the application.

AM resistance measurements will need to be performed before an application for the FM license can be filed. Two separate interlocking applications will need filing. One for resuming direct power measurements on AM and one for the FM station license. Unless your attorney can speed the processing of the FM license application there will be a long delay before program transmission is authorized (normal processing line delay). WBNQ did receive program authorization within a matter of days. The wording of the request should be worked out with your attorney since each application and circumstance is different. A sketch of the new antenna installation must be filed with the applications. A sample sketch is shown in figure 6. Don't forget to notify the District Engineer in charge when programming is resumed.

The intent of this article has been to assist other engineers in planning an antenna change. Plan carefully, plan ahead, and use your attorney to get better results easier and faster. ▲

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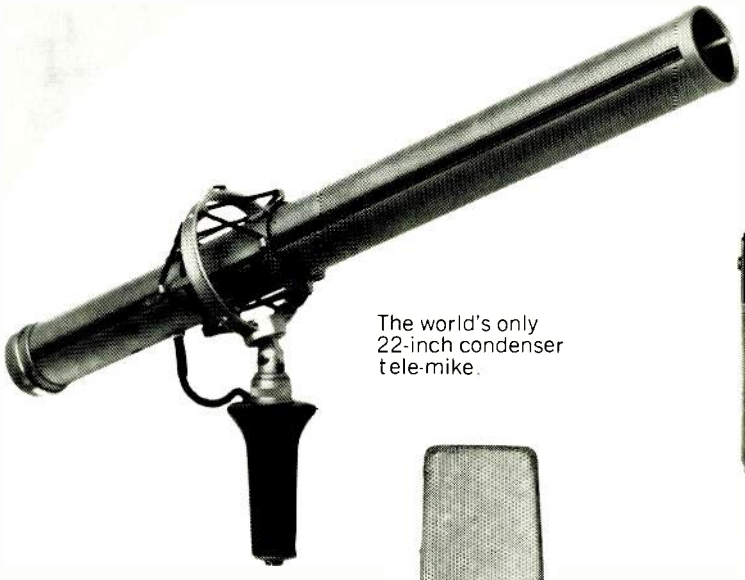

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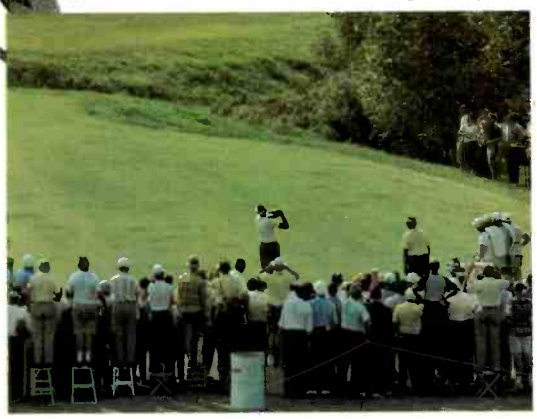

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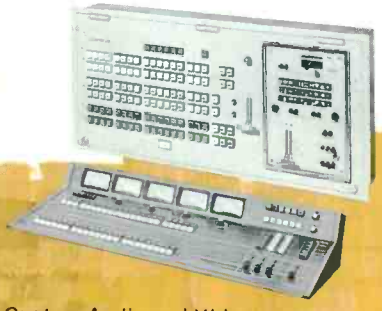

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Direct Current from D.C.

By Howard T. Head

Daytime Obstruction Lighting Proposed For Tall Towers

The Federal Aviation Administration (FAA) has proposed new criteria for obstruction marking and lighting of tall towers and other structures. If the new standards are adopted, daytime high-intensity lighting systems will be required on towers and other obstructions which are 500 feet or more in overall height above ground level. In special cases, this lighting may also be required for structures less than 500 feet above ground.

The aviation interests have long been concerned about the difficulty encountered by pilots in seeing tall radio and television towers and guy wires during daytime hours, especially during periods of marginal visibility. Various systems were tested a number of years ago, but were not adopted at that time because they were ineffective.

The high-intensity lighting system now proposed has been tested on the tower of a television station in Oklahoma City, and it consisted of flashing high-intensity lights operating at various rates. As a result of the tests, the FAA is proposing lights at a minimum of three levels, flashing synchronously at 40 flashes per minute. The effective intensity of each light unit is to be 200,000 candelas, which will be visible in daylight.

The FAA does not have authority under the law to prescribe marking and lighting requirements for radio and television towers, which are completely within the jurisdiction of the FCC. In past cases, however, the Commission has completely followed the lead of the FAA where obstructions to aviation have been involved.

Directional Antenna Maintenance Under Study

The Commission's engineers are turning an increasing amount of attention to maintenance practices followed by radio stations. Particular emphasis is being placed on standard broadcast stations employing directional antenna systems.

Directional antenna license renewal applications are receiving considerably closer scrutiny than in the past, and FCC field inspectors are stepping up their inspection schedules at license renewal time to check field strengths at the licensed monitoring points. Requests for changes in current ratio and phase angle specifications also are receiving closer investigation.

More . . .

This program is bringing to light an increasing number of instances where directional antennas have not been receiving adequate attention from the station's engineering staff. Instances where serious discrepancies are noted in phase and current relationships, or in monitoring point field strengths, skeleton proof of performance and in some instances complete proofs of performance are being requested to establish the directional antenna pattern. In many cases, pattern readjustments are proving necessary.

The Commission's staff also is placing increasing emphasis on non-directional proofs of performance so that the non-directional field strength measurements may be compared with those for directional patterns. In many instances, variations in field strengths have been traced to both short-term and long-term changes in soil attenuation which will affect both types of antenna systems.

The Chief Engineers of stations employing directional antenna systems should make certain that adequate maintenance is given to the antenna system, and should institute a program of regular checks to assure that the system is properly adjusted.

Western Hemisphere To Adopt NTSC Color

The technical Committee of the Inter-American Association of Broadcasters (IAB) has unanimously approved the NTSC system of color television broadcasting for all countries in North and South America. This recommendation now goes to a meeting of the parent body to be held in Peru this summer.

The Commission has announced an inquiry into possible changes in television signal specifications to facilitate the international exchange programs. Of particular interest is the placement of vertical interval test signals in the vertical blanking interval. In the U.S. and Canada, lines 18 and 19 are used for VIT signals.

Court Orders Non-duplication Protection Against Translator Signals

The U.S. Court of Appeals, in a case involving television translators in Laramie, Wyoming, has reversed a Commission decision in which the Commission declined to order television translators to provide network non-duplication protection of a local television broadcast station. The network affiliate in Denver has authorized rebroadcasting of non-network programs, but had held that their network affiliation agreements precluded similar consent for network programs. The Court held that in the absence of rebroadcast permission, translators might not carry the prohibited material.

Howard T. Head

Washington, D.C.

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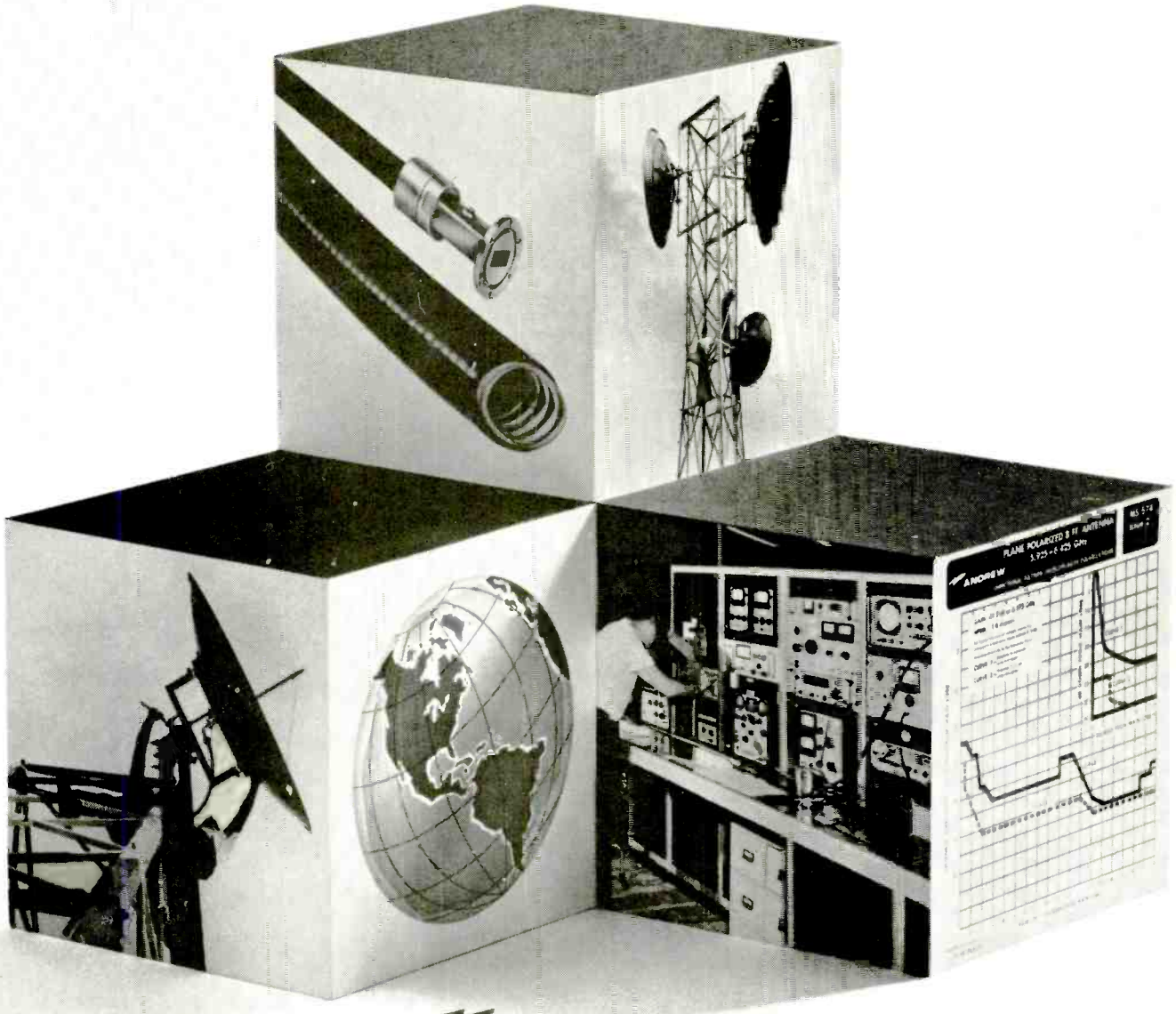

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Circle Item 17 on Tech Data Card

Building an Audio Network Control Unit

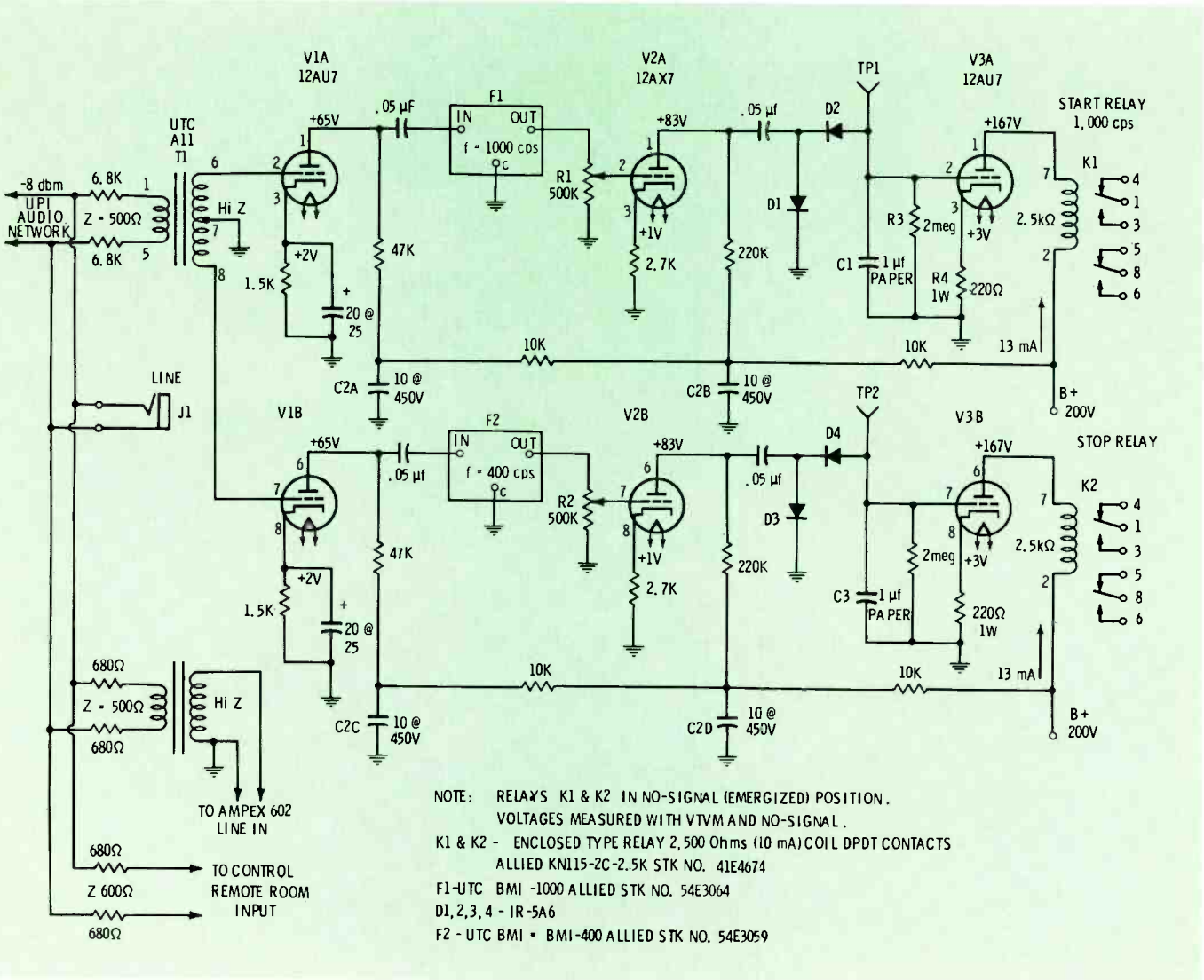
By David H. Schick*

A large number of broadcast stations are on the United Press International (UPI) Audio Network. The member stations receive news reports and actualities at regularly scheduled times throughout the day. In addition, bulletins are sent down the line whenever they occur. The usual procedure at the local station is to have a man standing by the tape recorder to record these transmissions on schedule for later use on the air. In a busy station these scheduled times are often difficult to meet, especially on the weekends when the operating staff may be at a minimum.

