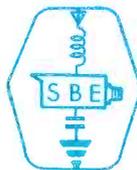


JOURNAL

OF THE

SOCIETY OF BROADCAST ENGINEERS



VOLUME THREE

NUMBER ONE

JUNE 1966

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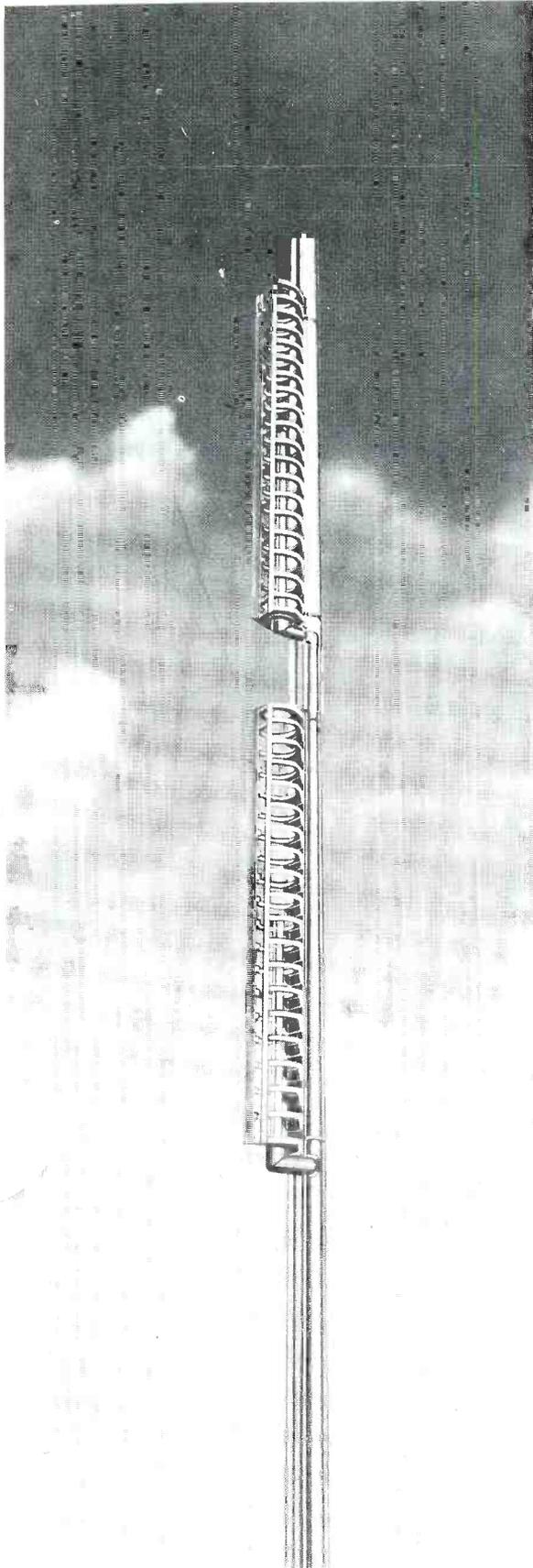
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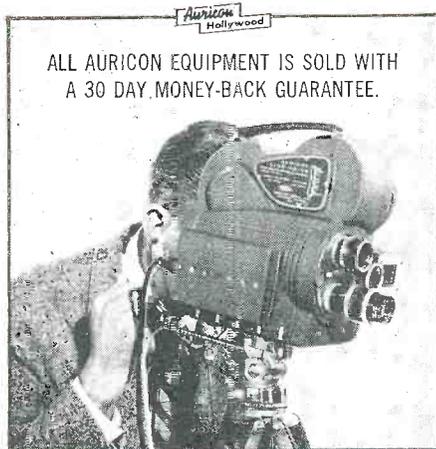
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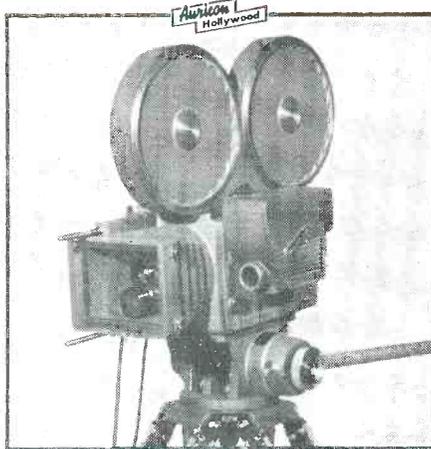
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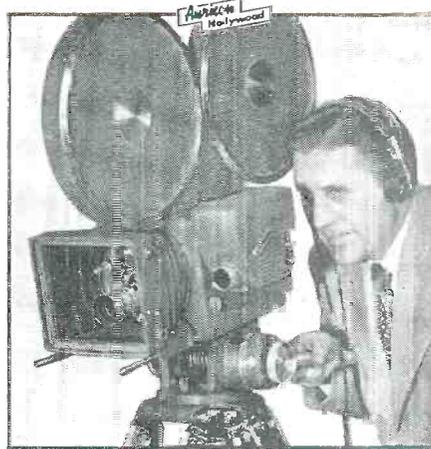


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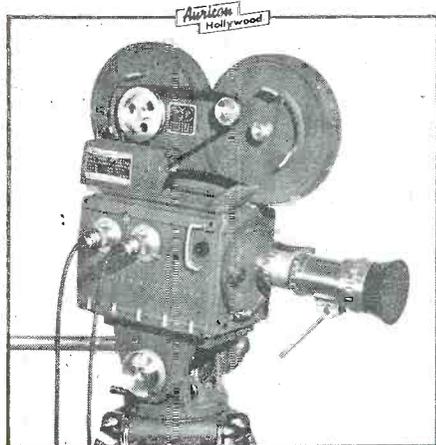
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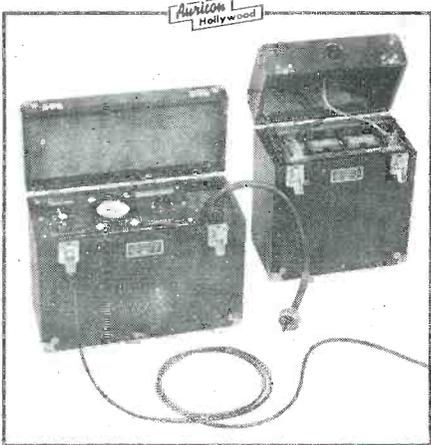
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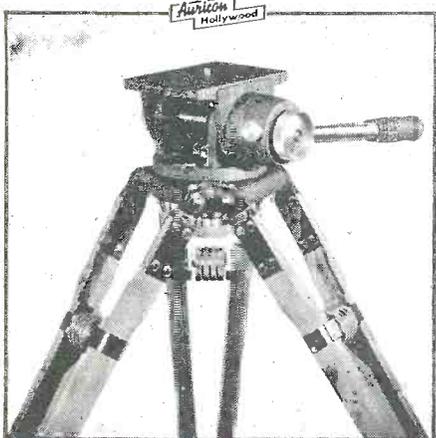
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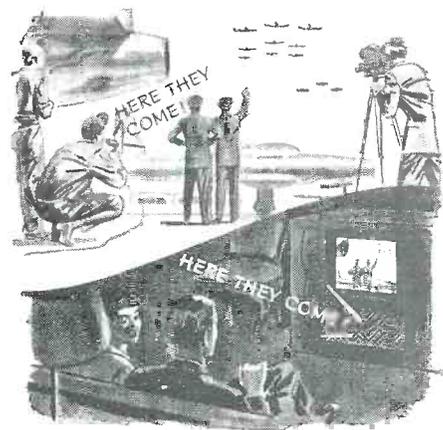


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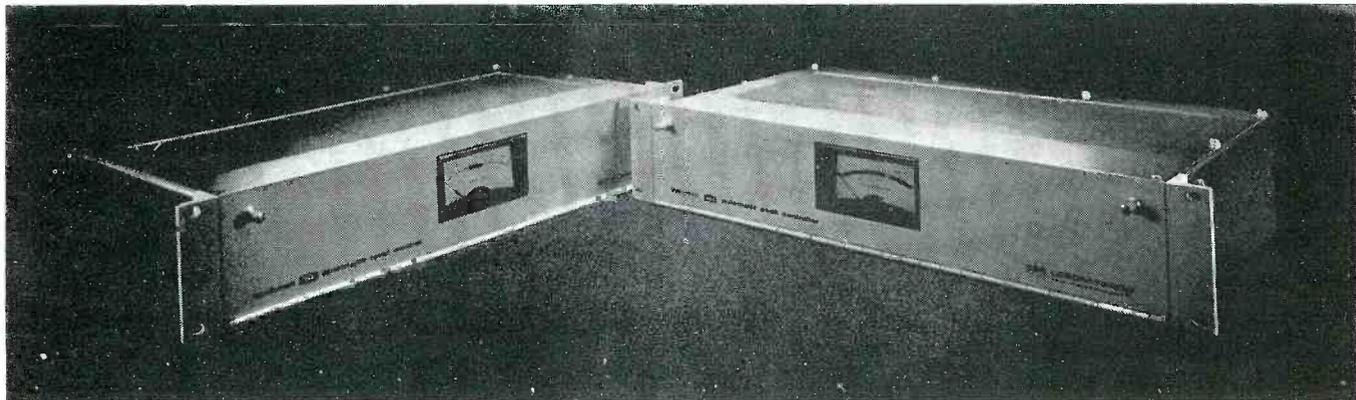
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EDITORIAL CUE LINE

GENTLEMEN! YOUR NEW PRESIDENT!

