THE JOURNAL OF THE SOCIETY OF BROADCAST ENGINEERS

VOLUME TWO NUMBER TWO

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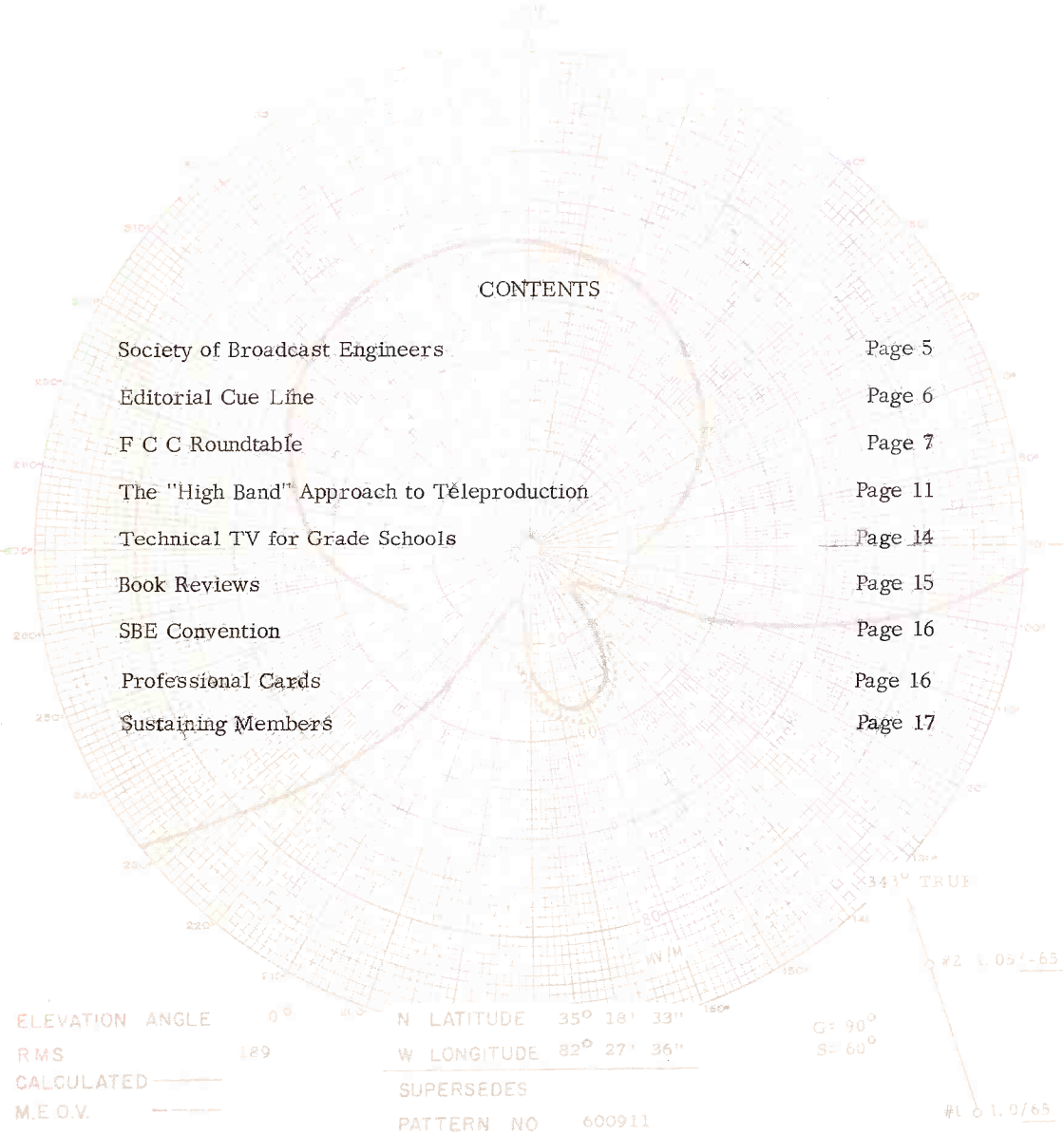