It was decided at WGTO that some sort of automated operation of an unattended recorder would be desirable. Several methods were tried with varying degrees of success. This article describes a control unit-recorder combination that has been in use for nearly a year and has proven to be both reliable and simple to operate.

The UPI network has anticipated automated operation by sending audio tones down the line at the beginning and end of each transmission. The transmission starts with 45 seconds of 1000 cycle tone and ends with 45 seconds of 400 cycle tone. The control unit uses these tones to automatically turn the tape

*Chief Engineer, WGTO, Cypress Gardens, Florida.



NOTE: RELAYS K1 & K2 IN NO-SIGNAL (EMERGIZED) POSITION.
VOLTAGES MEASURED WITH VTVM AND NO-SIGNAL.
K1 & K2 - ENCLOSED TYPE RELAY 2,500 Ohms (10 mA) COIL DPDT CONTACTS ALLIED KN115-2C-2.5K STK NO. 41E4674
F1-UTC BMI -1000 ALLIED STK NO. 54E3064
D1,2,3,4 - IR-5A6
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Fig. 1 Amplifier schematic.

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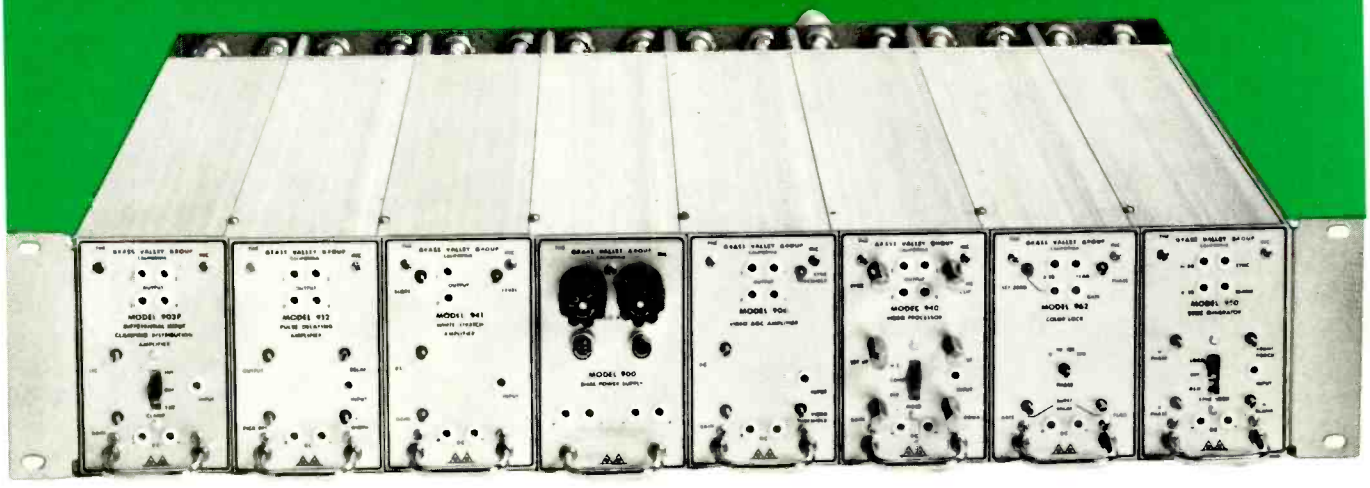

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recorder amplifier on and off and also to control the recorder motor. The unit is used in conjunction with an Ampex 602 that has been modified in a very simple manner.

System Operation

The tape recorder is first loaded with tape and the controls set for operation in the RECORD mode. This includes having the tape transport engaged in the forward-record position, the Line Input set at the proper record level, and the AC switch in the ON position. The system is now in standby position with no AC line voltage supplied to the recorder. When the 1000 cycle START tone is received by the control unit, AC line voltage is supplied to the recorder, and its amplifier warms up to the proper operating level within 15 seconds.

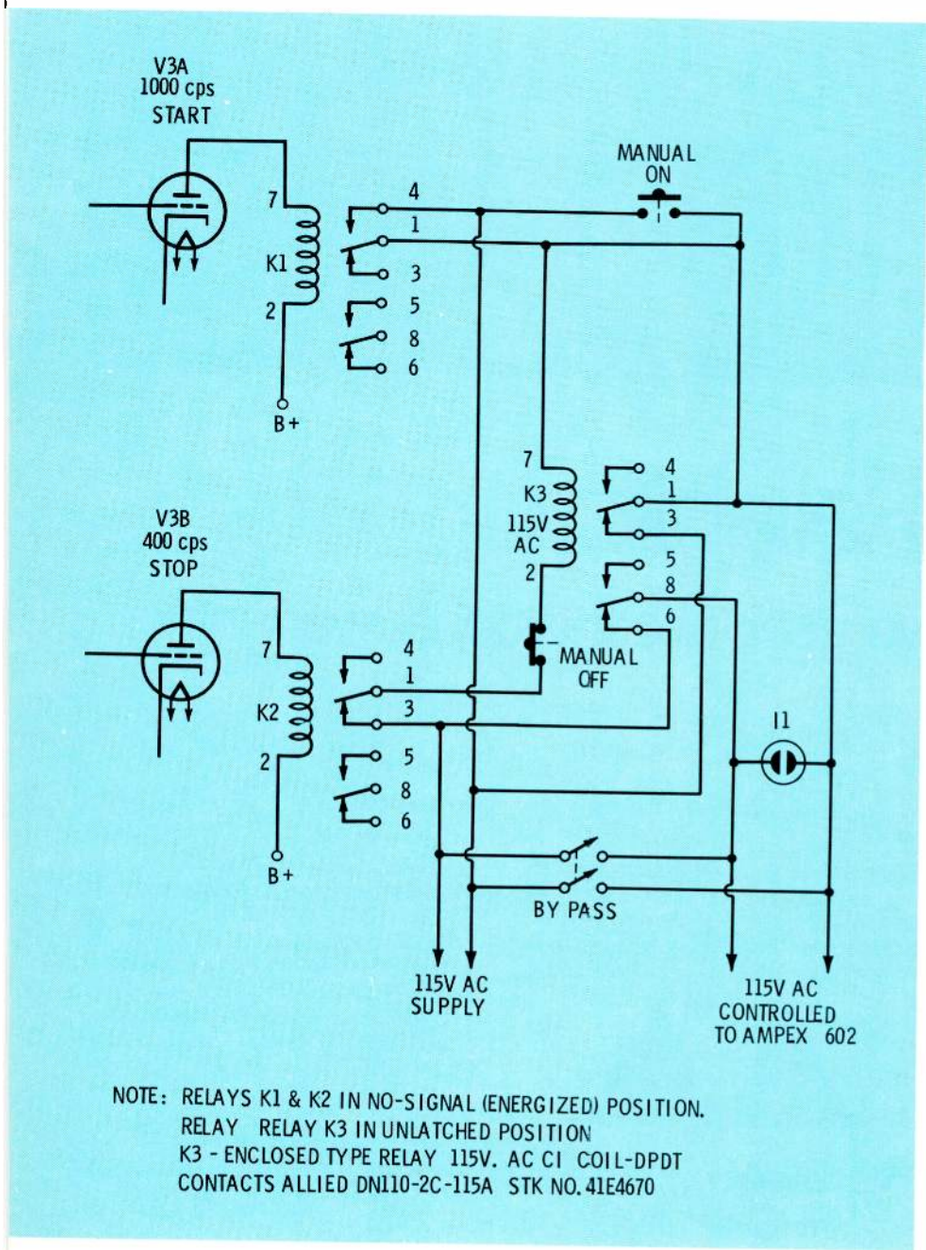


Fig. 2 Relay control schematic.

The tape transport motor will remain off and thus the tape will not move as long as the control unit is receiving the 1000 cycle tone, because the unit also controls the AC voltage to the motor. At the end of 45 seconds the unit will turn on the motor, and the recorder will begin normal recording.

When the transmission has been completed, the 400 cycle STOP tone will be received from the line. At the beginning of this tone, the control unit will turn off the AC line voltage to the recorder and motor, leaving it again in a standby position. Push buttons are provided to manually turn the recorder AC on and off. A bypass switch is also provided to shunt across the control unit in case of a malfunction or when it is desired to rewind a tape while a 400 cycle STOP tone is being received. The control unit operation is explained in three parts; the tube amplifier section, the relay section, and the motor control section.

Amplifier Section

The tube amplifier schematic is illustrated in Figure 1. A tone is received from the network telephone line at a level of —8 db, fed through the bridging resistors, and coupled through the input transformer to the control grids of triodes V1A and V1B. Both triodes amplify the tone and feed a signal to the inputs of filters F1 and F2, highly selective interstage audio filters. They are sharply peaked to one frequency, having approximately 2 db attenuation at plus or minus 3 per cent from center frequency and attenuation of 40 db per octave. The types used are the UTC-BMI-1000 and BMI-400. These same types should be used or an exact equivalent, as they are the most important single parts in this unit. Filter F1 (BMI-1000) will pass the 1000 cycle tone to sensitivity control R1 and to the control grid of triode V2A.

After being amplified further by V2A, the audio signal is now changed by rectifiers D1 and D2 to a negative DC bias voltage and ap-

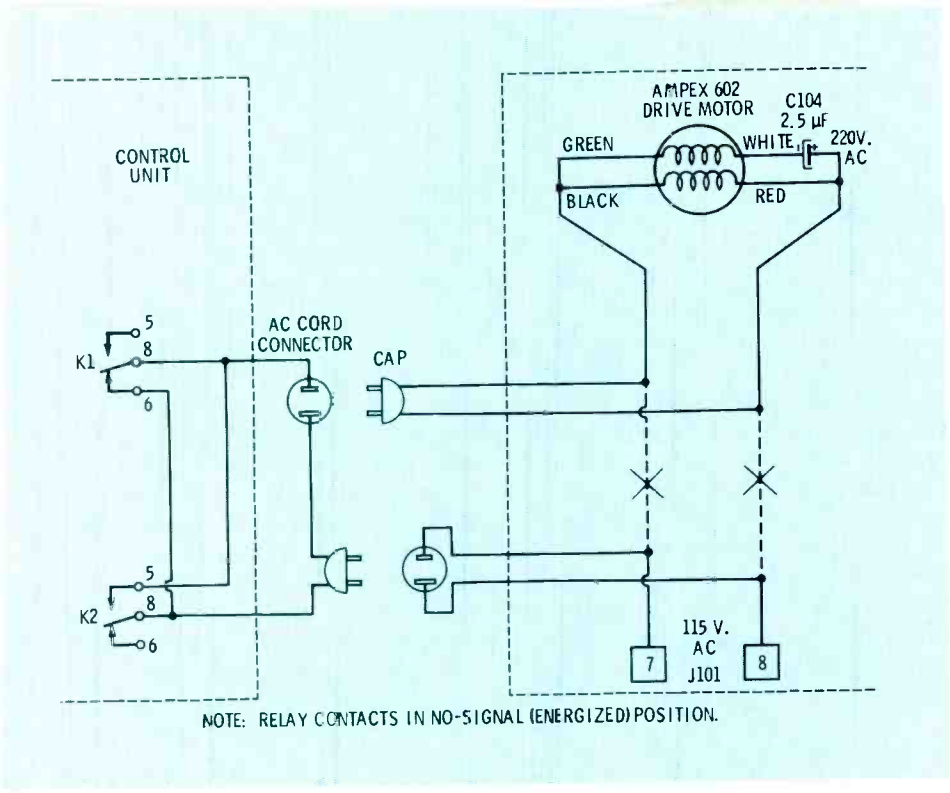


Fig. 3 Control unit connectors for motor control.

plied to RC combination C1 and R3 and the control grid of V3A. In a normal standby (no-signal) condition, V3A will have a plate current of 13 ma. passing through the plate relay coil K1 and the cathode resistor R4. This causes K1 to be normally in an energized (closed) position. Resistor R4 limits the amount of plate current. The explanation thus far also applies to the other triodes sections V1B, V2B, and V3B, with the difference being that filter F2 is now a BMI-400 and sharply tuned so that it will pass only a 400 cycle tone.