I wish to express my sincere thanks and appreciation to all members, Society of Broadcast Engineers, for my election to the office of President. This is an honor and a challenge.

I believe my message to you as published last year, upon my election to the post of Executive-Vice President, is as timely now as it was then. Although the Society and the Journal have made substantial progress in the past year the need for growth is as urgent as ever. Larger membership, more ACTIVE chapters and a strong Journal. Chapters, both active and on paper, must get busy and enlarge membership. Many broadcast engineers have not yet heard of our society or know little of its purpose and benefits.

Members in areas where no chapter exists should meet to form a new chapter, no matter how small, and continue in the effort to make this society a larger one.

Chapters must be active, hold regular meetings and make membership attractive, interesting and educational.

The Journal needs strength, not only in circulation and advertising but in editorial content as well. Articles for the Journal are needed and welcomed.

Educational information obtained through reading the Journal should be another strong attraction for membership in our society.

Please be assured that as your President, I will direct every effort toward the achievement of a greater Society of Broadcast Engineers. Again, many thanks!

Charles Hallinan

PROGRESS

The Society continues to grow. Our membership is now 500 by latest count. This is a far cry from three years ago, but not far enough! We should have had at least 1,000 members by now. The plans now in force should ensure that we may have this number by the end of the year! A new membership drive is under way, and a new annual publication that is to be issued once a year by another publisher has agreed to carry an application form and details of the SBE in every one of its almost 20,000 copies! One will go to at least every engineer in our field!

The JOURNAL which has seen much progress in the past eight issues is on the verge of a breakthrough. Look for new faces in this issue, and then sit back and wait for the brand new look and contents in the September issue! You can't afford to miss it. So don't fail to pay your dues!

DUES

We are somewhat remiss in getting out dues bills this year. Some public spirited members have sent in their money without being asked. If you do this - it's fine with us, but do please be sure that your company --- if it pays for you --- says who the dues are for. We still have a number of company checks that are for members, and we don't know who! So you don't get credited!

ACCIDENT

All our members will join us in wishing Bill Kramer our treasurer a speedy recovery from the accident that nearly put him out of the picture just after our Annual Meeting. He is now up and around again, but for a while it was touch and go! As a result of this unhappy event both our treasurer and secretary got behind in their SBE work, and if anyone is missing a letter or similar piece of mail drop them a line, or if it is membership, write to Fred Hervey or Leo Reetz.

BROADCAST ENGINEERS

We repeat the topic head that broke all records in the SBE history for generating mail! In the March issue we brought up the subject of professional status for engineers, and printed some letters on the subject. This opened the flood gates, and we have many more including a very interesting article by "E.N. Gineer". For rather obvious reasons Mr. Gineer had to hide his light under a bushel, but many of his points are well made. Mr. Robert J. Hendrick whose thought provoking articles have appeared many times in the JOURNAL has another

STATION MAINTENANCE- and Common Sense

F. C. Hervey, WHKW, Chilton Wise

The Rules say that you must properly maintain and inspect your station ... Common Sense tells you that it must be done, too- or risk the wrath of the Front Office because of outages, troubles, missed spots, and so on. So --- as long as it is a must, let's go at it the easiest possible way. In my own experience, I have seen a good many troubles develop because things were over-maintained, so let's not go overboard about these things.

Regularly, during the required five-days-a-week inspection periods, you might check the following:

Electrical Connections: Tight? Clean and bright? This is very, very important on high-powered gear - a loose primary connection can burn off the terminal in minutes. It just takes a little longer on low powered transmitters. Check the primary power terminals, all of the terminals on power contactors, the transformer terminals.

Tube Caps: Check all tube plate caps, especially the Eimac and Amperex types that are bushed to size with a large, solid metal cap. These either screw on to the anode lead of the tube or are held on by a small Allen screw. Make sure they are both tight on the tube, and that the plate cap itself is secure. Check both ends of the plate lead, while you are at it - see if it is secure on both ends, and is not about half broken off. Now is a good time to think of getting rid of those porcelain plate caps on the 872's or 8008's, and install the heat-dissipating metal types. Be sure to take the caps off once in a while to make sure they are not corroded inside.

Clean, Feel and Look: Vacuum clean the inside of the cabinet when it needs it. Wipe off the insulators. Feel things, right after sign-off shut down. Anything running hot? Look things over for signs of breakdown, cracked insulators, corrosion, arcing, etc.

Weekly and longer intervals:

Relays: There are two schools of thought here. I feel that the less you fiddle around with relays, the less trouble you will have in the long run. Clean relay contacts with a steel blade and Ethanol. DON'T USE CARBON TET FOR ANYTHING!!! Carbon Tetrachloride is a very deadly poison, and men have been killed by only a few minute's exposure to the fumes from it. By the way - Carbon Tet reacts with hot iron or steel to form phosgene gas. Talk to any WW I vet. about it - lots of them are drawing VA Compensation for phosgene gas exposure. All the more reason to get rid of those Carbon Tet fire extinguishers. The only type fire

extinguisher that has any business around a radio or TV station is a big CO2 extinguisher, anyway. Any other type will do more damage than it's worth. But back to relays - if they need adjusting, by all means, do so. But don't adjust just to bend springs. If the relay contacts are clean, and they have a little contact "follow", leave them alone. Clean power contactors regularly. When they start to burn a little, dress the contacts with a fine file, maintaining the original form of the contact. All large contactors have removable contacts, so they are easy to maintain. If they are burned or pitted badly, don't monkey around with them, put in a new set. Note the make and model of the contactor, and if it is a regular "Motor Starter" type, the nearest Electrical Wholesaler has the parts. Make sure that you remove all power at the source when working on power control circuitry. It's a good idea at all times, even when just wiping the dust off tubes and parts.

Motors and Blowers: Just because a blower motor has an oil hole is no reason to oil the hell out of it.

One or two drops of oil a month is plenty, on most motors. If the motor is ball bearing, let it alone! Don't repack the bearings, don't add grease, no matter what the Instruction Book says. A noisy ball bearing is shot, and no amount of greasing or cleaning will fix it. Motor bearings are worth about \$5 a pair, more for very large ones, and they will run for years if left alone. They give you plenty of warning before failure, so when you hear a noisy bearing, pull the end bell of the motor, get the bearing number, and get a new pair. Every large city has supply houses that specialize in ball bearings of every size, shape, and description. Install new ball bearings as they come, keeping them wrapped until you are ready to put them in. A speck of dust will ruin a new bearing. DON'T ADD MORE GREASE - they come ready to use. If you must grease a ball bearing, be sure that you get the special grease made for motor bearings - automotive-type greases will ruin the bearing. For sleeve bearings, use a light machine oil - non detergent type. Heavy motors with ring oilers take heavy oil, but any motor less than a couple of horsepower is better off with a little light oil. A little - a few drops. Too much oil will do more harm than no oil at all.

Tubes, Sockets, and Airways: Pull the tubes on a regular basis, clean the pins or contact surfaces, and clean the socket contacts. Be sure the annular contact fingers are still "springy". Vacuum clean the sockets

still "springy". Vacuum clean the sockets and airways, get the bugs out. Reach down inside of the blowers, too, and vacuum clean the inside of the scroll case and the runner. Work on mercury vapor rectifiers one at a time - be careful not to "snap" the tube when you remove it, and keep it upright.

Tuned Circuit Components: Clean all tuning parts once a month or so - your own experience will tell you how often this is necessary. Wipe off all contacting surfaces with Ethanol and a lint-free cloth, polish the silver plating. Look things over for signs of arcing or burning. While you have things apart, clean out the insides of all cavities. Polish up roller coils with crocus cloth, if they are burned, wipe off with Ethanol. Lubricate the tuning drives with a little Lubriplate. Lubriplate works good on condenser rotor contacts, too. Other Engineers have told me that it is the best lubricant for roller coil contact rollers and the shaft they run on. Check the transmission lines - get in the habit of feeling the lines for hot spots every time you walk by them. No matter what the meters say, a hot spot on the line means trouble. Don't forget to go out to the doghouse and look over the tuning components out there. Clean up the parts, get rid of the dead mice, bugs, wasps nests, etc. Give the lock a shot of graphite powder so you won't break off the key in it, next time. Do the same to the gate on the antenna fence. Check the connections out here, too - look for signs of arcing, lightning damage, etc. Look over the line supports on the way back to the transmitter house. Check Tower Lighting gear, while you're out in the field. All connections secure? nothing hanging loose? Contacts OK? Block off the PE cell window, if it's on the tower for a quick check. All lights OK? Check the flashing rate of the flasher - I set mine at about 15-16 flashes per minute. Check all of the tower guys: use whatever method the maker of your tower specified to check the guy tensions every six months or so, but you should check the guys at the anchors much oftener to see that they are still safety-wired so the turnbuckles can't turn, that nothing is working loose, and nothing is broken. Check the grounds for good connections. Look up the guys with a good pair of binoculars for broken insulators or anything that doesn't look right. Don't guess - a few dollars spent for proper tower maintenance can save the tower!