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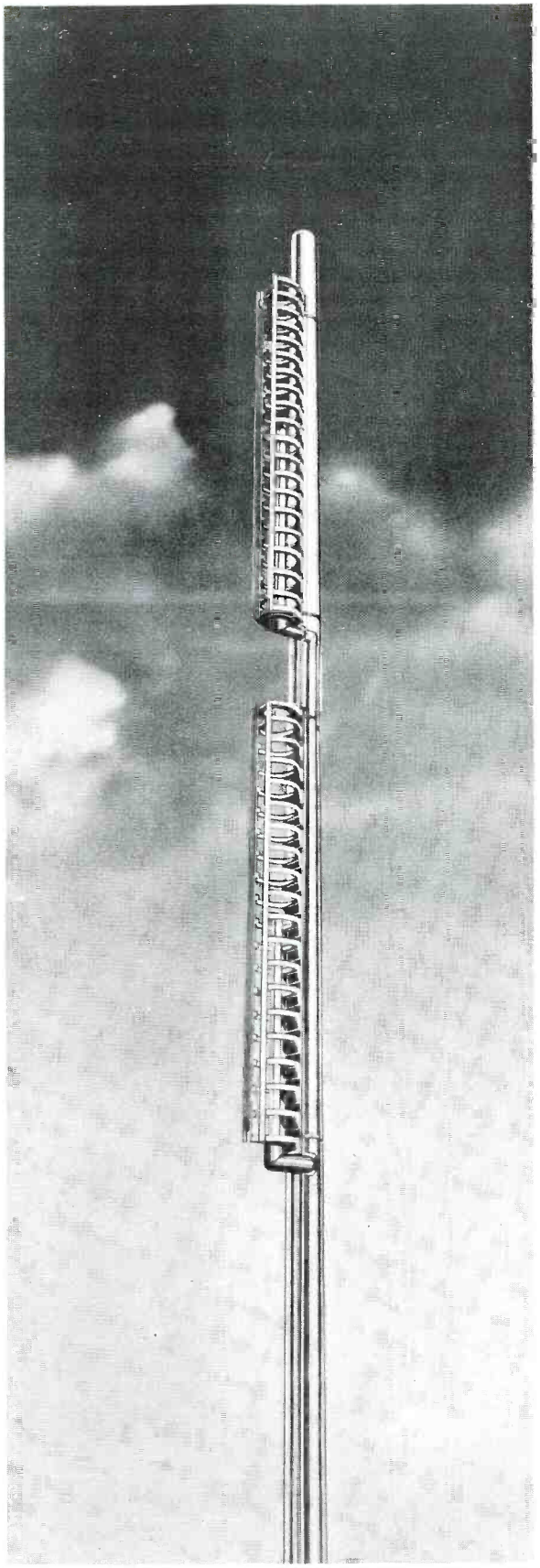

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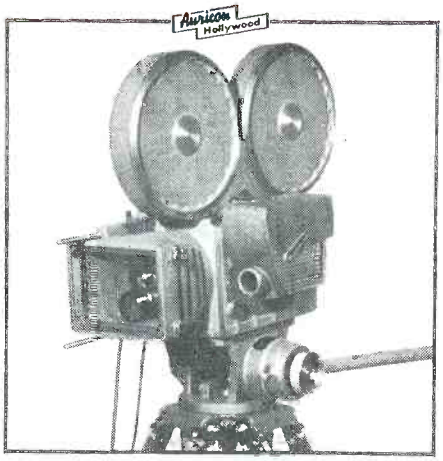

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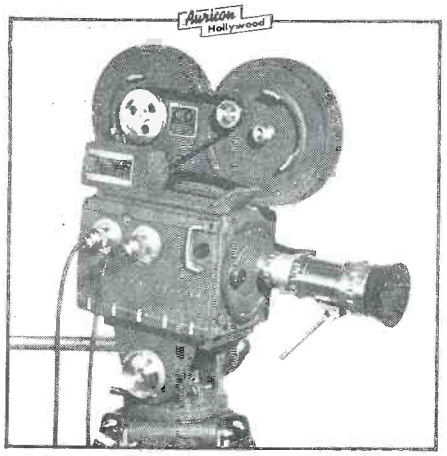

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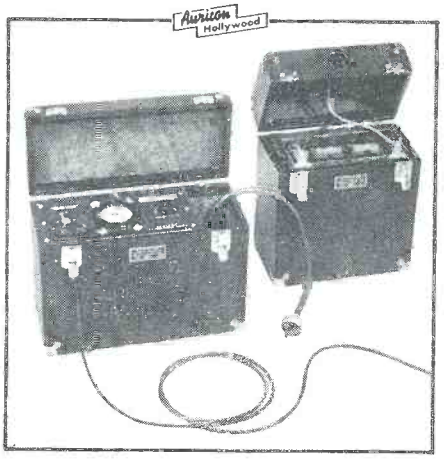