Relay Section

The relay section in Figure 2 is set up so that when a 1000 cycle START tone is received, V3A is biased to cut-off by the negative rectified signal voltage and relay K1 will be de-energized, causing contacts 1 and 4 to close. This in turn causes power relay K3 to electrically latch itself closed, since it now completes a circuit to its coil through contacts 1 and 3 on one side and relay K2 contacts 1 and 3 on the other side. When relay K3 closes, it delivers AC line voltage to the recorder through contact 1 and 3 and 6 and 8. Then when a 400 cycle STOP tone is received, V3B is biased to cut-off, causing relay K2 to be de-energized and contacts 1 and 3 to open. Since one side of the K3 coil circuit is opened, relay K3 is then also de-energized (unlatched). AC line voltage is now removed from the recorder.

Motor Control

The motor control circuit is shown in Figure 3. It requires a

Fig. 4 Back of control unit shows control lines.

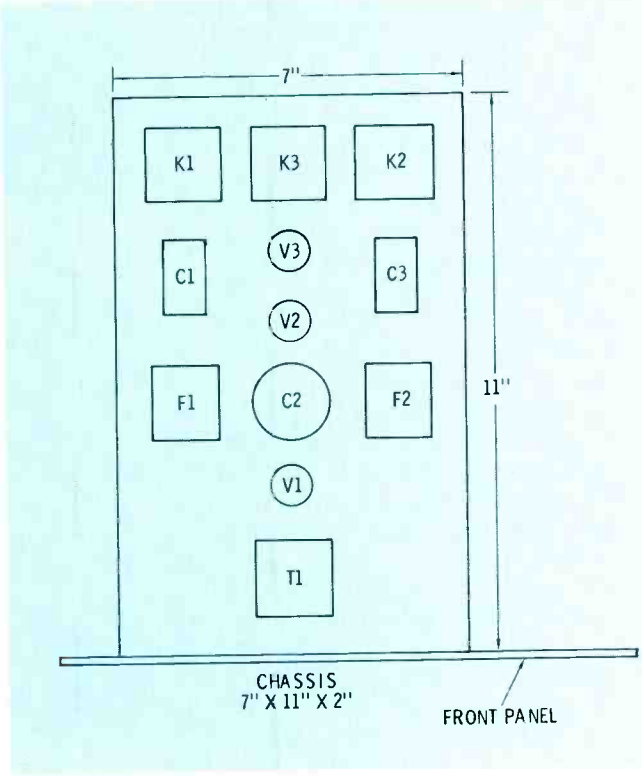


Fig. 5 Component layout on chassis.

modification of the AC wiring inside the recorder case. The AC supply pair to the motor is cut and an extension spliced on so that it extends to about six inches beyond the opening in the lower back of the case. An extension AC pair of the same length is also connected to the motor pair. On the AC supply pair, a female AC socket is installed, and on the motor pair, a male plug. These connectors are illustrated in Figure 4. Another set of AC plugs and sockets are installed on the AC pairs coming from the control unit.

If the recorder is removed from the control unit and used elsewhere, the connectors coming from the case are simply connected together and the motor AC wiring is completed.

With no signal received, the recorder is without AC power. When a 1000 cycle START tone is received, K1 will be de-energized, causing K3 to latch and supply AC voltage to the recorder but not to the motor, since K1 contacts 6 and 8 are now open. When the 45 seconds of 1000 cycle tone ends, K1 will now be energized and AC voltage will be delivered to the motor through closed contacts 6 and 8. The extra wiring to relay K2 contacts 5 and 8 is a precaution in case of failure of the control unit, and both K1 and K2 would be de-energized. In this situation the recorder could be operated manually by clicking the bypass switch to the ON position.

The reason for motor control is to avoid recording the 1000 cycle START tone. The newsman would have to go fast-forward through the tone on each tape in order to get to the text of the transmission.

To adjust the control unit, connect a VTVM between Test Point No. 1 and chassis ground. When a 1000 cycle START tone is received from the network line, advance the sensitivity control, R1, until relay K1 closes and indicator lamp I1 comes on. There should be a reading of about —10 volts on the VTVM. Now advance R1 until there is a reading of —15 volts on the meter. This completes the adjustment of the START side. Next connect the VTVM between Test Point No. 2 and chassis ground. The same adjustment as described above applies to the 400 cycle STOP tone side except that sensitivity control R2 is now used. An audio signal generator with an output of —8 db into 600 ohm can be used for preliminary adjustments, but the final touch-up should be with the network tone signals. The test points and sensitivity controls are mounted on the front panel so that it is convenient to make periodic checks on the bias voltages and the condition of the amplifiers.

The WGTO installation is illustrated in figures 8 and 9. The complete control unit-recorder is mounted in a cart and located in the newsroom next to the teletype machines. The recorder is mounted on top with the control unit conveniently located in the top part of the box base. A small speaker amplifier is placed next to the control unit, and its controls appear on the right side of the panel. This is an added convenience to the newsman so he can listen to a transmission being recorded or play a tape back. The speaker amplifier is not included in this article, but it can be most any small audio amplifier that will drive a 6-inch speaker. The

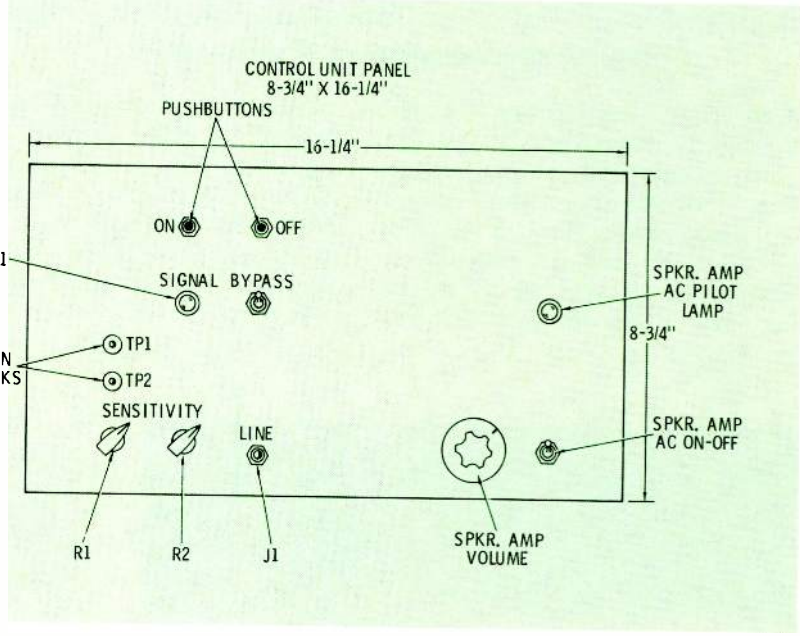


Fig. 6 Control unit panel.

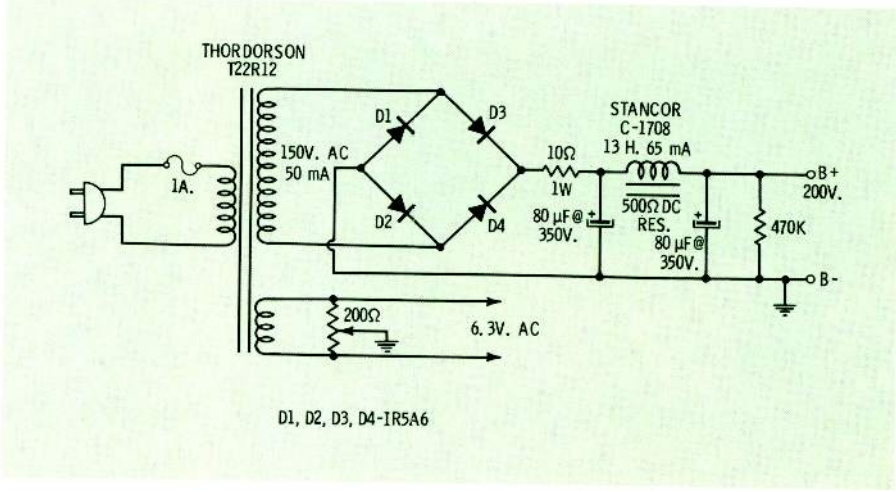


Fig. 7 Control unit power supply.

line output jack on the Ampex 602 is used to feed a signal to this amplifier.

Power Supply

The power supply for the control unit is located in the storage area at the bottom of the cart base box. The power supply schematic is shown in Figure 7. It is conventional and can be most any unit that will supply about 200 volts DC at 35 ma. and heater voltage of 6.3 volts AC at 0.9 Amp. A top view of the layout of the control unit chassis is shown in Figure 5.

Enclosed type plug-in relays are used for reliability over a long period of time and are well worth the small difference in price. The plug-in feature also makes it easy to remove a relay for inspection or replacement.

The panel layout is shown in Figure 6 and it should be noted that the controls are convenient for the operator as well as for testing purposes. In our particular case, we also feed the UPI line to a remote input in our control room consol board. This is an advantage when the UPI network feeds an event live.

Another feature of this is that the announcer can be on the board and listen to what is being recorded by simply punching-up the remote line and putting the remote pot in the CUE position or on the Audition side. There is no AC line switch on the control unit as it is left ON continuously. This tends to stabilize the sensitivity of the amplifiers and is one less switch for the newsman to remember to turn on.

This control unit has proven to be a worthwhile addition to our newsroom. Our news staff can make better use of the UPI audio network and present news programs that appeal to our listeners.

Fig. 8 Unit installed and ready for operation.

Fig. 9 WGTO's CE, David Schick, at the controls.

The switch-hitters

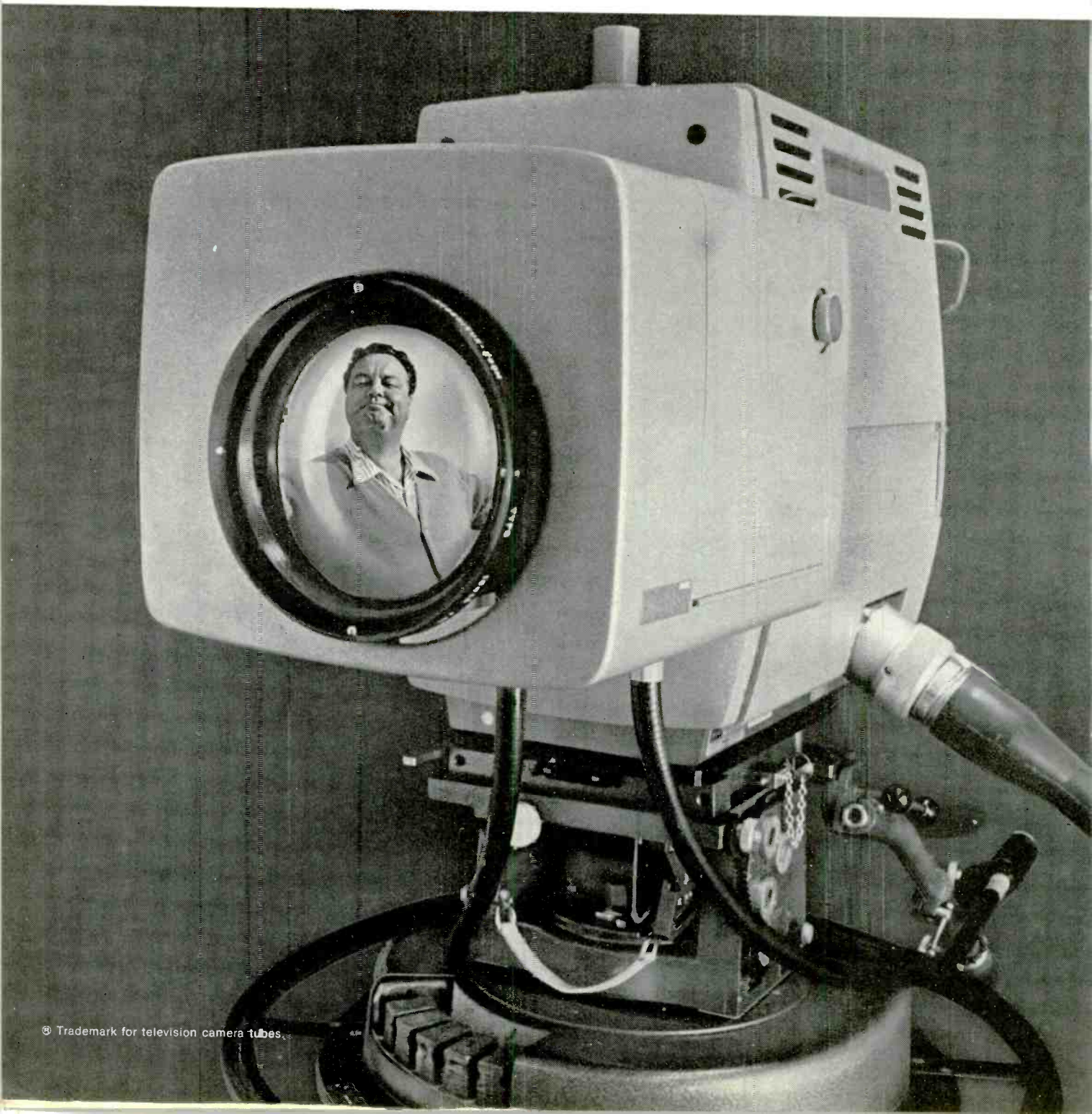
THE PHILIPS PC-70... the prime time king of color cameras ... serves on more live and taped studio color shows, by far, than any other camera.