Base Insulators: Keep them clean - and at the first sign of a crack or repeated flashovers, make your plans to replace them. Check the arc gaps for proper spacing. A bout double the gap that just flashes over on modulation peaks is about right

Tube Testing: There are a couple (or more) schools of thought about testing tubes. Me, I would rather test the equipment as a whole, rather than pull tubes and run them through the tube checker, which, by the way, must be a good Mutual Conductance type. Emission-type tube checkers don't tell you much more than that the tube lights. Personally, I think that it is easier and better in the long run to make quick Proof of Performance tests on audio gear than it is to check tubes. Some makes of equipment have test jacks that will give a specified voltage reading with a good tube. As long as the equipment is working satisfactorily, I see no good reason to start in with a tube checker, tho many will argue this point. No tube checker I have ever used checks a high vacuum rectifier satisfactorily, so the only real way to find the old ones is to check their output voltages. As long as the voltage is up, might as well let it alone. While you are at it, now is a good time to check voltage-regulated power supplies. If the voltage is down, the chances that the "pass" tubes are getting old. The only way I know of to check VR tubes is to measure the drop across them. If it is within specs, it is most probably good. VR tubes very seldom fail, when operated within their ratings. Small tubes in the transmitter are best checked with the meters: if the drive is OK on the following stages, the tube is OK. The inspection period is a good time to thump the small tubes with the off-air monitor gain wide open. Noisy ones will be immediately apparent. A pencil with a big eraser makes a good "tube thumper". Check tube filament voltages regularly - 6.0 volt s is better than 6.6 volts on a nominal 6 volt-rated tube. It will last three to four times as long. Expect all DC tube filament supplies to drop off with time - rectifiers age slowly. Most VOM's have satisfactory DC voltage calibration, but check the AC scales against the Power Company's standard - you may be in for a surprise!

Specialised Mechanical Gear: Tape transports need frequent cleaning - heads and drives. One drop of oil seems to be enough to get all over the innards of any tape transport, so underlubrication will cause you less trouble in the long run. VTRs, Film chains, Slide Changers, and the like are specialised jobs for the man in charge of them. The best method is to leave them completely up to his care and tender ministrations, everybody else keep their cotton-picking fingers out! The same goes for as mundane a thing as a turntable and the pickups - one man should be completely responsible for them, and all others let them alone! It takes a good ear to decide when to replace a stylus, but the best bet is "If in doubt, replace it!" New styli are too cheap to wait around and ruin your station sound because you don't want to spend a few bucks. Keep those styli clean, too! A little fuzz under them can sure ruin a good musical

because you don't want to spend a few bucks. Keep those styli clean, too! A little fuzz under them can sure ruin a good musical program. One of those little electric shaver cleaner brushes works fine to pick the fuzz off of the stylus with.

Remote Equipment: At regular intervals, haul out all of the remote gear - check the tubes, clean the pots, talk on every mike. Check all the mike cables out with an ohmmeter for continuity, and try them all, wiggling the cable near the connectors to detect incipient trouble. Replace the batteries as needed. Here again, if you are not sure just how long they have run, replace! Those mercury batteries used in most miniaturised Remote Amps have nearly a flat voltage characteristic, so they will drop catastrophically to nothing right in the middle of the basketball game if you guessed wrong on how long they had run. And under this heading comes the remote lines. Have the Telco check out your permanent loop.. Who knows what may have happened since the last time you used it? If you have several, you can have the Telco patch them back to you, so you can feed #1, read out on #2, 3 etc. I never met a man who worked for Ma Bell who would not help out when asked to - so ask! As far as the jacks in your jackfield, keep them clean, but don't overdo the job. They get enough use to keep the sleeves clean, as a rule, so you don't have to polish. My feeling is that the jackfield should be gone over thoroughly about once a year - burnish the normals, polish the tip blades and the sleeves, and keep the cleaning compound out of the works, no matter what you use. I like "Contactene" or one of the other contact cleaners-lubricators that leaves a very slightly oily residue.

And the Etceteras: Everybody looks at the board all day, but how often does it get opened up? Do so, clean the pots with Ethanol and a lint-free cloth, lubricate sparingly with Davenoil or Lubriplate. Take the vacuum cleaner to its innards, clean out the cigarette ashes, dead bugs, dust and other debris that has accumulated inside since the last time you looked at it. Clean and burnish the key and relay contacts - and hold back that overwhelming urge to "adjust" the relays - you can get into a lot of trouble that-a-way. Some of them are make-before-break, and if the springs are mis-bent, you will get a resounding whoop each time the CR Mike is keyed on. All fuse holders, all over the place, should have the ampere rating of its fuse marked nearby. Fuses, especially the little cartridge fuse variety, "let go" from old age - so if a fuse holder has been undisturbed for many, many moons, it would probably be a good

idea to put in a new fuse on general principles. Metal fatigue cracks the fuse metal, and they blow at the most embarrassing times.

Don't forget to set up a regular schedule to test the emergency power plant at least once a week. Be sure that it is run long enough to warm it up thoroughly. Test it under load at least once a month. This article being aimed at Maintenance in general for the man more or less new to this business, we simply cannot cover all of the many facets of this problem. DA's must check their pattern regularly on the original radials, TV's have special maintenance problems of their own. About the best bet is to list all of the things that have to be done, make up new lists for Daily, Weekly, Monthly and twice a year, and set yourself up a regular calendar of maintenance work. Looked at in toto, it looks like an insurmountable task. Taken one day at a time, there really isn't much to it. (Don't tell the front office that!) Spend some time with the instruction books: they will tell you what has to be done, how often, and how to do it. The rest of the job is just common sense, as any old-timer at this game can tell you. Keep at least 100% spare tubes around the place, along with fuses, small parts, especially those special parts that you can't get along without. Collect a good set of test equipment and small tools and keep them locked up where the combo men can't get at them. But most of all, know your equipment! There is no substitute for complete familiarity with all of your station, from the mikes to the towers. If you ever become bored for lack of something to do, drag out a print and figure out the transmitter control circuit, or something like that. A good man can draw out any circuit in his station. A very good man also knows how and why everything works, and how to keep it that way. This has been a very light "once over" of a very large subject, and a guide to the proper and methodical maintenance of broadcast stations in general.

THANKS

Once again it is our pleasant duty to say thank you to the National Society of Broadcaster's for their generous cooperation making space available at Chicago, and also for carrying details for our meeting in their official program. We hope that as the years pass and the SBE grows in stature the SBE and NAB will be seen working more closely together in matters pertaining to engineering.

MONITORING MODULATION DURING A STEREO TRANSMISSION WITH AN OSCILLOSCOPE

Klaus H. Binder
 Staff Engineer, WNBC-FM
 Binghamton, New York

Most FM modulation monitors (monophonic) are not reliable during a stereo transmission. For this reason a transmitter engineer should have some other method of monitoring in order to stay within the F.C.C. limits. Even after adjusting a stereo system for maximum performance, overmodulation during program transmission will provide the listener with a very poor signal. To avoid this, a system of monitoring stereo transmissions with an oscilloscope is recommended for stations which do not have a stereo modulation monitor. The equipment required are an oscilloscope and a wide band FM detector such as the FMD-1 which is made by Belar Electronics Laboratory, Drexel Hill, Pennsylvania.

Figure 1 is a block diagram for the equipment arrangement. The composite signal is connected to the vertical input of the oscilloscope, and the 38 KC from the stereo generator is connected to the horizontal input of the oscilloscope.

The oscilloscope is calibrated using the monophonic modulation monitor. Operating the transmitter in the monophonic mode, feed it with a 400 Hz left signal only, and adjust it to read 45% on the modulation monitor. Turn on the 19 KC pilot, and a waveform such as in Figure 2 should appear on the oscilloscope. Bring up the right channel to 400 Hz to form a square on the scope as in Figure 3. This waveform represents 100% modulation of both the right and the left channels (for stations not using S.C.A.). By merely marking both the upper and lower limits of the square waveform on the oscilloscope the highest deflection the oscilloscope should have during stereo program transmission is indicated.

This system of monitoring is also capable of showing if the left and right signals are in phase with each other, or exactly opposite in phase (180°) such as in Figure 5.

Caution:
 Some oscilloscopes will not work due to improper phasing of the vertical and horizontal sections. An R.C.A. WO-91A gave excellent results.