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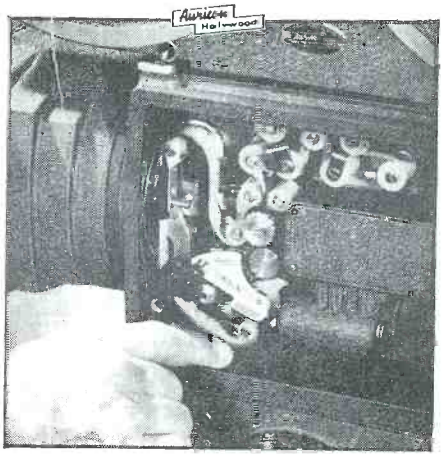

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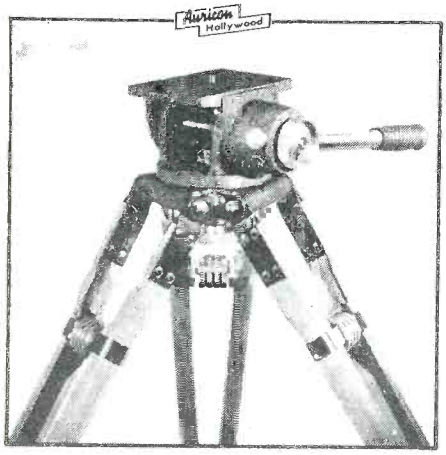

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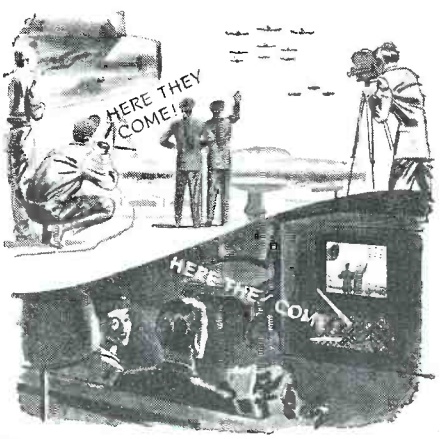

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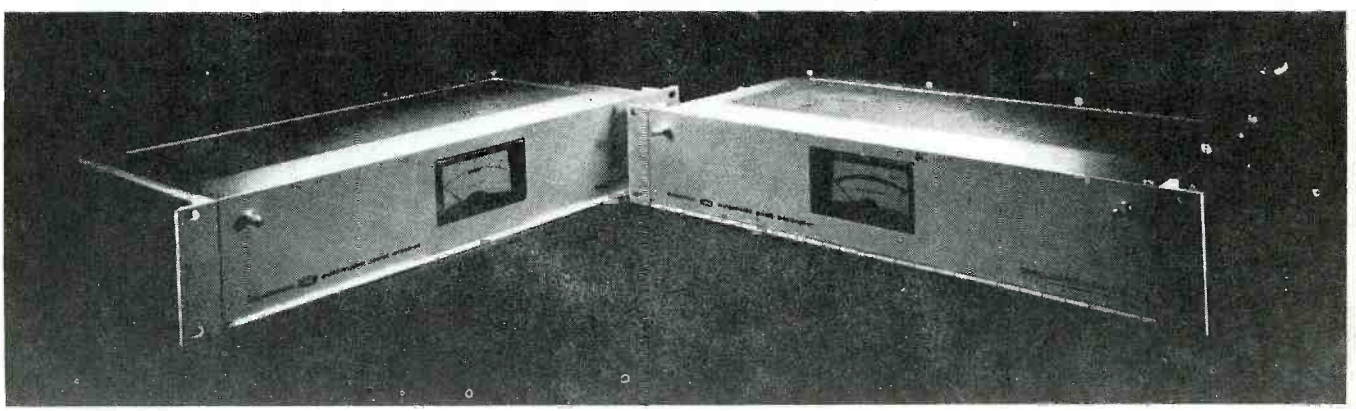

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EDITORIAL CUE LINE

This month sees the JOURNAL going to a new look! This issue is of 5,000 JOURNALS---one going to every broadcast station in the US and Canada. Also we feel pretty proud of our new saddle stitched cover, makes the outside look as good as the inside! We have several new advertisers, and the JOURNAL is well on the way to becoming self-sustaining.