And it's a fantastic switch-hitter. If the PC-70 is a winner in studio work, in the field it's no contest. For major outdoor news and sports events, the PC-70 consistently takes the most valuable player award.

Why? Its unsurpassed color picture, faithful and sharp. There are over 700 Philips 3-Plumbicon® cameras in use worldwide. A videoman's dream. The cameraman's camera. Management's assurance of the best, most reliable, and most economical performance.

When a better camera is built, Philips will build it.* In the meantime, the PC-70 is the ticket.

*The Philips PC-100, announced at NAB '69, will be available early in 1970.



® Trademark for television camera tubes.

THE PHILIPS PCP-90 digitally controlled "Minicam" takes the field alongside the PC-70 as the most mobile and versatile of portables. Operating wireless or on small, cost-reducing triax, the 3-Plumbicon Minicam brings total flexibility to broadcast-quality telecasting.

The PCP-90 is designed basically as a field camera. Controls may be beamed from as far away as 30 miles. Signal processing is done in the backpack. The Minicam produces a real-time color-composite signal for direct broadcast. Or it can go into the field with a portable recorder to tape interviews or other action—totally unencumbered.

And here again, you have a star switch-hitter. Three new one-inch Philips Plumbicon tubes perform to broadcast standards, bringing the Minicam right into the studio.

Training camps for Minicam prototypes included crowded conventions, major sports, the inauguration and other events. Now it's ready to sign with you.

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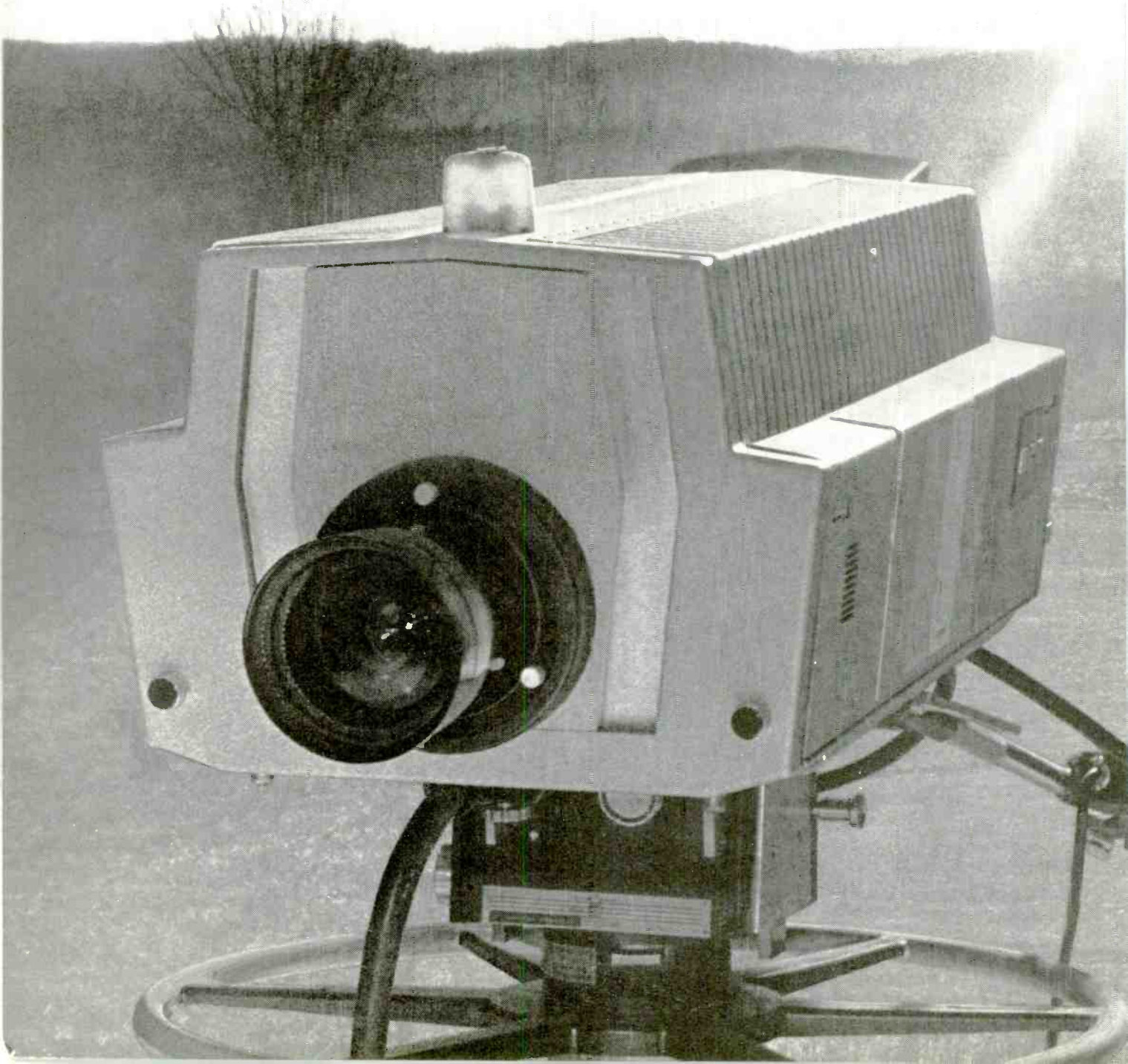
The world's best color camera is the TK-42

Is there anything comparable in 4-tube design? Ask any of the TV stations that own one. The TK-42 is the 4-tube camera with the unique 4½-inch image orthicon for resolution unequalled by any 4-tube camera. It can spotlight the winner in a fast-moving race (that's partly in bright sunlight, partly in deep shadows)—as easily as it delivers the sponsor's goods. Flood it with light—the TK-42 won't let it bloom. Back-light dark-haired performers—they won't turn green (and you won't turn gray). The TK-42. The nearest thing to perfection current technology allows.

For all the reasons why the TK-42 is the world's best 4-tube camera, call your RCA Field Man, or write: RCA Broadcast Equipment, Building 15-5, Camden, New Jersey 08102.

Circle Item 80 on Tech Data Card



The world's best color camera is the TK-44A

The TK-44A is the lighter side of perfection. It's the world's best 3-tube camera. Only 105 pounds (without lens), it's the camera you need for easy-to-handle remotes and studio work. Uses RCA's exclusive "contours with a comb" for color "snap" without raising the noise level. And you can color-match its output to any other camera you own—with RCA's "Chromacomp".

The TK-44A. The 3-tube camera that can equal it hasn't been made yet. And we can prove it.

For all the reasons why the TK-44A is the world's best 3-tube camera, call your RCA Field Man, or write: RCA Broadcast Equipment, Building 15-5, Camden, New Jersey 08102.

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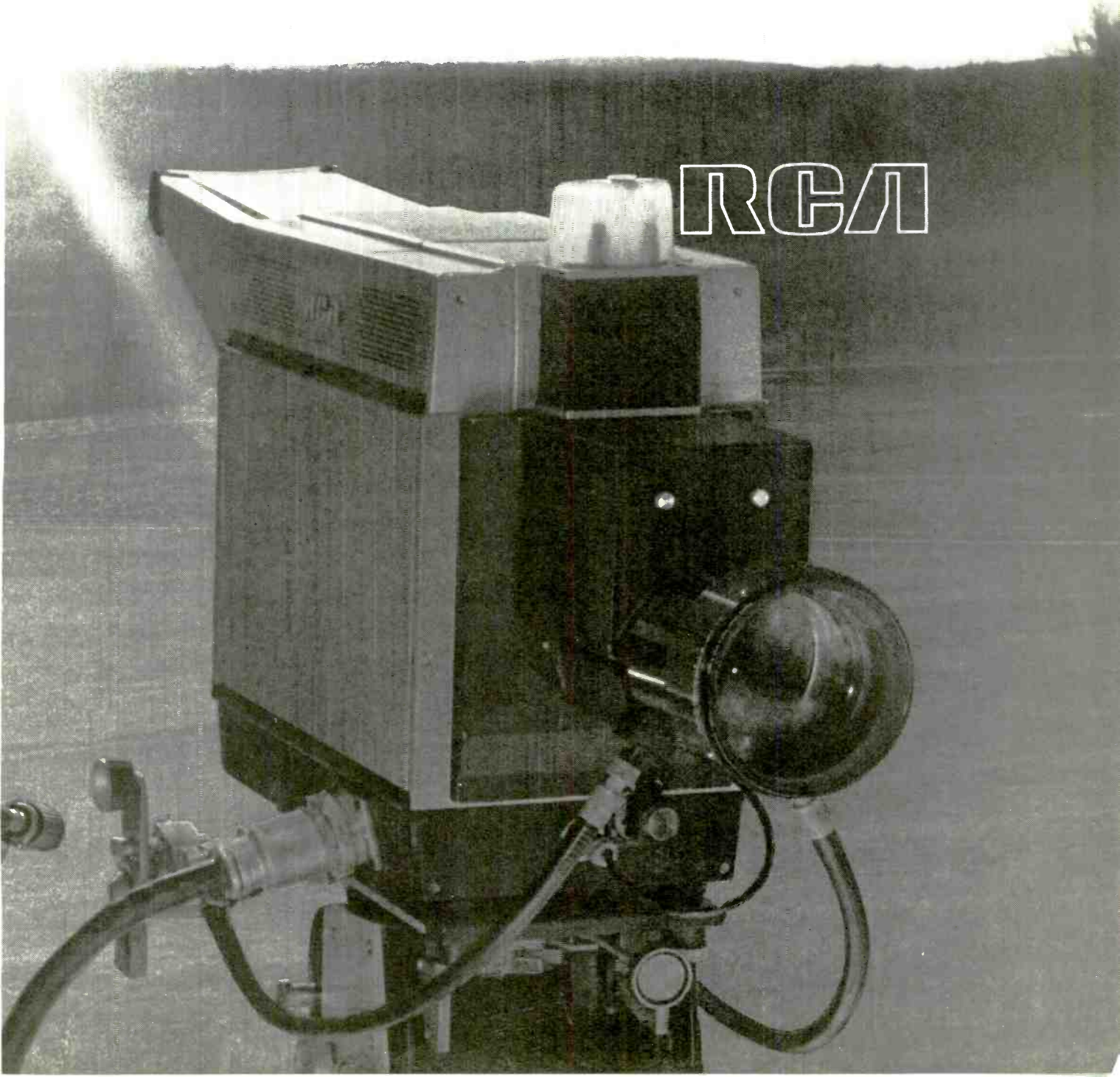


Attention TV Stations:

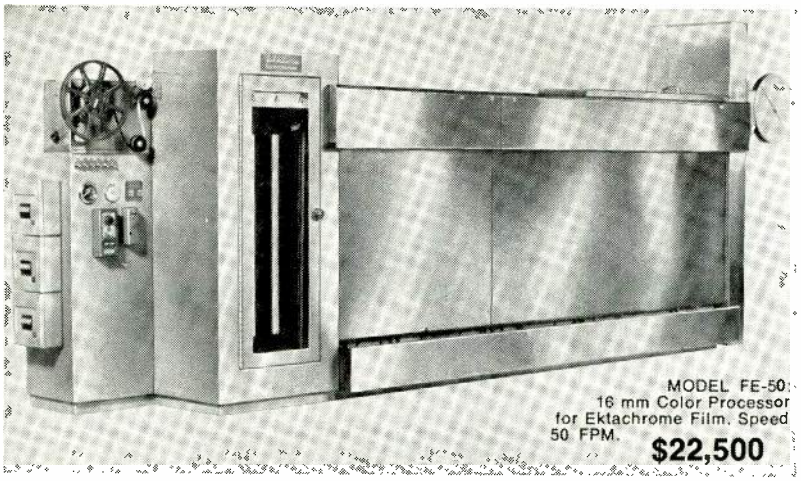
We've got news for you!

FILMLINE'S professional color film processors now available for TV NEWS

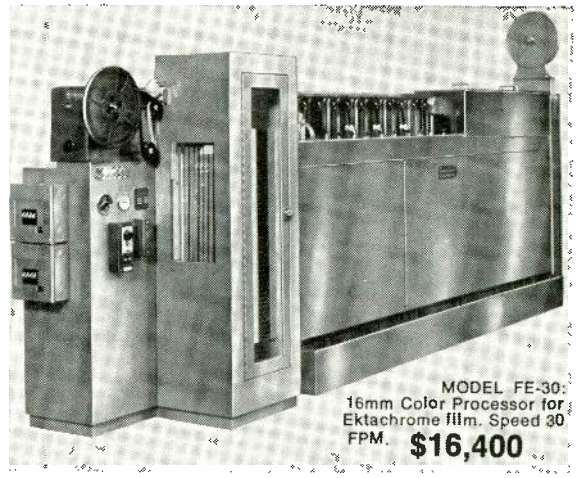
The FILMLINE Models FE-30 and FE-50 are exciting new color film processors designed specifically for use in television station news departments. The design is backed by Filmline's reputation as the world's leading manufacturer of professional film processors for the commercial motion picture laboratory industry.