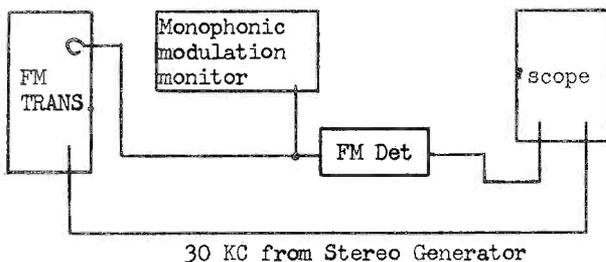


FIGURE 1: Block diagram of connections.

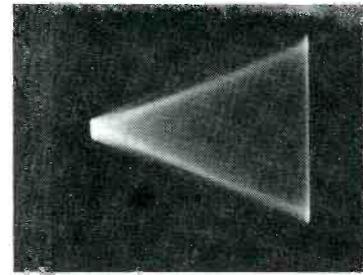


Figure 2 - Left signal

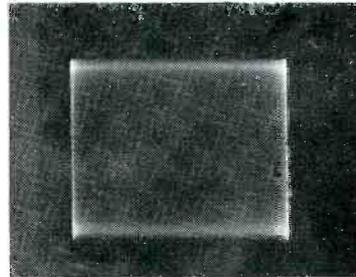


Figure 3 - Left and right signal

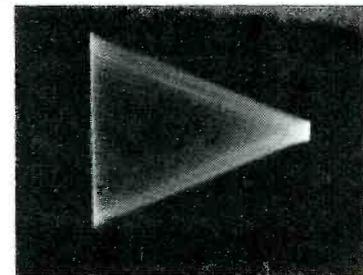


Figure 4 - Right signal

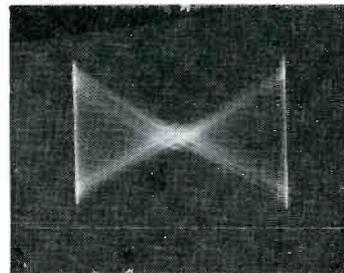


Figure 5 - Reversed polarity modulation

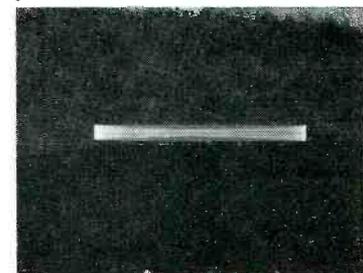


Figure 6 - 19KC pilot only (no modulation)

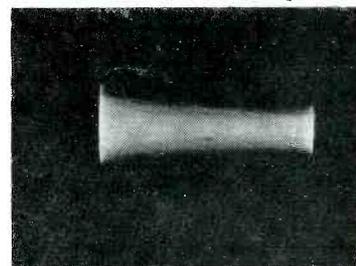


Figure 7 - Program Transmission

HOW TO MAKE AN FM STEREO

PROOF OF PERFORMANCE

Delivered at the 1965 NAB Convention

Eugene A. Robison and Charles E. Dixon,
Collins Radio Company, Cedar Rapids, Iowa

Stereo broadcasters are faced with the need to make a proof of performance in order to verify that their equipment is performing at its maximum capabilities. Stereo multiplexing is a more complicated process than unichannel broadcasting. Thus, stereo multiplexing requires additional and more accurate measurements along with more specialized equipment and procedures than those required with monaural broadcasting.

Measurements of percent modulation, frequency response, distortion, and signal-to-noise measurements are no longer adequate for the stereo broadcaster. Since stereo multiplexing involves the transmission of two channels of information, the interaction between these channels is of prime importance. The stereo multiplex frequency spectrum is shown in figure 1.

The stereo signal consists of a main channel (L + R) signal with a bandwidth of 50 cps to 15 kc, a 19-kc pilot carrier and a sub-channel (L - R) double-sideband suppressed carrier with a bandwidth of 23 kc to 53 kc. If SCA is present, it would appear as an FM signal centered about a 67-kc carrier.

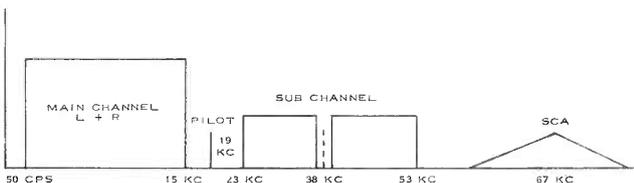


Figure 1. Stereo Multiplex and SCA Frequency Spectrum

To preserve the channel separation between the main and subchannels, the gain and phase shift between these channels must be maintained within a close tolerance through the equipment in which they pass. As an example, for approximately 30 db of channel separation the main channel (L + R) and subchannel (L - R) DS /SC signals must have amplitudes within 0.3 db of each other, and the zero crossings of the envelope of the DSB/SC L - R signal and the L + R signal must occur within 3°. Thus, besides measuring the percent modulation, frequency response, distortion, and both AM and FM noise the stereo broadcaster must also measure pilot carrier phasing and injection level, subcarrier suppression, channel separation, and crosstalk.

The equipment needed for a stereo proof of performance are:- a low-distortion audio oscillator, audio vtm, distortion and noise meter, and an FM stereo modulation monitor.

The stereo modulation monitor should have at least the following capabilities:

- (1) It should read total, main channel, and a 19-kc pilot carrier percent modulation.
- (2) It should read channel separation, subcarrier suppression, crosstalk, pilot carrier phasing, and noise.
- (3) It should also provide outputs for distortion and AM noise measurements.

The modulation percentage metering circuit should be a peak reading device to give a true indication of the maximum instantaneous peak voltage which exists in a complex signal composed of frequencies from 50 cps to 53 kc, the stereo multiplied bandwidth. An average reading circuit with a peak scale will not give a true maximum instantaneous peak reading for complex signals. An average circuit would work on a pure sine wave but there are no stations that broadcast only sine waves.

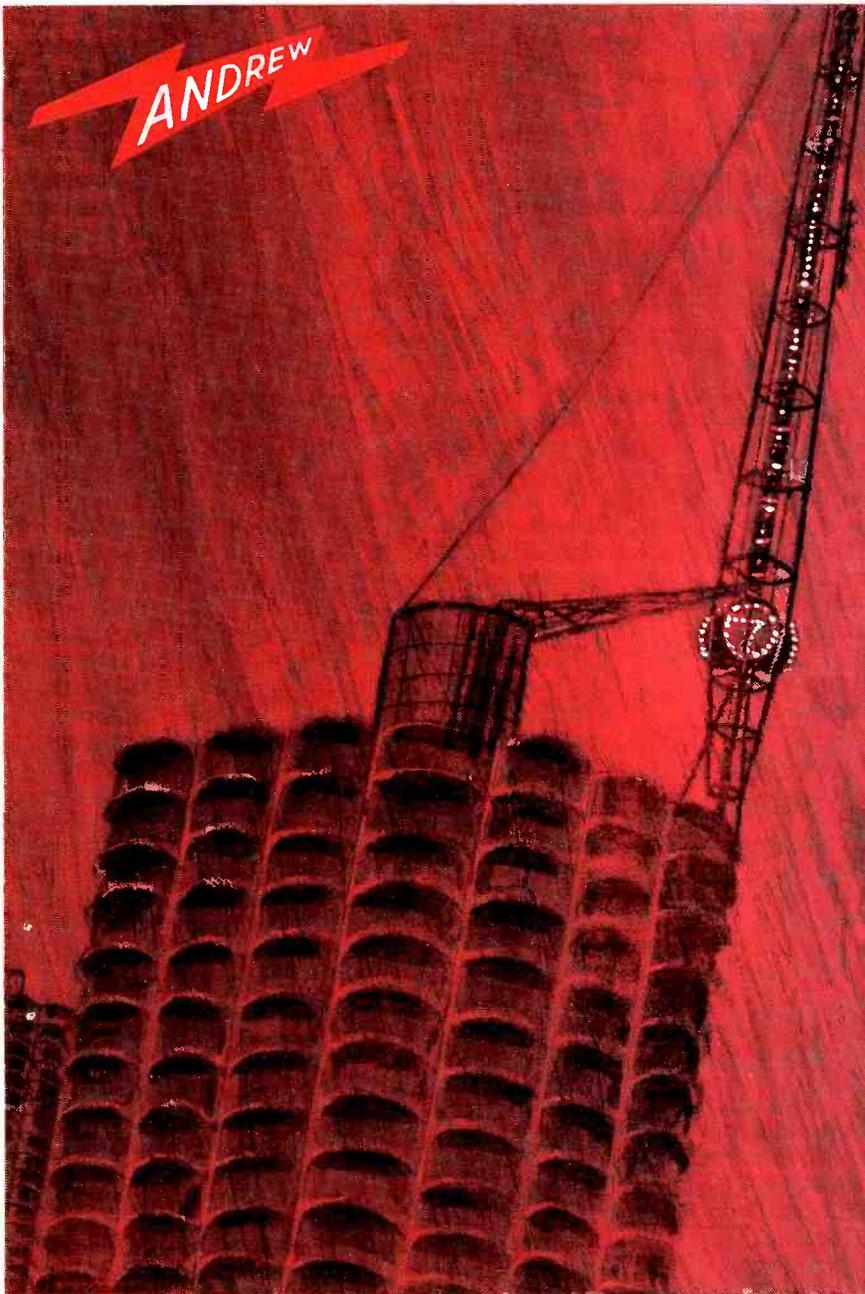
Thus, a true peak reading modulation meter would simplify matters considerably for the monaural broadcaster as well as the stereo broadcaster.