PROGRESS

This month too we find that the Post Office has given us educational mailing privileges, so that our mailing costs which have been very flexible in the past will be more constant and much, much lower. The fact of being acknowledged by the PO as an education organization is an indication of our growth and increased stature.

CONVENTION

This issue too, carries news of the greatest promotion work done by any of our Chapters or Regions--Ken Benner, President of the Montana Chapter, and Northwest Regional Director together with other enthusiastic workers of the Great North West has planned the first SBE Convention to be held anywhere, and the first engineering convention that the NW Region has seen for a long time. The place is Lewistown, Montana, the date October 4th and 5th. All members as well as non-members are invited to attend, registration being $10 which includes the banquet as well. Dave Sather, President of KXLO, Lewistown, Montana, is the Convention Chairman, and full details can be obtained from him. A registration form is included in this issue, and it should be mailed immediately to Dave or Ken to help them in planning and organizing. It is hoped that a number of manufacturers will exhibit, and papers will be given by John Moseley, Ted Hildebrand, Fred Bartlett, Al Browdy, and the SBE President, John Battison. It would be tragic if this operation failed to go over 100% at least! Every member who is located anywhere near Montana should do his utmost to attend to give support to this very worthy project.

DUES

The response to the dues bills which have gone out is excellent, exact figures on renewals are not to hand, but the response is good. Apparently people who join new professional societies are better payers than many others! To those few who still have not sent theirs in, please do so right now, because you won't get the December issue if you don't!

LAPEL PINS AND CERTIFICATES

We are still waiting for the final figures on the lapel pins, but already some members have sent their money to order them. To these members we say "please excuse the delay---the manufacturer is being rather slow". Membership cards patterned after the FCC card are being mailed to all members who are paid up. Comments on the style would be appreciated ---it was suggested by several members. Membership certificates suitable for framing are being printed, and every paid up member will receive one within the next few weeks.

MORE PROGRESS

The Society is growing, and establishing itself firmly. We have a new look JOURNAL, membership, cards, lapel pins and membership certificates. We also have close to 400 members. But we need more members. Every engineer in every station should be a member. Every member should get at least one new member. We know that this is old hat, but the only way to grow is to get out and work for your Society. The inspiration of the Montana Group should inspire others to do the same, and the same kind of Headquarters help will be forthcoming in the form of limited advertising, and efforts to get speakers and exhibitors, plus any other form of moral and physical support that is possible. It's interesting to see how the two active Chapters are both Northerners!

ANTI-POVERTY

We at JOURNAL offices have our own anti-proverty campaign. It is to do away with the poverty that we suffer from time to time in the lack of material to publish! This month we were lucky to have some good material available from the NAB Convention that most members will not have had an opportunity to see previously. But this is a Society for the members, and this means by the members. And that means contributions from the members. Even if you don't fancy yourself as a virtuoso on the typewriter, put it down and send it in. If the contents are interesting we'll put it in shape. We'd welcome requests for articles and topics, and also questions on operating problems. In fact we'd appreciate comments on our lead article---the FCC Roundtable. The second part will appear in December, provided our readers like it. We feel that it covers a number of very important points; the second part covers emergency operation, inspections, measurements, logging, and many similar very pertinent questions. We would like to print bi-monthly, and eventually monthly, but without more members, and more revenue, we can't do it...and one might add---more hours in the night! It's a sort of vicious circle, to maintain interest we need more frequent contact with our members, and to be able to do that we need more members. The last we can do first---so let's do it!

NEW CHAPTER

Lucky Number Thirteen! That's the latest Chapter to be formed at New Braunfels, Texas by Robert E. L'Roy of KLRN. All you Texans should rally round. We've also received a copy of the second issue of the Chapter Six Newsletter Congratulations to Editors Ted Hildebrand and Dutch Meyers who put it out. It has a very interesting article by Ken Benner on COMMUNICATIONS FREQUENCY MEASUREMENTS. It's very informative, and we hope to run it in the JOURNAL one fine day.

J.H.B.

LAPEL PINS!

STOP PRESS!