Now for the first time the television industry can enjoy the benefits of professional caliber equipment incorporating exclusive FILMLINE features that have paced the state-of-the-art in commercial laboratories, at a cost lower than processors offering less.

After you check these exclusive Filmline features you'll want to install a Filmline processor in your news department ***NOW!***



MODEL FE-50: 16 mm Color Processor for Ektachrome Film. Speed 50 FPM. **$22,500**



MODEL FE-30: 16mm Color Processor for Ektachrome film. Speed 30 FPM. **$16,400**

- **"FILMLINE OVERDRIVE FILM TRANSPORT SYSTEM"** This marvel of engineering completely eliminates film breakage, pulled perforations, scratches and operator error. The film can be deliberately stalled in the machine without film breakage or significant change of film footage in solutions. The heart of any film processor is the drive system. No other film drive system such as sprocket drive, bottom drive or simple clutch drives with floating lower assemblies can give you the performance capability of the unique Filmline Overdrive Film Transport System.
- **"TORQUE MOTOR TAKE-UP"** gives you constant film take-up and does not impose any stress or strain on the film itself. Completely independent of the film transport system. This FILMLINE feature is usually found in professional commercial processors but is incorporated on the FE-30 and FE-50 models as standard equipment. Don't settle for less!
- **"TEMP-GUARD"** positive temperature control system. Completely transistorized circuitry insures temperature control to well within processing tolerances. Temp-Guard controls temperatures accurately and without the problems of other systems of lesser sophistication.
- **"TURBO-FLOW"** impingement dryer. Shortens dry-to-dry time, improves film results, and carefully controls humidity content of your valuable (and sometimes rare) originals. Immediate projection capability is assured because the film dries flat without the usual curl associated with other film processors.
- **"ZERO DOWN TIME"** The reputation of any film processor is only as good as its reliability. The combination of the exclusive and special added Filmline features guarantees trouble-free operation with absolute minimum down-time and without continual operator adjustments. Recapture your original investment in 2 years on maintenance savings alone. Filmline's "Push the button and walk-away processing" allows inexperienced operators to turn out highest quality film.
- **"MATERIALS, CONSTRUCTION AND DESIGN"** All Filmline machines are constructed entirely of metal and tanks are type 316 stainless steel, heliarc welded to government specifications. The finest components available are used and rigid quality control standards are maintained.

Compare Filmline features to other processors costing more money. Feature-by-feature, a careful evaluation will convince you that Filmline offers you more for your investment.

Additional Features included in price of machine (Not as extras).

Magazine load, daylight operation ■ Feed-in time delay elevator (completely accessible) ■ Take-up time delay elevator (completely accessible) ■ Red brass bleach tank, shafts, etc. Prehardener solution filter ■ Precision Filmline Venturi air squeegee prior to drybox entry ■ Air vent on prehardener ■ Solid state variable speed D.C. drive main motor ■ Bottom drains and valves on all tanks ■ Extended development time up to two additional camera stops at 50 FPM ■ Pump recirculation of all eight solutions thru spray bars ■ Temperature is sensed in the recirculation line ■ All solutions temperature controlled, no chilled water required ■ Built-in air compressor ■ Captive bottom assemblies assure you constant footage in each solution ■ Change over from standard developing to extended developing can be accomplished in a matter of seconds ■ Impingement dryer allows shorter put through time.

Partial listing of Filmline Color Installations: — NBC- New York, NBC- Washington, NBC- Cleveland, NBC- Chicago, CBS & ABC Networks, Eastman Kodak, Rochester.

Laboratories: De Luxe Labs, General Film Labs (Hollywood), Pathe-Labs, Precision Labs, Mecca Labs, Color Service Co., Capital Film Labs, Byron Film Labs, MGM, Movie Lab, Lab-TV, Technical Film Labs, Telecolor Film Labs, Guffanti Film Labs, A-One Labs, All-service Labs, NASA Cape Kennedy, Ford Motion Picture Labs.

TV Stations: WAPI-TV, KTVI-TV, WXYZ-TV, WTPA-TV, WBTV-TV, WEAT-TV, WMAL-TV, WSYR-TV, WDSU-TV, WVUE-TV, WJXT-TV, WTOP-TV, WAVY-TV, KTAR-TV, WTVR-TV, WFBC-TV, WMAR-TV, WCKT-TV, WAVE-TV, WCPO-TV, WAPA-TV, WCIV-TV, WJIM-TV, WWL-TV, KYW-TV, KETV-TV, WNBQ-TV, KSLA-TV, WSAZ-TV, WHP-TV, WHCT-TV, WTWO-TV.

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Time & Lease Plans Available.

"When you buy quality Filmline Costs Less"

Circle Item 20 on Tech Data Card

For Superior Recordings Only

AKG C-12A Condenser Microphone System

C-12A microphone shown with grille screen removed.

A twin-diaphragm assembly consisting of two one inch non-metalic, gold-vapored diaphragms, mounted back-to-back, account for the C-12A's smooth, flat and effortless sound transmission over a range of 20-20,000 Hz.

Each diaphragm may be independently polarized by a remote switch, thereby permitting selection of directional patterns of omni-directional, cardioid and figure-eight, plus six intermediate patterns.

The variable pattern selection is important in adjusting the microphone to acoustical environments. As an example, it allows for complete control of reverberance by selecting any position between a "tight" cardioid to an "open" omni-directional pattern, depending on the hall, studio or material to be recorded. Or, a cardioid pattern for any soloist may be changed to accommodate a second performer by switching to a figure-eight.

Switching between patterns while in use is absolutely noiseless without clicks or interference.

The diaphragm assembly and a solid-state preamplifier are contained in a compact housing—inconspicuous on stage or television.

The power supply, containing the pattern selector switch and a bass roll-off switch, can be remotely located as far away as 1,000 feet.

Response characteristics, polar patterns and complete technical specifications are available in a 14 page booklet. For your copy, please write today.

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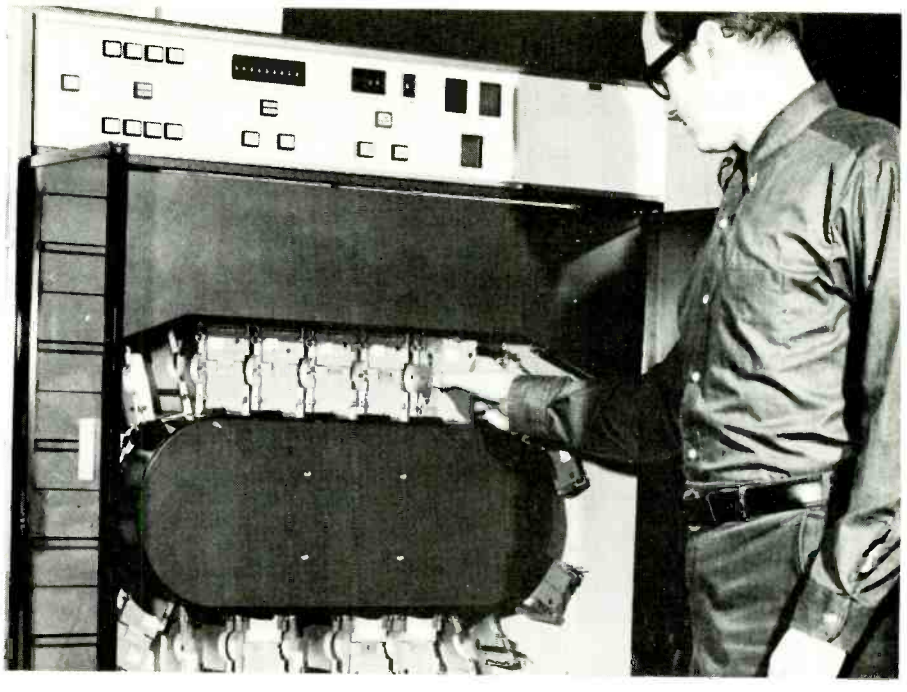
AKG-69

AKG CANADA • DIVISION OF DOUBLE DIAMOND ELECTRONICS • SCARBOROUGH, ONTARIO
Circle Item 21 on Tech Data Card

NEW PRODUCTS



(60)

There was no doubt about it, this year's NAB meet was a buyers convention. Several companies registered new highs for contracts signed at the annual affair. And as reported in the March issue of Broadcast Engineering, there were some manufacturers not willing to spread the word on their new lines before convention time.

Among those commanding previously unannounced new line attention was **RCA.** Offering the TV industry's first system for recording and playback TV programming from video tape cartridges, the company scored high in interest, and demonstrations of the unit continually drew crowds.

The unit can reproduce up to 18 three-minute programs without re-

loading. This would be especially useful in playing back-to-back commercials in a mix with station breaks and promotional announcements in either black-and-white or color. Switching from one video cartridge to another is accomplished in microseconds.

The 18 cartridges are cued up and reproduced in a predetermined sequence, according to instructions given the machine. A small digital computer is built into the cartridge system where it analyzes the status of the electrical and mechanical sub-systems and makes decisions required for automated operation.

Another **RCA** new product development is the TT-30FL 30-kw transmitter. It was developed in conjunction with Westinghouse Broadcasting Company, owners of KDKA.

Reportedly offering an increase in color transmissions by a wide margin, the TT-30FL provides complete redundancy of components, with each 15-kw section capable of sustaining a broadcast signal. Each section of the transmitter uses only five tubes.

(61)

The big news at **Philips Broadcast Equipment Corp.** was the new PC-100 color camera. The all new camera utilizes digital control techniques and a small diameter triaxial cable. The viewfinder is tiltable, rotatable and removable.

The camera lens is optically designed for the 1-inch Plumbicon format, with an f stop of 1.8 and a zoom range of 14 to 140 mm. A special lens mounting design automatically couples internal mechanical drive shafts as well as completing the electrical connections.

Transferral of information between the camera and its camera control unit via lightweight cable is accomplished by multiplexing three channels of information through the cable. The three channels include video, monitor and a tele-command channel. In addition, 100 volts is supplied to the camera through the cable. With this setup, the triaxial cable can be used up to one mile without repeaters.

The PC-100 also uses Philip's patented prism block beam splitter, and features low target capacity, ceramic centering ring, and an anti-comet tail gun.

(62)

Broadcast Electronics, who provided the convention with a taped news call-in service, showed their Spotmaster 500 C combination recorder-playback unit. Taping at 7.5 IPS, the 500 C puts wow and flutter down to 0.2 per cent or less while maintaining a signal to noise ratio of 50 db or better.

The primary cue tone (stop) is 1,000 Hz with two optional cue trips at 150 and 8,000 Hz. Cueing

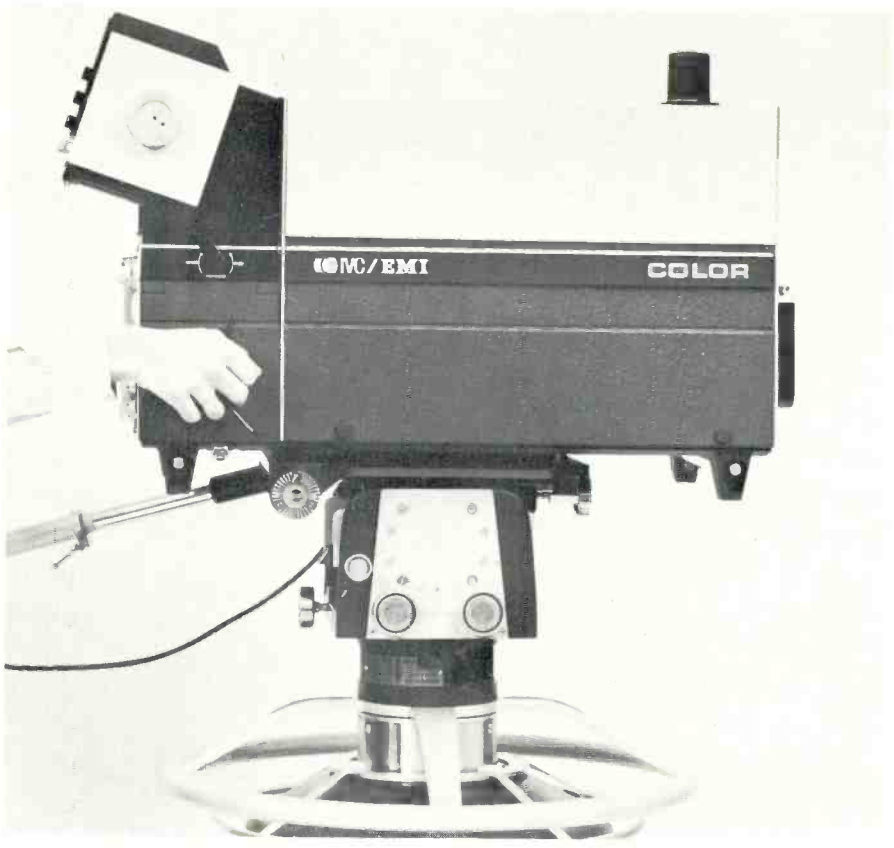
accuracy is 0.1 second and the starting time is 0.05 second. Frequency response is ±3 db 40 to 15,000 Hz.