This paper is written around the Collins 900C-1 FM Stereo Modulation Monitor. Measurements made with other equipment should be similar but may involve additional external equipment to the modulation monitor.

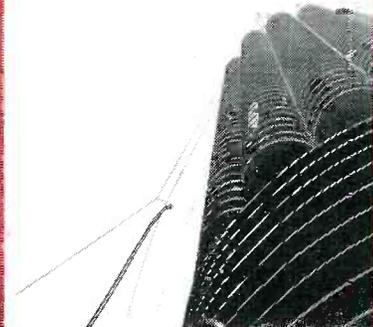
Existing monaural FM modulation monitors are unsuitable for stereo multiplexing monitoring because of their limited bandwidth, frequency response, and phase linearity characteristics.

All measurements for the proof of performance should be made with the system adjusted for normal program levels. The system should include all circuits between the main studio mike input and the antenna output. This includes any telephone lines, pre-emphasis circuits, and equalizers except for microphone equalizers. If compression equipment is used in the system, it should be disabled during the proof of performance. If an SCA channel operation exists, noise and distortion measurements should be made with SCA modulation on.

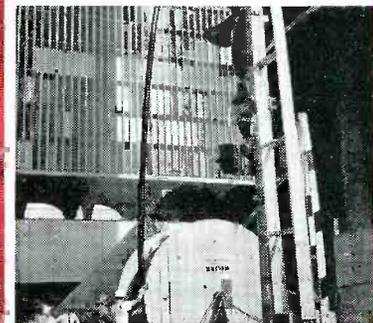
ANDREW



... Factory attached fittings



... Long lengths



... No splices

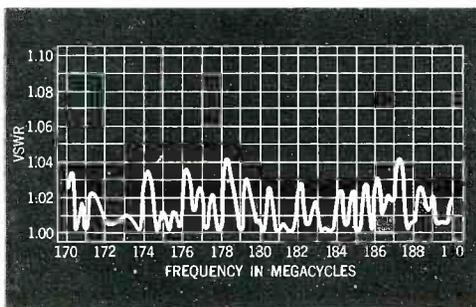
HELIAX 5" air dielectric coaxial cable hoisted from street to Marina Tower rooftop in one continuous length for ABC-TV, Chicago

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Actual measured VSWR for installed 742 foot length of 5" HELIAX



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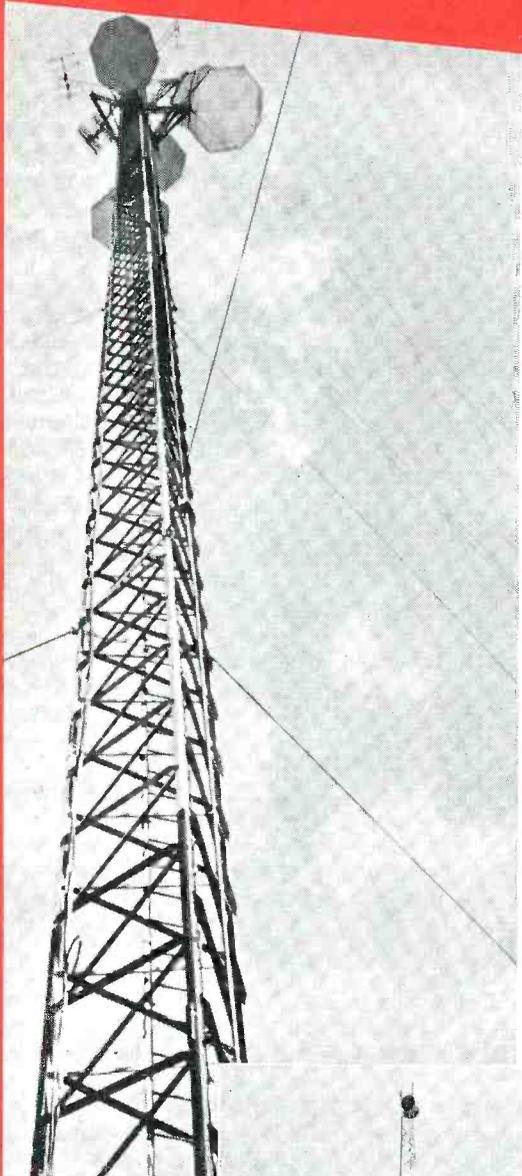
*Handles average power of 250 kw @ 10 Mc or over 50 kw @ 200 Mc

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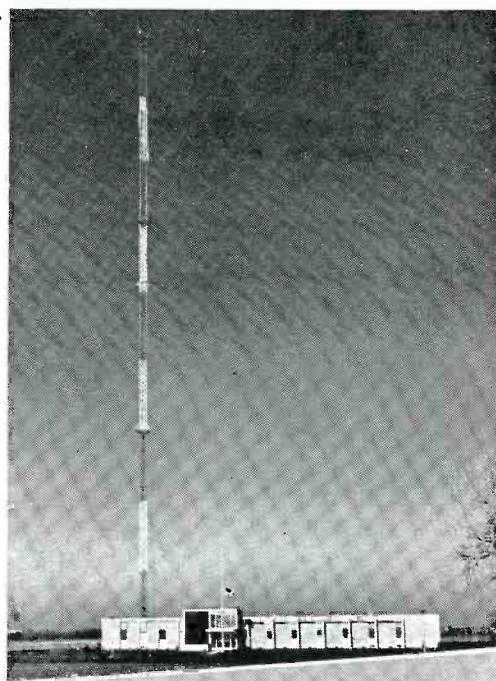
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In order to run a stereo proof of performance, certain test signals will be required. These test signals will be a right, left, a $L + R$, and a $L - R$. The waveforms of these signals as they would appear at the wideband output of the monitor with pilot carrier off, are shown in figure 2. It should be noted that a good indication for channel separation is the relative flatness of the base line for the L or R stereo signal. The most convenient way of generating the test signals required for a stereo proof of performance is to have a matrix network as shown in figure 3.

Figure 4 shows a test setup for a typical stereo multiplex station for a proof of performance.

The frequency response of the system should be measured in both the monaural and stereo modes of operation with pre-emphasis in the system and without de-emphasis in the measuring equipment. The monaural frequency response is run as usual with first a right and then a left test signal for frequencies from 50 cps to 15 kc, noting the output of the signal generator with the percent modulation constant. The stereo response is run much in the same way as the monaural mode response except that now the main channel and the subchannel response must be checked.

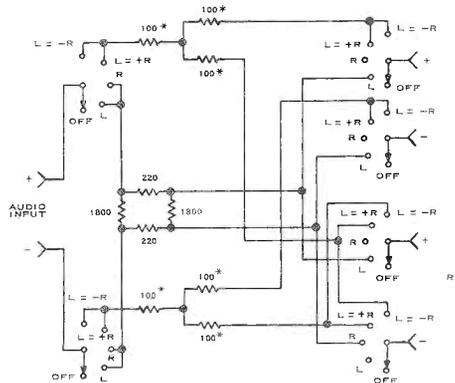


Figure 3. Stereo Test Matrix

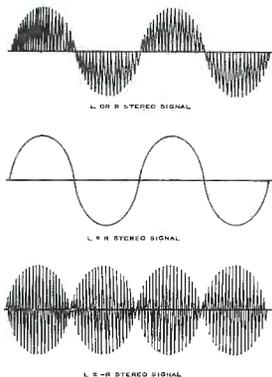


Figure 2. L/R , $L + R$, $L - R$ Stereo Signals as Observed at the Wideband Output of the Modulation Monitor with Pilot Carrier Off

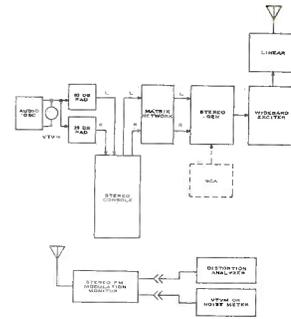


Figure 4. Typical Stereo System and Test Setup

To check the main channel response, a $L + R$ signal is transmitted for frequencies from 50 cps to 15 kc, noting the signal generator output with a constant percentage of modulation. The subchannel response is measured by transmitting a $L - R$ signal from 50 cps to 15 kc, noting the signal generator output with a constant percentage of modulation.