Lapel Pins denoting membership in the Society are now available, price $2.50 each postpaid, from SBE Headquarters. Order yours today and wear it proudly! Box 1841, Annapolis, Maryland.

FCC TECHNICAL PANEL QUESTIONS AND ANSWERS

This is a verbatim report of the annual question and answer session at this year's NAB Convention. The session was moderated by James D. Parker, Director of Transmission Engineering, CBS, Television Network, New York. The FCC Panelists were: Hart S. Cowperthaite, Chief, Rules and Standards Division; Ralph H. Garrett, Chief, New and Changed Facilities Branch; Otis T. Hanson, Chief, Aural Existing Facilities Branch; Wallace E. Johnson, Assistant, Chief Broadcast Bureau; Harold G. Kelly, Supervising Engineer, TV Applications Branch; Frank M. Kratokvil, Chief Field Engineering Bureau; Neal K. McNaughten Chief, Emergency Systems Division, Office of Emergency Communications. The verbal type of format has been retained with each participant introducing himself on his first contribution.

MR. PARKER: The final and closing feature of this Engineering Conference will be the FCC Technical Panel. This is a program that was initiated last year and proved to be highly successful; being both constructive and informative.

MR. KELLEY: I'm located in the Commission's Television Application Branch, where we process applications for construction permits, modification of construction permits, and applications for licenses. We also handle special temporary authorities and issue program tests.

MR COWPERTHWAIT: Chief of the Rules & Standards Division.

As the name implies, we are charged with the responsibility of processing proposals to change the rules, standards and regulations. We receive these proposals from a variety of sources. Some are generated in our own staff. Some come from the Commission, and, of course, the bulk come from the industry.

Being bureaucrats, we like to receive these proposals in the form of original and fourteen copies. Sometimes this makes people mad, especially engineers. So, if you have a proposal that will revolutionize this system of braodcasting, please hand it to us over a cup of coffee and we'll be very grateful. Or even if you just have a simple suggestion for clarifying the wording in the rules, which are said by some to be a bit on the abstruse side, we will be happy to have them informally.

When we receive these proposals, we sit down with our engineers and prepare an analysis, accompany it if it has merit, with a notice of proposed rulemaking and take it to the Commission. If they agree to adopt it, public notice is issued, and a period of time is given for comments, usually thirty days or more. When the comments come in, we again examine the proposal and prepare a final report and order, which we take to the Commission and which they may adopt or deny.

MR. HANSON: Chief of the Aural Existing Facilities Branch, Aural meaning AM and FM, to differentiate from any friend Harold Kelley.

We do practically the same work in my office. Primary responsibility, for the people on the outside, is program tests. Everybody wants to get on the air, of course, if they have a new station, or if they have made changes in their facilities, they want to get on the air.

We have the famous ten-day rule, where we are supposed to act on the applications within ten days, and believe me, we are pressed to stay within that particular ten days.

We also handle SCA operations, remote control operations and pre-sunrise complaints. We have referrals from the Field Engineering Bureau, from the Complaints and Compliance and from the Renewal Branch. The engineering portions of that are thrashed out in my shop. When we're not doing that, we're answering letters.

MR. KRATOKVIL: Chief of the Field Engineering Bureau. This is the Bureau that you probably have the greatest contact with. I operate twenty-four district offices in the major cities of the United States and Honolulu, Anchorage, Puerto Rico, San Juan, and I also operate through three divisions in Washington here, the Field Offices Divisions, the Monitoring Systems Division and the Engineering Division. I operate these district offices I have mentioned, and the eighteen monitoring stations, which are located in Alaska, Hawaii, Puerto Rico and the contiguous 48.

In addition to policing the airwaves and checking by means of inspection, we also render a public service. Like every policing organization, we try to be helpful as well as serve a violation notice on you.

In addition, you, no doubt, were following the Gemini flight. The monitoring system was standing by to render direction-finding assistance in case Mr. Grissom went down in the Indian Ocean or parts where he didn't figure he ought to go down. And by means of high frequency direction finding we might have assisted in locating him.

So you see we have quite a large span. Of course, our attention is devoted not only to the broadcast services, but to the other public services, such as citizens' radio, amateur radio, and ship radio service in all of the Commission's activities.

MR. McNAUGHTEN: Chief of the Emergency Communications Systems Division. This Division operates under the policy guidance of the Defense Commissioner, Commissioner Bartley, and under the administrative direction of the Executive Director.