And the 10 spot and 5 spot push button multiple cartridge decks, the 610B and 605B, are now available. Facilities are provided on the rear panels for remote control and for interconnections between channels so as to permit automatic sequencing from channel.

(63)

International Video Corporation expanded their line of color cameras. The two latest cameras—one with three and one with four Plumbicon tubes—will be manufactured by EMI of Great Britain and sold by IVC. They will be called the IVC/EMI 2001-C and the IVC/EMI 200-B.

The four tube camera provides a separate luminance signal for improved monochrome resolution. By matrixing the luminance signal with the chrominance signals of the three color tubes, Livingston error is reduced.



Circle Item 28 on Tech Data Card

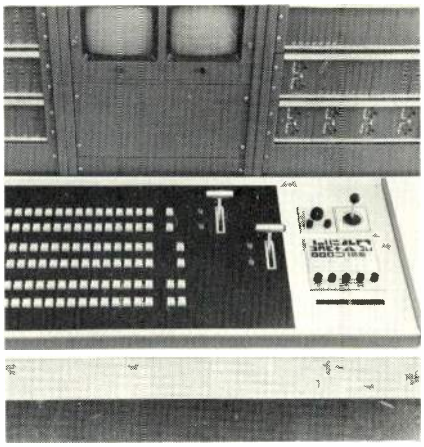
Chrominance and luminance signals are obtained in the normal manner in the three tube camera. A three-way, direct imaging optical system is used. Contour enhancement is built into the camera control unit.

All circuits in both cameras are on plug-in modules and all conductors of the camera cable are accessible at an open terminal array inside the camera and CCU. A selected kit of spare parts is included with each camera. Also, a built-in lens shot box included on both cameras allows pre-programmed lens angles. Shot box zoom rate is continuously adjustable and lenses plug in without optical realignment.

(64)

General Electric introduced a new video production switcher that can be integrated into an automated, computerized television station.

The GE TS-300-A matches the TS-301-A distribution switcher. Both switchers employ computer logic circuits. GE demonstrations included the 115 central computer and the PE-350 color camera.



(65)

Ampex Corporation placed its HS-200 slow-motion disc recording on display, but as much interest was generated by their new transmitter for VHF TV stations, which is the first to employ solid-state RF circuits up to the 75 watt level with a solid-state modulator.

To be known as the TA-8000 series, the transmitter is capable of remote control operation. The TA-8000 amplifiers employ tetrodes designed specifically for VHF frequencies. Thus three basic amplifiers are available, using 1.6, 6, and 18 kw tubes.

Standard features of the new transmitter include FCC frequency tolerance in the visual oscillator, air filters in the air supply to the amplifiers, manual control power circuits and manual differential phase and gain correction.

Also new in the Ampex line is their RA-4000 random access tape controller. The unit automatically permits synchronized search, cue and playback of one or more broadcast videotape recorders. The system may vary from a single, manually controlled machine to an automated, multiple machine system controlled by a computer.

(66)

The **3M Company's** new two-inch magnetic video recording tape was demonstrated. Designed to eliminate windowing and cinching, scratching, capstan slippage and dust generated dropouts, the new tape will be called "Scotch" brand 400.

The new tape is virtually scratch resistant and should essentially eliminate the problem of redeposit on the tape surface, a major cause of dropouts. A 90-minute program can be taped on a single roll.

(67)

CBS Laboratories showed their new Dynamic Presence Equalizer along with other new line units. The 10 pound equalizer, the first of its kind for the broadcast industry, was developed by CBS Laboratories' Acoustics and Magnetics Department.

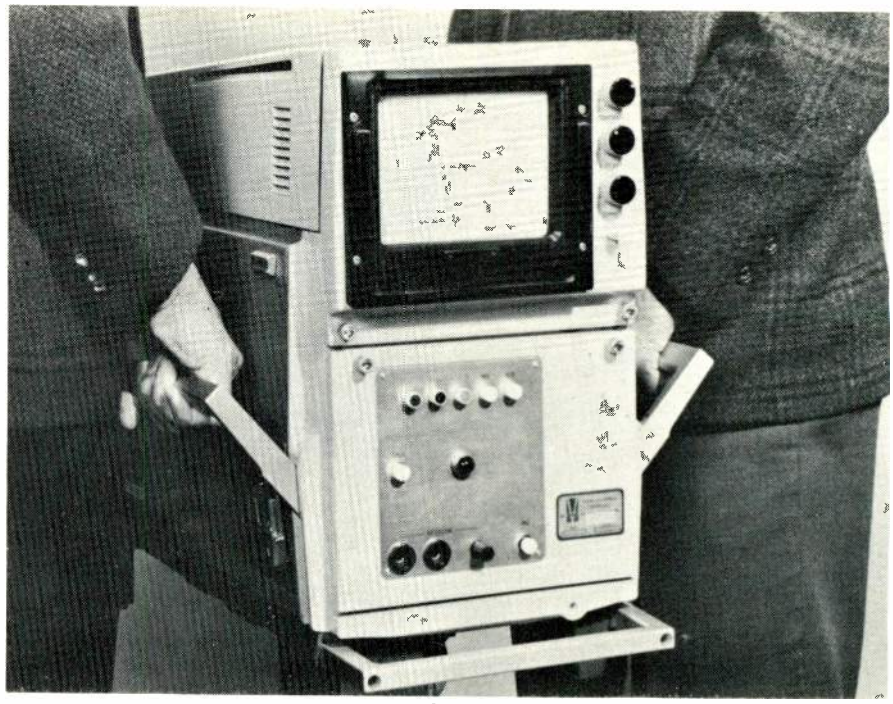
In operation, the equalizer uses precise sensors to examine sound signals automatically on a continuing basis as they are transmitted. When the signal frequency varies or a deficiency is detected, the system equalizes it and makes the proper adjustment to prevent loss of clarity.

Conventional methods of controlling the level and quality are used. But equalization continues automatically, regardless of signal source variations and is always checking for presence.

Other **CBS Labs** units were covered in the March pre-NAB issue.

(68)

Rust Corporation delivered their CPX-10 for convention inspection. The unit is designed to automatically give status and alarm indications of up to 10 status alarm parameters.



(69)

Visual Electronics Corporation used their new VP-3 color camera for live demonstrations of talent. The three-tube Plumbicon camera includes printed circuit yokes mounted in parallel to provide consistent registration.

Featuring integrated circuits and temperature compensating components, the camera head weighs less than 90 pounds.

Visual also demonstrated four video tape recorders and switching and an automatic program control system which includes automatic log printout.

Acting as a central alarm center, the CPX-10 will show status of filaments, plate voltage, building security, main AC power and STL equipment. Including a fail-safe indicator, the alarm system includes visual forward power, aural forward power, visual frequency, aural frequency and water temperature.

The unit is designed for convenient rack mounting.

(70)

American Electronic Laboratories is now ready with their FM-5HB FM broadcast transmitter. The FM-5HB features AEL's new model 2202 solid-state exciter, low distortion one tube design, automatic recycling, one button operation provisions for remote control and circuit breaker protection. The transmitter requires no neutralization.

The new transmitter's optional units include the 2202 stereo generator and the 2204 SCA generator.

(71)

Anderson Laboratories introduced their zero studio delay unit that allows direct switching from a camera or other source to a second source which has been routed through a separate studio.

The unit permits dissolving, wiping and other special effects normally restricted by delay effects. It features 1 H minus studio delay ± 10 nsec. Other features include: bandwidth flat to ± 0.5 db to 4 MHz; output S/N—50 db (peak RMS); differential phase is less than 2 per cent with an input signal level at 1 volt peak.

(72)

Gates Radio Company demonstrated their automatic program logging system in which teletype impulses from first seconds of tape cartridge travel activate a page printer, and the schedule of programs logged are typed directly from the tape cartridge. The system is a direct printout of a complete and permanent program log, recorded automatically.

In addition to the long line of Gates units normally offered was the TV-15 console with a TVS-6 submixer panel. Gates line features included digital logging and accessory monitors and amplifiers.

TeleMation showed their TSG-2000 EIA sync generators. The new line features all digital design, no monostables, no delay lines, and no width or delay adjustment is required. In line with current industry trends, the units rely on integrated circuits.

Dual outputs permit pulse assignment with full standby. Monochrome genlock, color genlock, bardot and sync changeover add-in modules are all available with the TSG-2000 series.

Send releases on new products to: Editor, Broadcast Engineering, 1014 Wyandotte, Kansas City, Mo. 64105.

PEOPLE IN THE NEWS

Powel Crosley, Jr., inventor, engineer, and visionary genius, who died March, 1961 at the age of 74, was posthumously awarded the Broadcast Pioneers' coveted "Hall of Fame" award at a luncheon of the National Association of Broadcasters annual convention in March. Powel was the founder of a major broadcasting company WLW, as well as a radio manufacturing concern in Cincinnati in the early 1920's.

The presentation, made by John T. Murphy, president of Avco Broadcasting Corp. and a past president of the Broadcast Pioneers, was accepted by Mrs. Vaughn E. Montgomery, Jr., niece of the recipient.

Avco is the company originally founded by Crosley. In June, 1945, Crosley Corp. was sold to Aviation Corp., which later became Avco. The company was known as Crosley Broadcasting Corp. until 1966.

Crosley's interest in radio began when he considered the extremely high prices on the early receiving sets, and attempted to find a way to mass produce them so as to place them in everyone's price range. He believed that the key to this lay in finding a way to eliminate the crystal. He succeeded in discovering the key which enabled him to build a radio business that by 1922 made him the largest manufacturer of radio sets and parts in the world.

Convinced that radio sets would sell only if good entertainment were made available, Crosley's activities then expanded to broadcasting. The consequent "entertainment" broadcast came mainly from Crosley's own record collection, from his living room studio, and became WLW, "The Nation's Station." Crosley's goal was to build more and more power into the transmitter so that the production costs would decrease, thus creating more listeners, in the long run. As a result, WLW became the first 5,000 watt, then the

first 50,000 watt, and finally the first and only station authorized to operate temporarily on 500,000 watts.

"Soap operas," now a household phrase, quiz shows, and mystery programs were given to the world by WLW.

In 1938, Crosley went into experimental TV, which paved the way for the emergence of the station which later became WLWT.

The following Federal Communications Commission personnel retired from Government Service on February 28, 1969:

Joseph A. Giammatteo, staff accountant, Economic Studies Division, Common Carrier Bureau. Giammatteo began his Government career in 1930 with the Interstate Commerce Commission. He joined

the FCC in 1935 and held positions in Administrative Service and Safety and Special Radio Services before moving to the Common Carrier Bureau. He has served as chairman and member of the supervisory committee for the FCC credit union.

Mrs. Mildred K. Roberts, chief of the Ownership Section of the Renewal and Transfer Division of the Broadcast Bureau. Mrs. Roberts joined the FCC in 1938 after having held positions with the Reconstruction Finance Corporation, the Farm Credit Administration and the Social Security Board.

Mrs. Eleanor Wells, applications examiner in the Ownership Section of the Renewal and Transfer Division of the Broadcast Bureau. Mrs. Wells has 30 years of Government service—26 with the FCC.

Mrs. Tennys F. Gresham, Broadcast Failities Division of the Broadcast Bureau. Mrs. Gresham had been with the FCC for almost 10 years.

William L. North, engineering assistant to Commissioner Kenneth A. Cox, retired after 30 years of Government service with the FCC. Since joining the FCC in 1939, North has been a field radio inspector, section chief of the wartime Radio Intelligence Division, head of the Portland, Oregon monitoring station and chief of the Frequency Allocation and Treaty Division.