The harmonic distortion of the system may be measured by connecting a distortion analyzer to the distortion meter output on the stereo monitor. De-emphasis should be in when the distortion is measured for both the monaural and stereo modes of operation. Main channel audio harmonic distortion is measured for the monaural mode; distortion for the left and right audio channels is measured for the stereo mode. These distortion measurements should be made for frequencies from 50 cps to 15 kc at the standard percent modulation levels. This is done by switching the monitor to main channel, left audio, and right audio.

The system output noise must be measured for monaural and stereo operations. This is done by transmitting a 100-percent modulation level left signal in the monaural mode with de-emphasis, setting a main channel audio reference level of 0 db on the internal audio voltmeter, and replacing the audio input lines to the console with a good quality resistor matching the input impedance of the console. The sensitivity of the internal audio voltmeter is increased to obtain a reading in decibels on the meter. This is added to that indicated by the meter sensitivity switch for the monaural signal-to-noise ratio in decibels. The right audio channel also should be checked for noise in the same manner. With the system transmitting in the stereo mode, the preceding should be repeated for the left and right audio channels. The 100-percent modulation level in the stereo mode of operation includes the pilot carrier modulation as well as the audio information. The noise levels should be at least 60 db below the 100-percent level for frequencies from 50 cps to 15 kc.

The AM output noise may be measured by shunting the resistor across the console input with a piece of bus wire. The r-f carrier level is adjusted on the monitor to read 100 percent; the AM noise level then may be measured at the AM noise meter output on the monitor with a vtvm or noise meter. The AM noise is referenced to a carrier level of 1 v rms.

For the 38-kc suppressed subcarrier suppression measurement, modulation, pilot carrier, and SCA signal should be off. A $L+R$ 90-percent modulation level signal is transmitted and a 0-db reference is set up on the internal audio voltmeter with the monitor in the main channel audio position. The $L+R$ signal is removed and the monitor then is switched to the subchannel audio position. The sensitivity of the internal audio voltmeter is increased until a meter indication is obtained. The algebraic sum of the meter indication and the audio voltmeter sensitivity switch is the subcarrier suppression in decibels.

For a stereo demodulator to give proper channel separation, the 19-kc pilot carrier must have the proper phase relationship with the envelope of the double-sideband suppressed carrier subchannel. Thus, the pilot carrier must be adjusted on the stereo generator so that the monitor indicates that it is properly phased. Once the 19-kc pilot carrier has been properly adjusted the channel separation may be measured.

With the audio oscillator reconnected to the console a 90-percent L-signal and a 10-percent pilot carrier are transmitted. The monitor then is switched to left audio position and a 0-db reference is set up on the internal audio voltmeter. The left signal is removed and a right is applied; the sensitivity of the voltmeter is increased until a reading is obtained. The channel separation of the right channel information from the left channel is the algebraic sum of the meter reading in decibels and the sensitivity switch indication.

The channel separation of the left channel information from the right channel is performed in a similar manner except that a reference level is obtained with a right signal applied to the system. The right audio is removed, a left audio signal then is applied and the channel separation of left channel information from the right channel is determined.

A minimum of 30 db channel separation should be obtained for modulating frequencies from 50 cps to 15 kc.

In making crosstalk measurements from main channel to subchannel and subchannel to main channel the pilot carrier and SCA signals should be off.

For subchannel crosstalk from the main channel information, transmit a 90-percent modulation level main channel signal, $L+R$. Switch to the main channel audio and set up a 0-db reference level on the internal audio voltmeter. Then switch to the subchannel audio and increase the sensitivity of the internal voltmeter until a reading is obtained. The algebraic sum of the meter reading and the meter sensitivity switch indication is the subchannel crosstalk from the main channel information.

For main channel crosstalk from the subchannel information, transmit a 90-percent modulation level subchannel signal, $L - R$. Switch the monitor to main channel audio and increase the meter sensitivity until an indication is obtained. The crosstalk from the subchannel information to the main channel is the algebraic sum of the meter indication and the meter sensitivity switch.

The crosstalk from main channel to subchannel and subchannel to main channel should be at least 40 db down.

Since the main and subchannel information is composed of matrix signals, $L R$ and $L - R$ respectively, the left and right inputs should be balanced. This balance must be better than one percent of each other at the input of the stereo generator for the $L - R$ and $L + R$ signals when making crosstalk measurements.

CUE LINE continued

letter, and we feel that his suggestion has merit. We suggest that anyone willing to get to work with him, or others, in "Belling the cat" contact Mr. Hendricks to form a committee to work on the matter. This should probably be handled through Joe Risse, the Executive Vice President, as far as parliamentary procedure is concerned.

CHAPTERS

Numbers One and Two are neck and neck. They hold individual meetings with up to 30 attendees, and joint ones with their combined memberships. That's what enthusiastic leadership can do! Number nine in Phoenix is continuing to prosper, but apart from these three activity this spring has been poor. What about it Members? In the past leadership from National HQ has been less than 100% in the form of help because of sheer lack of time to devote to everything, but now that the Society is settled down and the responsibility is spread out from one individual there is no reason why we should not forge ahead!

LETTERS TO THE EDITOR

Editor:

I notice that the question posed by Mr. Hervey in the December 1965 issue of the SBE Journal has again rekindled the flame of the operator-engineer situation in the broadcast industry. As usual the comments in the March 1966 issue indicate much interest and concern along these lines.

I agree with Mr. Hervey that a permanent license number would be very fine, however, I feel that other aspects of the licensing of engineers and operators are more urgent and important at this time.

As you will recall in a rather comprehensive article published in the Journal in the December 1964, I raised the question of FCC requirements as to operator qualifications, experience, education, etc. and suggested that changes in these regulations were long overdue.

I also agree with Mr. Garrison and Mr. Smalling in their letters in the March 1966 issue that the holding of a license for a lengthy period of time should not be the prevailing criteria in granting an up-graded license. If we are to maintain any degree of technical stature within this group, some means of determining qualification on the basis of the scope and type of experience and educational background must be developed, as well as by FCC examination.

As suggested by Mr. Morgan in his letter in the March 1966 issue of the Journal, I believe that all stations should not be required to maintain the same class of technical personnel. I think it logical to assume that a small market, perhaps remotely located 250 watter might not require the caliber of engineering as that of a 50 KW or a DA system.

Of course we all have a tendency to approach the problem from our own needs and perhaps from a somewhat selfish standpoint. This is the thing we must avoid. We must live and let live and subsequently some compromises from two extremes probably must be made before an agreeable plan can be achieved. Any solution or improvement in the situation must be done with much objective thinking and certainly looking to the future as well as the present.

I agree with Mr. Battison and also stated in my earlier article that the FCC must be made aware of the condition. From material that has been published in The SBE Journal so far, it seems that we might have enough information and detailed suggested solutions in Mr. Garrison's letter in the March 1966 issue, Mr. Schneider's material "More On Engineer's Qualifications" in the March 1965 issue, and in my article "Higher FCC and NAB Standards

Versus FCC Commercial Operator Requirements" in the December 1964 issue to at least get started on drafting a final proposal to present to the FCC.

I believe that the only way we can make any progress along these lines is by forming a committee, gathering much material and data, doing unlimited research and study, looking toward drafting an unbiased, practical, and equitable plan, which will be acceptable to the FCC and submit to The Commission as a formal petition for rule change.

Sincerely,

Robert J. Hendrick
WKCT, Bowling Green,
Kentucky

EDITOR'S NOTE: Any volunteers for this committee?

Editor:

When I was a boy, one of the most admired people in life was that KING up there in the locomotive cab, the "Engineer".

My father was "Engineer" in a mill because he tended the boilers and steam engines and my brother is a dredge "Engineer" and has a certificate to prove it, although he didn't quite make it through high school.

The "Engineer" was sent up to my San Francisco hotel room to open my bag, when I couldn't locate the key.

I feel no resentment at being categorised with all these other dirt-under-the-nails fellows but perhaps four years of college training might alter my viewpoint. In fact, I might demand that the institutions of higher learning discontinue use of the term "Engineer", in favour of a more dignified title.

Yours truly,

Guy Rauer, Chief Engineer
WEJL, Scranton, Pa.

Dear Sir:

Do you have the nerve to print this in a future Journal? I hope so for I believe the comments are pertinent.

RISE UP! RISE UP! fellow members of the Society of Broadcast Engineers, we are being invaded by management at last!! This

is the first step towards divide and conquer and a recognition that, as a group of engineers, "WE GOT SUMPIN' GOING HERE". . . Oh yes we need their pay, but they are finding out the hard way that they need us. All this is due to the shortage of competent broadcast engineers - or so they say..

In the March issue of our (?) Journal one of our members listed as General Manager and Chief Engineer (there goes another job fellows) says that any good engineer worth his salt can do his job in 20 hours - and he would gladly pay 40 hours time to get this guy.
WOW! WHEE! MEN! FELLOWS! get in line. Remember I am first. We now get 40 hours pay for 20 hours work and we can spend the rest of the time hunting, fishing, play golf, fly airplanes and, what's more important, see our families now and then.