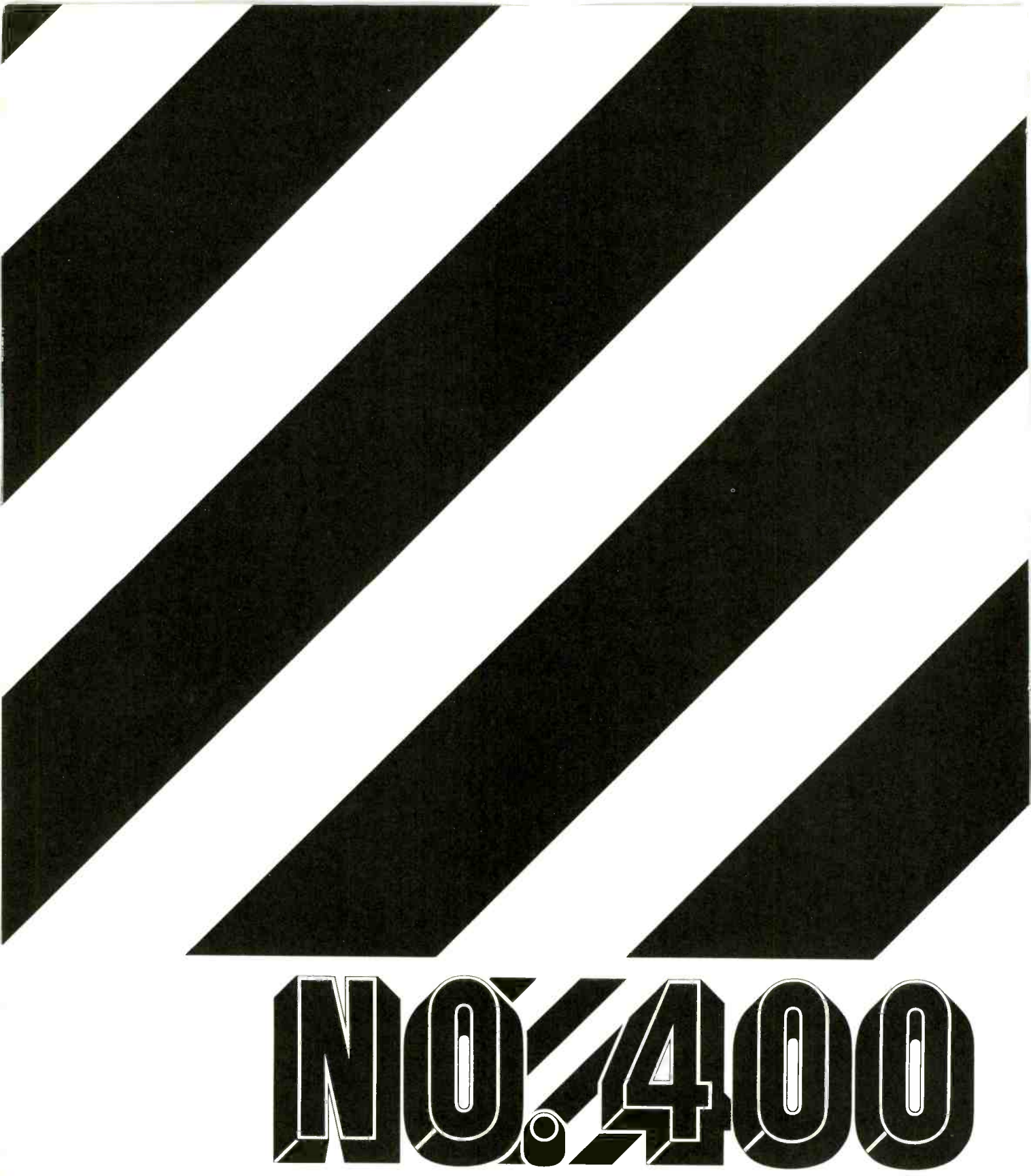
North was appointed engineering assistant to Chairman Newton N. Minow in March, 1961. He joined Commissioner Cox's staff in May, 1963.

Alfred G. de la Croix, an engineer with the Aviation and Marine Division of the Safety and Special Radio Services Bureau, retired after 28 years of Government service—26 with the FCC and two with the United States Navy.

Another retiree is **Daniel B. Hutton,** assistant chief of the Allied Propagation Branch of the Research Division of the Chief Engineer's Office, after 31 years of Government service—18 with the FCC.

FCC chief hearing examiner **James D. Cunningham,** retired after 38 years of Government service. Colonel Cunningham has served with the Commission since it was organized in 1934 and was one of the original group of hearing examiners appointed at the FCC in 1947 when the Administrative Procedures Act went into effect.

During his service as an examiner, Colonel Cunningham presided over a wide range of newsmaking proceedings including the ABC-ITT merger hearings, the recent "Pot Party" inquiry in Chicago, the "Payola" investigation and the first television comparative hearings following lifting of the freeze of VHF frequency assignments.



Guards against cinching.

"Scotch" Brand No. 400 now solves your video tape handling and shipping problems. A new, matte-finish back treatment virtually eliminates cinching, windowing and creasing. Capstan slippage is a thing of the past.

New "Scotch" Brand Color Video Tape guards itself against damage.

Guards against scratching.

The exclusive treatment on "Scotch" Brand No. 400 resists scratching, eliminates polyester redeposits on the oxide surface. Prevents the increase of dropouts and effectively extends tape life.

Guards against dust damage.

This highly conductive treatment reduces static attraction of contaminants that can damage tape and VTR heads. New No. 400 gives you built-in protection, plus performance — the finest value in color video tape.

3M COMPANY

Spectrum Engineering... The Key To Progress

By R. P. Gifford

The Joint Technical Advisory Committee (JTAC) report, "Spectrum Engineering—the Key to Progress," calls for a continued program of "Spectrum Engineering" as the means to realistic progress in spectrum management in lieu of more committees and more patches to be added to the present system. It deals with the national goal of maximizing the effective use of the radio spectrum so that present uses, including national security, transportation, conservation, education, business, entertainment and recreation can be adequately accommodated, and needs for future growth and new uses met. It reveals the urgency of this challenge as it documents the strangulation already occurring in some services due to lack of sufficient frequencies.

"Spectrum Engineering" refers to the technical component of spectrum management.

- It provides the technical basis for disposition of applications for authorization to operate spectrum-using equipment.
- It provides the technical basis for disposition of cases of interference.
- It takes action aimed at reducing the incidence of cases of interference and at the establishment and policing of standards relating to equipment characteristics and users' operating and maintenance practices.
- It collects data by measurement, observation, and questionnaire.
- It conducts technical studies in support of spectrum management.

The three major functions of the spectrum engineering system are: frequency selection, engineering planning, and interference reduction. In performing these functions, the system uses interwoven combinations of three main types of internal activities: analysis of spectrum utilization; building a data base for spectrum utilization; and measurement of spectrum utilization.

The distinctive characteristic of spectrum engineering is its purpose to enable system optimization of the many factors involved in effective utilization of the spectrum resource. In order to determine in what areas present spectrum engineering processes needed to be improved, it was necessary first of all to evaluate them.

The JTAC Subcommittee directed its work towards this objective. The reports of the Working Groups that covered various parts of this activity are contained in the Supplements of the Report. With well over 1000 pages of background information such as these working groups provided, the Subcommittee then formulated the development of a Spectrum Engineering System founded on two basic principles:

First, the system must be evolutionary. The present system's functioning is understood, in varying degrees, by many thousands of people—millions, if licensees' operators and Amateur and Citizens Radio Services licensees are included. Changes in the system must be well thought out and amply foretold, or the continued co-operation of those concerned will simply not be possible. Also, recovery of capital investment in equipment must be

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Ed. Note:

This is a paper presented at the March convention of the IEEE. R.P. Gifford is chairman of the Joint Technical Advisory Committee (JTAC) of the IEEE and the Electronic Industries Association.

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considered in planning for changes. But none of this means that evolution must continue at the snail's pace of the past.

Second, spectrum engineering and management thinking must continue to move away from the concept of controlling spectrum usage through simple but rather restrictive and rigid administrative rules. The movement must be in the direction of increasingly individual technical assessment of applications in different geographic areas under explicitly formulated priority criteria, and under a reduced and more flexible employment of block allocation concepts. This will require much heavier use of analytical and data-processing capabilities in the nation's spectrum engineering than at present. It also implies that objective measures are required for measuring the use being made of channels and that it is necessary to know the applicants' proposed uses.

The User's Role

A would-be user, or renewal applicant, would come in contact with the system's frequency selection activities. Prior to actual submission of the application, the prospective applicant might ask for data from the system to help him plan his intended operations. If he were a land mobile applicant, he might have the help of one of today's unofficial frequency co-ordinators. If he were a TV broadcaster, the FCC Rules would specify the channels on which he could operate.

Other classes of users would also have limited bands within which to seek authorizations, but some of the limitations would be less severe than at present. Government agencies would use the same process, though their contacts with the system would follow suitable inter-department staff action channels.

The frequency selection process would determine the applicant's technical requirements for spectrum and would find one or more ways to "fit him in." The spectrum management function of assignment would authorize him to use one of the ways. The actual frequency selection work might be done by the applicant, with or without the asistance of user association frequency co-ordinators, consulting engineers, or others. Some applicants would leave the work to the system's frequency selection staff.

To support these processes, analytical, data base, and monitoring capabilities considerably beyond those currently operating in the spectrum engineering system will be needed and will be available to the frequency selection staff. A remote console computer system will probably be in use.

Long-Term Influences

While the frequency selection function would be an on-going, day-by-day kind, the engineering planning function would be concerned with long-term influences on spectrum utilization. Engineering planning would include preparing for international conferences on allocation plans, setting standards for allowable off-frequency radiations from transmitters, prescribing procedures and criteria to be used in the frequency selection activities, and analytical procedures for estimating potentialities of interference. It would also provide guidance for the interference reduction activities.

System design to keep the system evolving would be part of the engineering planning function. Analytical, data base, and spectrum field measurement capabilities also will have to be available to the engineering planning staff. The interference reduction function operating on a day-by-day basis, would receive reports of interference, and then investigate and recommend solutions. Monitoring and measurement would be required.

The efforts of the interference reduction function would include:

- Measurement of equipment characteristics for data base.
- Measurement of equipment performance to standards.
- Monitoring for unauthorized or improper use of the spectrum.
- Fostering development of new monitoring equipment.

The interference reduction staff should have access to the same computer system used for frequency selection.

Broadcast Considerations

Now, what could installation of such a system mean to the broadcasting services?

1) It could provide valuable data in planning new stations; the latest propagation data and terrain information on file would make it quite easy to design a station and antenna to cover the desired service area at minimum cost.
2) It would provide a means for the careful sharing of broadcast services with other services, thereby reducing pressure for wholesale channel reallocation.
3) The use of engineered usage and saturation criteria for nonbroadcast services would uncover any under-usage of spectrum; spectrum engineering techniques could then determine means to fully load these frequencies before additional spectrum in other allocations is sought.
4) The data base and improved monitoring facilities would provide for the rapid identification of interference sources leading to the correction of interference.
5) The spectrum engineering facility would have the objectivity, competence and manpower to analyze and evaluate technical proposals for reduction of bandwidth requirements without impairment of quality of the service, whether they applied to broadcast or non-broadcast services.

INDUSTRY CALENDAR

MAY

22-23 The Magnetics Group of the IEEE will hold a Workshop on Applied Magnetics at the Sheraton-Park Hotel in Washington, D.C.

JUNE

8-10 Annual convention of Florida Association of Broadcasters, Thunderbird Motel, Arlington (Jacksonville).

12-14 Spring meeting of Colorado Broadcasters Association at Manor Vail, Vail, Colo.

14-17 Georgia Association of Broadcasters, Inc. summer convention to be held in Savannah.

22-25 18th Annual National Cable Television Association convention and exposition call for papers. Convention will be held at San Francisco Hilton hotel.

22-27 The IEEE Summer Power Meeting sponsored by the IEEE Power Group will be held in Dallas.

FCC Adopts Rule Opening Network Contracts to Public

A rule opening network affiliation contracts to public inspection has been adopted by the FCC. This was done in a report and order on Docket 14710, a proceeding initiated in 1962 and opened for new comments last September in view of legislative and court developments.

"Our action will directly serve the public interest in the fostering and maintaining of a national competitive broadcast structure," the Commission said. "We believe that publication of affiliation contracts will make a major contribution toward this objective. It will enhance and intensify competition among broadcasters and will equip licensees and the public with additional information relevant to the public interest."

The change applies to affiliation contracts filed on or after May 1. Two rules are affected. A subparagraph was added to Section 0.455 (b) of the Rules on Commission organization. This section covers inspection of records filed with the Broadcast Bureau. The new subparagraph specifies network contracts, filed after the effective date of the change, under Section 1.613. This section in the Rules on practice and procedure is on filing of contracts. The provision on network contracts now requires that those filed initially after the rule

change be in one-document form. They may not incorporate past contracts by reference but must be complete, although subsequent ones may simply renew, extend or change contracts filed after the rule change.

Broadcaster comments in 1962 opposed the rule proposal. In an order released last September 20, the Commission again invited comments. Again networks and broadcasters opposed the idea, except for Mutual Broadcasting System Inc., which said that the Public Information Amendments to the Administrative Procedure Act left the Commission no choice but to permit public inspection.

The Commission's original notice of proposed rule making referred to recommendations by Congressional committees and by the Commission Network Study Staff in a 1957 report. Reviving the proposal last September, the Commission noted that since initiating the proceeding it had revised its rules in line with the 1966 Public Information law. These rules require disclosure unless non-disclosure can be justified. In its new report the Commission noted, "In 1967 when the Commission's rules were amended to reflect the new policies . . . for the first time since 1948 network affiliation contracts were not specifically exempted from disclosure."

Discussing the response to its notice, the Commission said, "Most of the commenters say that to require public disclosure of affiliation contracts—particularly network rates—will result in 'competitive injury' to licensee-affiliates without any compensating benefit to the public; that in the commercial community such information is normally handled as confidential and restricted and that 'there is no reason for treating such information differently in broadcasting.' They appear to argue that the same tests should be applied **ipso facto** to the retention and disclosure of information in the field of broadcasting as in ordinary commercial enterprise. This line of argument, of course, is wide of the mark and overlooks the unique nature of broadcasting.

"It is true that business aspects of broadcasting, including rates, are established by private initiative and regulated by the interplay of competitive forces rather than by governmental fiat. It is equally true, however, that simply to be an adequate commercial competitor does not discharge a broadcaster's responsibility as a licensee of this Commission under the Communications Act. The differences between a broadcaster and an ordinary commercial entrepreneur stem from the terms of this license and the nature of his calling."

The Commission saw no probability that making affiliation contracts public would "unduly damage networks and licensees in their legitimate competitive contest."

Answering challenges to its authority to make the rule, the Commission said, "We are fully authorized by the Communications Act to require disclosure of these contracts upon our finding the public interest in broadcasting so requires."

KOMU-TV Plant Saved From Total Disaster By Staff

At 8:42 p.m., March 11, a three-alarm fire erupted at KOMU-TV, six miles south of Columbia, Mo. Soon after 6:30 p.m., March 13, KOMU was broadcasting again. In less than 48 hours, cleanup crews and station personnel had recovered from potential disaster and had put Channel 8 on the air again.

Though operating on only 50,000 watts (one-fifth normal power), it is amazing that KOMU is operating at all. "It's a miracle the building is standing," assistant volunteer fire chief, Patrick Barnes, said the day after the fire. "It was really burning when we got there."

Part of the success in saving the building was the volunteer fire department's quick response to the fire call. A station employee phoned in the alarm at 8:42 p.m., and within eight minutes, 30 men and three trucks were at the scene. Three more trucks and more volunteers arrived minutes later. Firemen brought the blaze under control by about 10:30 p.m., and a small flare-up early the next morning was doused quickly.

The fire broke out in the fan room in the north corner of the building. The cooling fans quickly forced smoke and flames into the adjacent transmitter room, and air conditioning and heating units carried smoke through ducts into the entire building. Two main ducts go directly through the room where the fire started. Soon after the fire broke out, ceiling insulation caught, and flames began eating at the roof, eventually spreading across it. Station engineer, William J. Reagan, said, "I was really surprised when I learned the ceiling insulation was burning. We've got a steel roof and 12-inch Hadite walls. I thought the place was fireproof. Now I know better."

The cause of the fire still is undetermined. Investigators from the station's insurance company, county sheriff's office, city police, Highway Patrol and University of Missouri (owner of the station) are probing for the cause. "There was

(Continued on page 78)

ENGINEER'S EXCHANGE

Since KAPS is located in a smaller market, we have trouble getting adequate service from some of the major record distributors. So, if a particular record becomes scratched or damaged beyond reasonable usefulness, we're almost out of luck.

The problem forms, then, that we must take measures to insure maximum life from the records we do receive. The answer, elementary as it may seem, lies within the hands of the capable engineer. A thorough inspection of each turntable, particularly tone arm and cartridge combination, may reveal hidden clues for any radio station in the same dilemma. A few illustrations show the proper ideals in any turntable installation.

Illustration number one takes in the method of determining the pivot-to-spindle distance. This can be done with the tone arm mounting template supplied with the tone arm. However, with some turntables, getting this template to remain in a perfectly straight, horizontal position is difficult. So, the engineer should measure (and correct, if necessary) this distance. This measurement is most important, as the tracking error is affected. A simple check for proper installation can be made by punching a hole the size of the turntable spindle, and extending its diameter on one side about four inches, drawing perpendicular lines about every half-inch.

Place the stylus of the turntable on the diameter approximately two inches from the center of the spindle hole. If the tone is mounted properly, the perpendicular lines of the diameter will be parallel to the tone arm and cartridge.

Other important considerations include the arm remaining parallel to the turntable surface in all horizontal planes. This is shown in Figure number two. In a model such as a QRK, one should determine what his particular station plays the most—since 45's and 33's each sit at different heights on the turntable. Naturally, the base of the tone arm would be set accordingly (as shown in Figure 2b).

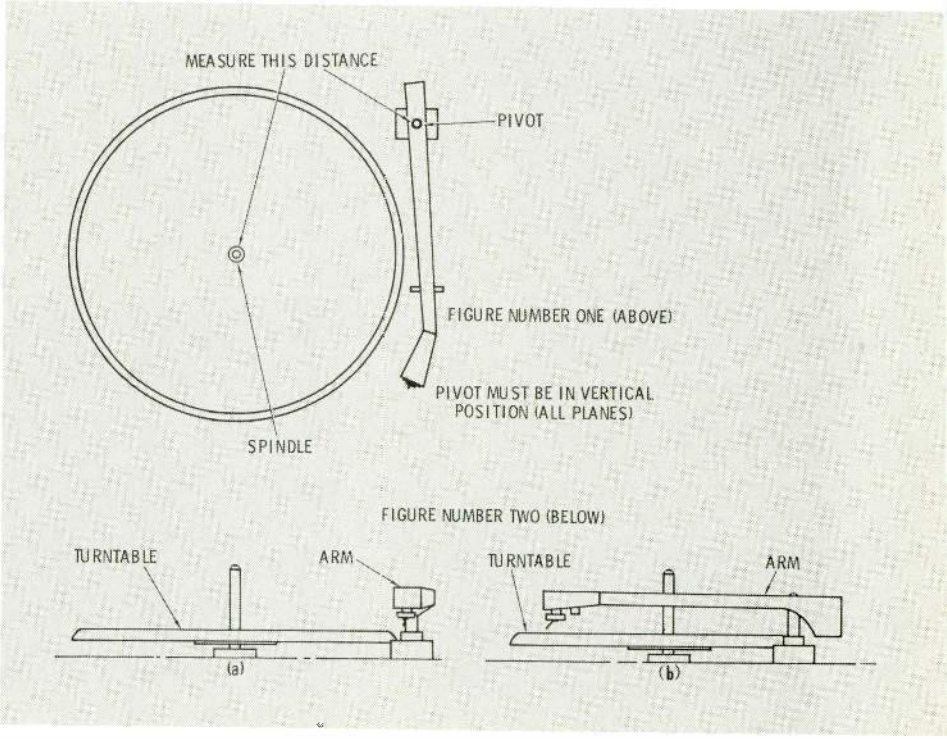
The cartridge mounting should also be checked to see that it sits in the arm according to the manufacturer. Always be sure to follow the instructions in setting the tracking pressure.

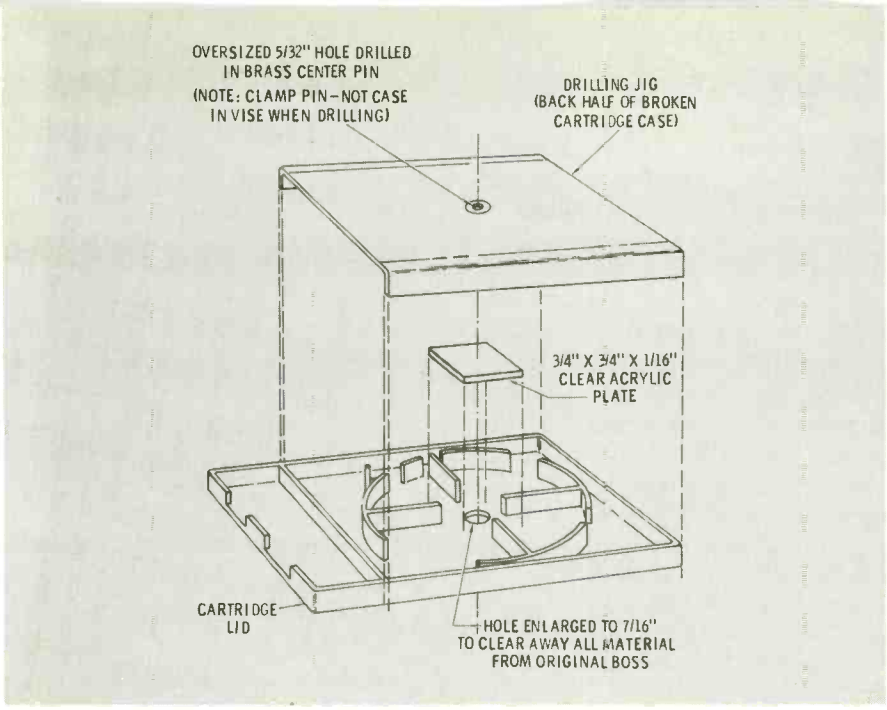
In tone arms that utilize viscous damping, the viscous fluid is of extreme importance—there is no substitute. If there's any doubt, it's a good idea to write the manufacturer of the tone arm for some fluid; it's very inexpensive. Proper adjustment will also aid in tracking distorted or "warped" records.

With properly installed tone arms, a radio station can avoid the problem of scratchy or skipping records. It really is worth the effort.

David P. Hebert
Chief Engineer, KAPS
Mount Vernon, Washington

Ed. Note: Got any tips you think would help solve other nagging problems? Any worthy shortcuts? A better electronic mouse trap? Send your tips to The Editor, Broadcast Engineering, 1014 Wyandotte, Kansas City, Mo., 64105.





Here's a little trick we found seems to work out pretty well for salvaging those many cartridge lids with the screw hole broken out.

One of the most common problems encountered with tape cartridges is the tendency for the screw hole in the lid to tear out, making it impossible to hold the lid on the case. Our earlier efforts used Scotch tape around the cartridge, but with the arrival of our 55 cartridge player, we soon found another answer necessary, since the tape gummed up the tape-handling mechanism.

We finally settled on the following approach: We first drill out the hole in the lid to about 7/16 to 1/2 inch. This clears away the original spacing boss. We ordered some clear acrylite plates ¾ by ¾ by 1/16 inch. These are then cemented to the underside of the hole wtih Ethylene Dichloride Plastic cement (which attacks both the Styrene of the Cartridge, and the Acrylite plates). When it has set solidly, we have only to drill and countersink a new bolt hole.

To simplify the hole location, we made up a drilling jig from the bottom half of a cartridge which had run afoul of the cartridge chewing habits of the above noted 55 player. We drilled a slightly oversized hole (5/32 in dia.) down through the brass center pin in the case, using the original threaded hole in the pin as a guide.

When we place this jig on a lid, we then drill up through the bottom of both, assuring proper location of the bolt hole. Counter sinking the hole from the top side completes the job. The 1/16th thickness of the plate varies a bit from sheet to sheet. You might have to handpick plates of the right thickness. Normal variation seems to be about ±20 thousandths of an inch. A light wash coat of the area with Ethylene Dichloride removes the rough edges, and when dry, the lid is as good as new.

Both the Acrylite and Ethylene Dichloride are available from: McClarin Plastics, Inc. P.O. Box 168, Hanover, Penna. 17331. They were quite helpful not only in supplying the material, but in locating an appropriate solvent.

Our batch of plates cost something like $15.00 for almost 400 pieces, including cutting costs. Considering that a new cartridge runs about $2.50 to $3.00 each, if a station can repair about a half dozen lids, thereby restoring instead of rebuying, they're ahead of the game. So far, I can't find anyone who wants to sell replacement cartridge parts—lids, cases, etc. About the only thing they do want to peddle are pressure pads, and I suspect only because some important improvements have been made since the outset, thereby rendering the old style obsolete to even the most stubborn manufacturer. Anyway, it's working for us—hope it helps elsewhere.

George Jennings
Chief Engineer, WCMB
Harrisburg, Pa.

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no apparent ignition source," Barnes said. "There were no electric lines nor flammable liquids at the point of origin"—apparently a pile of papers in one corner of the fan room.

As the fire spread, electric circuits shorted and chemicals exploded, compounding the problems firemen faced. Immediately after receiving the alarm, Barnes called the Boone County Rural Electric Cooperative to cut power to the building. The electric company, escorted by sheriff's cars, arrived about 20 minutes after firemen. During the interim, firemen fought the blaze with water. Two firemen who are licensed engineers entered the building "super-charged with electricity" to throw as many circuit breakers as possible before all power was cut. Complicating the situation further was the toxic atmosphere created by gases given off by burning chemicals. Firemen were forced to use self-contained breathing apparatus. "It was one hell of a hot, dirty fire," said Dave McConnell, fireman, licensed engineer and former KOMU employee, who was instrumental in initial fire-fighting efforts.

Except for minor injuries from dripping tar and broken glass, only one fireman was injured when he suffered a severe electric shock, but he was back on the job minutes later. Barnes said the volunteers sensed the importance of their job to put out a fire threatening to destroy a public service outlet. "All the fellows had that uppermost in their minds."

Another major factor in saving KOMU was the station staff's response. "They acted like sane individuals and did a heck of a good job," Barnes commented. After reporting the fire, personnel left the building quickly, taking as much equipment as they could carry. On the way out, they threw as many circuit breakers as possible and

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closed the doors behind them. When trucks arrived, the staff had placed a marker on the highway to indicate the driveway, and one person with a flashlight pointed out the hydrant. The staff is composed of full-time professionals and students at the University of Missouri School of Journalism. The station serves as a laboratory for broadcast majors.

Most of the actual fire damage was confined to the fan room, where about $50,000 in spare parts was lost. The building and equipment suffered from smoke and water damage, but spare parts accumulated for it since the station opened in 1953 were destroyed. Engineers had to disassemble and dry out the transmitter parts and then reassemble it for testing, replacing ruined parts with others borrowed from major electrical outlets. Their main concern was getting the driver working.

Because the transmitter is being repaired in a step-by-step process, service may be interrupted occassionally, as was the case March 14, when a short circuit curtailed broadcasting throughout the evening. A KOMU spokesman said such interruptions will be likely for the next few weeks.

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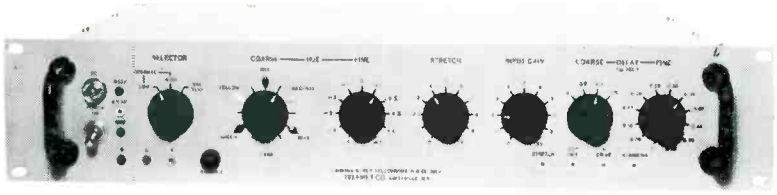

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