This man has set a precedent and we will gladly oblige. He sees the man must be competent .. well, some of us are fairly good and we will be glad to oblige.. won't we? As manager and engineer he further states that he sees both sides of the problem .. I really do not see much of a problem, for his kind of new wage scale he can get all the boys back .. plus us that stayed ... so the line forms on the right ..

Let me explain some more on this problem. Who is fooling whom? It's really the old story of capital and labor - or in the olden days - Land Barons and peasants. Read on and shed tears my fellow peasants. It all began when management pleaded poverty (while riding in their \$6,000 cars, buying and selling radio stations, applying for new ones until the FCC froze all new applications and made them keep the old ones for three years at least. How they ever got the guts to do all this I'll never know .. Why they even have brokers who do nothing but buy and sell for them! I sure wish I was in that kind of money.

So, they got remote control authorized for a starter and nine tenths of their engineers went forth into better and bigger jobs that they didn't even know were interested in their talents. But we lost them anyway. But "By golly you know what?" they found out they had to get someone to operate this new stuff .. Up came the restricted ticket and, under management's direction everyone applied - the secretaries, salesman, janitors and window washers until things got so fouled up it was a mess .. So the FCC sees they got to have 3rd class tickets with endorsements .. THIS REALLY FLOORED THE TROOPS!!!! bucuuz they had to draw a meter, put a handle on it and label it volts .. And whose job was it to try and teach them? Why, the engineer. Thus they survived .. they had to ..

At this point and before, what did the chief engineer have to do? He not only had to instruct them on what to do - but what not to do. This put him on 24 hour call. Namely 12 hours to keep the stuff going and 12 hour for emergency repairs. And you know what??? He had to do it all alone. These boys didn't want to learn and some couldn't.. Their "soul" beef was "I ain't got time for this plus all the other stuff". They didn't tell the manager this ... only us (and with the door closed) and by the way, did you ever try to check an antenna meter with one of these guys? .. as we well know it's a nightmare or a catastrophe what between records and announcements and their apathy ...

THIS MAN SES IT CAN BE DONE IN 20 HOURS ---
--- HE MUST BE SOME KIND OF A NUT -----
For his information let me spell out my 20 hours

To begin with, mine is a twenty four hour a day operation and I am responsible for technical operation of the following:

2AM trasmitters (one spare) 1 FM STEREO and vertical and horizontal elements, 2 control rooms, 2 recording rooms, 8 audio and measuring equipment racks, 2 FM transmitter racks, 3 racks of automated music gear (a nightmare), 8 turntables, 10 tape machines, 1 automatic logger, 4 cartridge machines and 500 cartridges, 2 transmitter plots with fences and 800 ft. transmission line. 2 towers and lighting, 2 FM lines (phased and balanced), 2 AM lines, 2 remote control units and lines. 10 permanent lines and some fixed audio amplifiers and mikes, 2 mobile remote amplifiers with mikes, etc., 1 portable studio set up, 1 mobile truck fully equipped, 1 base station antenna and gear, 3 expensive receivers for air monitoring and Emergency Broadcast system complete with alarms. And I am sure lots more if I could think clearly!!!

Then there's the paper work. Ordering lines, cancelling lines, telephone bills, checking all logs daily for errors by announcers who never heard of that rule. Ordering equipment (if I am lucky), answering letters, seeing salesmen .. and on and on. Plus Oh Yes! oiling the AP machine once a month (management got me into this).

But I still must go on boys ...

Have you ever been called into the office and heard this statement --- "Say Joe, the air conditioner won't work and I know nothing about this stuff, will you look into it. ATSA GOOD BOY".

So now I fix the following: Air conditioners, pencil sharpeners, light bulbs, switches, fuses, door locks, door signs, radiators, furnaces, candy machines and 17

coffee vendors, even paper towels plus you know what. Cigarette burns on the rugs, desks, etc. and now and then, one of the typewriters.. Especially when the transmitter has just left the air and the reason the readings weren't takes for 3 hours back was becuz the typewriter didn't work!!! Management gives them too much to do anyhow... Then, when you need the tools, some joker has them in his car and it's his day off...

AGAIN I SAY THIS MAN IS SOME KIND OF A NUT with his 20 hour deal.

Of course there is a shortage of engineers .. who but an old buck like me would put up with this kind of nonesense!! You see Pals, I have been an engineer for 35 years and too old to change. I started with carbon mikes to present day transistors. That's how old I am .. But I like this idea, -- the way I figure it out I have half of 35 year's/hours coming back and that adds up to 17 years paid vacation ... I'll take the money if you don't mind As they say "OLD ENGINEERS DO NOT FADE AWAY, THEY JUST FADE (on cue) FROM THIS EARTHLY STUDIO TO THAT GREAT REMOTE UP THERE IN THE SKY".

And then I have my wife and 23 kids to think of (might be 24 now as I haven't been able to get home for a week)..

For very obvious reasons, I cannot sign my true name to this .. What I have said is treason you know .. I would also state that I am not a member of any broadcast union so do not label me an agitator. I just happen to like my job and then along comes this man to upset me with his 20 hours ... Golly!! I now will have to look sharp cuz there is going to be an influx of fellows for that kind of pay.

In conclusion I would like to say..... Let's keep this an engineers society for engineers and engineers alone.. Management and "us-uns" do not talk the same way nor think it either. I, for one, am glad there is a shortage of engineers because "they brung it on themselves"... It's really no problem though, just pay that price and thousands will be on the way.

In any event, send all donations to me in care of our Journal .. our manager will say "well why don't you quit?" That's the way they are ..

Address me as

"DIME A DOZEN"

P.S. For your information my certificate a s a member ses CHARTER MEMBER.

EDITOR'S NOTE: This is almost verbatim, but "Dime a Dozen" should remember that lots of managers are still engineers, especially in smaller stations!

Dear Sir:

After reading recent comments in your column, I'm reminded of the moldy cliché which tells of the happy young Swedish immigrant who exclaimed "In the old country I vus only a plumber ... but hyar in the U.S.A., by yimminy I'm called a vawter anganeer!"

Perhaps a little sober reflection is needed before we lash out too strongly at the Commission, the P.E.'s or for that matter any other body of conscientious people who are mainly concerned with upholding professional standards.

The present uproar concerning the improper connotation of the word engineer with that of 1st. Class licensee is long overdue. Station owners for many years have exercised their prerogative to confer a title frequently without due consideration of the individuals experience or educational background. (Sometimes ... mayhaps, in lieu of a raise!) In some fashion the alter-ego of both employee and management in many instances seem to be better satisfied with Chief Engineer than the term Technical Supervisor.

Now, before we direct our ire at the BOSS, FCC or the "lobbying PE's" ... let's look at ourselves in the light of truth and recognize that we are nothing more than the by-product of our own aptitude, education and subsequent experience.

I take pride in being a charter member of SBE and believe that our newly formed organization can and will ultimately overcome many of the inequities which presently concern the membership. Professional status might easily be determined by a governing board within the Society and as the result of due process at national convention.

In time State Chapters could well be charged with the responsibility of feeding the legislative hopper to effect needed changes within their own State. I see no need to fear that any of our earned rights will be usurped from us. Let us instead legitimately go forward with the business of enlarging the ranks of SBE with qualified members. When sufficiently strong, we can police ourselves in the same successful manner as the legal and medical associations have been doing down through the years.

Oliver Golding Coburn, Chief
Engineer/President, Lincoln
County Broadcasters, Inc.
RADIO KLCB

In the March 1966 issue of our very thought provoking magazine, John Morgan of Fredericksburg, Va., had a letter to the Editor that set me off on a wild shake.

In my mind's eye, I wrote him a very nasty letter --- then I settled down and began to digest what he had said.

Well, I ask myself, why is there a shortage of "Qualified Engineers". It is true, Industry is paying more, I have worked in Industry. I know, but Radio and Television has the fulfillment that I want.

In the average small station, as well as many larger stations, the Engineer is considered a "Featherbedder". He does not contribute to the station income, (in the money coming sense). Most Station Managers don't think the Engineer earns his pay unless he can double in brass.

I will give you an example, my own. I worked in a small town station in Idaho, these were a few of my duties.

1. 42 hours a week board work. (5:30 sign on until 3:00 p.m. or 9:00 a.m. until 8:00 p.m.)
2. a few hours of copy writing.
3. a few hours of clean up.
4. a few hours of production (taped announcements) and production.
5. a few hours a week to set up remote equipment.
6. a few hours calling ball games or other remotes.
7. Oh, yes Engineering - two nights a week after sign off to install and keep up equipment.
8. Build equipment for studio convenience for the Announcer or guest.

As any Engineer can figure, I spent more time at the station, than I did with my wife and four children.

Now, I am not complaining, when I view my work I am happy, I like my work, I enjoy sitting in as D.J.

Let's look at the other side of the coin.

My wages at that station, for my duties, fell under the President's Poverty Program.

Be it Iowa, Kansas, Maryland, Vermont, or Idaho the wage scale for the Chief Engineer in comparable stations is about the same, and in these stations the Engineer is considered a "Featherbedder", a F.C.C. nec-

essary evil, a drag on the station income, that is unless his is a salesman, too.

All right, there is the gripe ... What to do.

That answer is in the same issue of the Journal, a letter by Jack Garrison. Let's prove the Engineer is worth his salt and not be a burden to the station pocket book.

1. Let's Educate and Motivate the "Kid Engineer" and the "Horizontal Engineer" to his duties and the proper use and operation of his equipment.
2. Get our Stations working better, after all stations' Engineers realize the importance of good station operation get them to practice it.

Back to Jack Garrison's letter "Chief Engineers Achieve Quasi-Official Inspector Status" Station "A" inspect station B; Station "B" inspect station "C"; Station "C" inspect station "A"; then mix it up the next time. Now some of us will have the "Kid Engineer" to inspect, or to inspect us, then we go to work on THE problem.

3. Then EDUCATE Station Managers - confront them with good equipment and Engineers who do their job. Most Station Managers do not realize the importance of a transmitter operating efficiently or noisy capacitors. The only time they have anything to say about Engineering is when their own voice doesn't sound good to themselves on one of their own commercials. Let's let the Managers in on our progress in Engineering, then they will know what they are buying.
4. When Station Engineer knows and does his work well, maybe, just maybe, Engineers would be paid more, and they would not come under the "Poverty Program".

The final result would keep more Qualified Men in the Broadcasting Field and give Big Industry the smile because we can keep our Qualified Technicians in Broadcasting.

Yes, it can be done --- or are we too LAZY to do it?

Very Fraternally yours,

John "Jack" Sweeney
KXGN-T.V. and Radio
Glendive, Montana 59330

CHAPTER NEWS

Highlights from Chapter activities

Chapter Two

The June 6 meeting of Chapter two was held at the Dutch Pant ry restaurant in the Wilkes-Barre/Scranton airport terminal building.

Following dinner, the regular business session was presided over by Vice Chairman "Chuck" Sakoski, in the absence of Chairman Joe Risse, who was up to his ears in the ICS "Educasting" system.

Tentative plans were proposed by Milan (WBAX) Krupa to hold a summer clambake in conjunction with the Luzerne County Radio-TV Service Club and a decision was reached to suspend regular meetings during July and August with the next meeting scheduled for September 12.

Program Chairman Charlie (WARM) Morgan was instrumental in arranging a demonstration and discussion of the new G.E. BC-35-A/B audio console. This presentation was made by A.C. "Chuck" Angus, Project Engineer, Audio-Video Engineering, assisted by Jack Painter, Pa. District Sales Manager, both from Syracuse.

Chapter One

On May 10, Binghampton Chapter one played host to Northeastern Pennsylvania chapter two, at its regular monthly meeting.

Emil Torick, Manager of Electronic Instrumentation and Research at CBS Laboratories lectured on the subject of the CBS FM Volumax and their Wide Range Program Monitor. A lengthy discussion period followed during which Mr. Torick answered numerous questions concerning these and other items. He also described some of the very involved research being carried on by CBS Labs which may, eventually, lead to a practical manner of measuring that very elusive and subjective quality called loudness.

To punish chapter two for not showing a 100% turnout at Binghampton, chapter one members and officers forced those who did attend to hike the whole length and breadth of both floors of the Colonial Motor Inn in order to reach the meeting place from the dining room, which was only a few steps away.

Chapter Two

The largest attendance to date was experienced at the April 4 meeting of the Northeastern Pennsylvania chapter of the Society of Broadcast Engineers. More than 25 engineers and technicians registered at the Scranton auditorium studio of WEJL for the chapter's sixth regular monthly meeting.

Chapter Two has been forming for over a year and instituted regular monthly meetings in November. The first elections were held in January.

Chairman Joseph Risse, who was recently elected to the post of Executive Vice President of the SBE national organization, observes that the great amount of interest shown and the rapid growth of SBE is indicative of the need which is being filled by an organization which is controlled by and devoted exclusively to the interests of broadcast engineers.

After regular business meetings the sessions turned over to knowledgeable representatives of nationally recognized firms for discussion and demonstrations of particular interest to members. Heard so far have been engineers from the RCA semiconductor division, the A.T. & T. Long Lines Department and the former SBE national President, John Battison. Attendents at the April meeting were the guests of A.T. & T. for a two-hour tour of their Scranton plant. Plans were completed to have a nationally known technical author, consulting engineer and lecturer as guest speaker at the May 2 meeting. Edward M. Noll, a former teacher of radiocommunications at Temple and Penn State Universities and the author of numerous engineering and technical books, will discuss some of the latest developments in broadcast equipment.

A joint meeting has been arranged for May 10 with the Binghampton chapter of SBE, which is presided over by Charles Hallinan, who was recently elected as national president of the society. The meeting will be in Binghampton, N.Y. and will feature a discussion by a representative of CBS Laboratories of the engineering and development of a new loudness meter.

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It is with the greatest appreciation that the Society of Broadcast Engineers list the following organizations as Sustaining Members. It is their Support that has helped make these JOURNAL issues possible.

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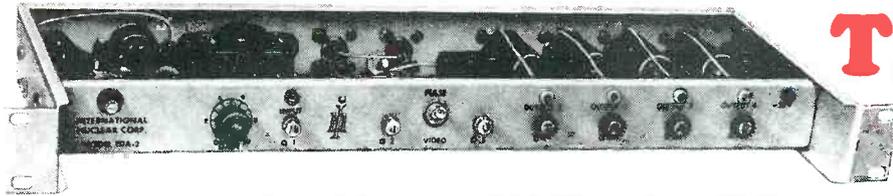
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P.O. Box 1841, Annapolis, Md.

APPLICATION FOR MEMBERSHIP

Application is hereby made in the SOCIETY OF BROADCAST ENGINEERS. The following information is supplied to assist the admissions committee in assessing qualifications and grade.

NAME _____ POSITION _____

ADDRESS _____ CITY _____ STATE _____

EMPLOYER _____

ADDRESS _____ CITY _____ STATE _____

(check preferred mailing address)

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Two references who are familiar with my work:

Name and address _____

Name and address _____

Annual dues of \$10 are herewith enclosed. (No action can be taken if dues do not accompany this application.) I agree to abide by the Constitution and By-Laws of the Society if admitted.

SIGNED _____

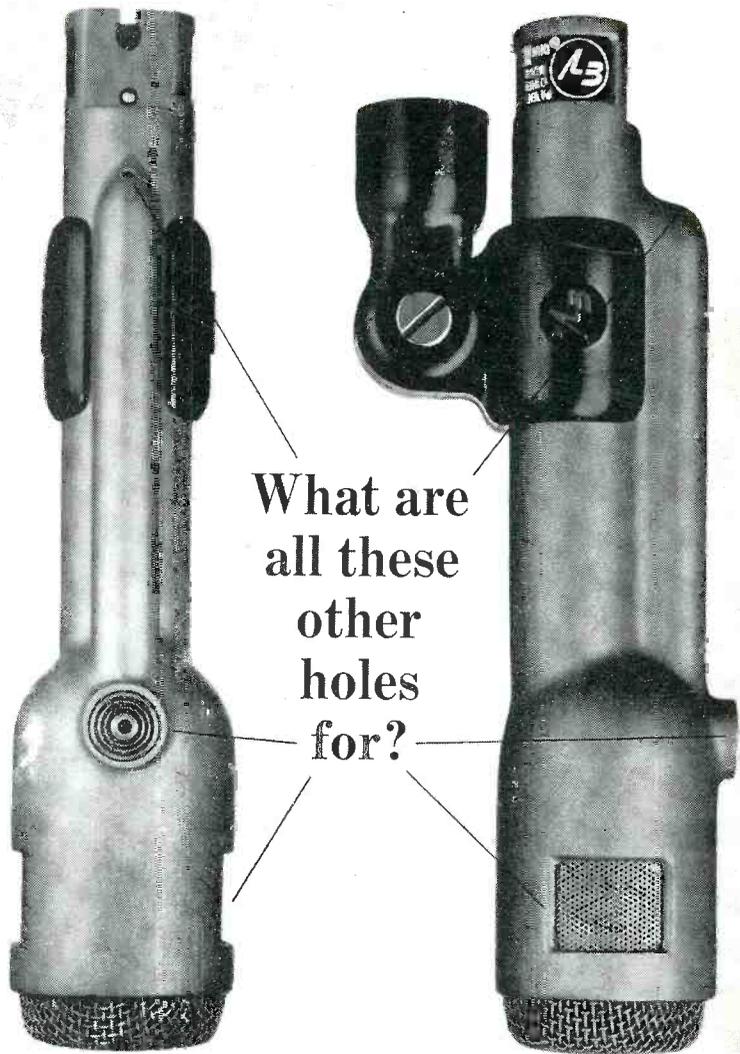
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