The job that we perform relates principally to the emergency broadcast system. We have a field force of eight men, one each at the OCD regional offices. They are there for the purpose of assisting broadcast licensees, as well as all other licensees, in the development of their emergency communications plans.

Right now in the broadcast service we have plans in from 49 states, and the 50th state is working on it. We have issued approximately 2, 300 national defense emergency

authorizations, which, I believe, far exceeds that number that was issued under the old CONELRAD program, and I believe it attests to the popularity of it.

MR GARRETT: In charge of the New Aural and New Changed Facilities Branch in the Broadcast Bureau. We process the applications for new broadcast stations and for major changes in existing stations. Having processed these applications, we write a report and make recommendations to the Commission. If it's in order, we feel that the proposal must go to hearing, we prepare an order, handling all the protests that have been filed with it, the petitions for and against it at that time, if possible.

MR. KRATOKVIL: We opened the Chicago meeting last year by having me tell you what the roll of compliance was, and I thought you might find the most recent one interesting.

In AM, the bigest violation that we have encountered has been in maintenance logs. That accounted for 12.5 per cent.

The next biggest violation has been log requirements in general - 9 per cent.

So, you see, 12 and 9, that makes about 21-22 per cent just on logs alone.

9.5 per cent equipment performance measurements, failure to make them, or to keep measurements on file.

8.1 per cent equipment indicating instruments, remote ammeters, calibration and so forth.

7.3 per cent the transmitter, fencing around the tuning house, or the antenna base, either not there, or in such a state as to practically not be there.

Six per cent was devoted to radio operator requirements, failure to have the operator with a third class license, plus broadcast endorsement.

5.9 per cent operating power, maintenance of operating power.

5.7 per cent program logs, failure to indicate sponsor.

5.3 per cent operating logs, failure to make or to record the half-hourly entries.

3.8 per cent modulation monitor defective, and 3.7 per cent modulation, meaning over, or I suppose, grossly under.

In the FM, the picture was like this ...

18.7 per cent logs in general.

11 per cent modulation.

10.1 per cent transmitter performance, failure to make or keep equipment performance measurements on file.

9.7 per cent maintenance logs, failure either to make or to log the required five days a week inspection of transmitting equipment.

6.3 per cent - there again you got it - operator requirements, failure to have a third class operator license plus broadcast endorsement on deck.

4.1 per cent logs operating failure to make a record half-hourly intervals.

3.9 per cent operating power, maintenance of operating power not proper.

3.2 per cent sponsored programs, the announcement of them lacking.

Three per cent station and operator posting.

In other words, 70 per cent of all the rule violations were chargeable to only nine sections of rules.

In TV, 34.1 per cent of the violation notices issued were for transmission standards, reference white level, and reference black level.

15.1 per cent were logs general requirements.

10.1 per cent frequency tolerance of the aural transmitter.

9.5 per cent transmitters. The aural transmitter, Rule 73.687 was violated in some respect.

6.2 per cent of the violations were operating power, calibration of transmission line meter was either faulty or not shown.

5.6 per cent maintenance, failure to make or record tower light inspections.

3.4 per cent was program log, failure to indicate sponsor.

And 1.7 per cent was identification.

In this case, 86 per cent of all the rule violations were chargeable to only eight of the rule sections.

I have available a series of reproduced papers showing a check-off system that our inspecting engineers use when they visit your stations.

MR. PARKER: One of the first questions which I have relates to that maintenance log. What type of entry is required in the maintenance log to meet the daily inspection requirements?

MR. HANSON: The rules on the maintenance log are not too clear, I'm afraid. It says you make an entry of the time you arrive, and the time you depart and what you do while you are there. I think this is all that is necessary. If there is no maintenance required, a simple statement, no maintenance required, everything is satisfactory. Whatever maintenance you do you should log. If there is no maintenance and you are satisfied no maintenance is required that day, fine.

MR. KRATOKVIL: I think most of the violations have been that you just didn't keep the maintenance log or you didn't record the tower light observations, and something like that would be entirely within your control.

MR. PARKER: Section 73.690 of the rules now requires television stations to measure their carrier frequencies "within intervals not exceeding one month." Our station employs an outside commercial measuring service for this purpose. Our past arrangement with the measuring service has been set up on the basis of a monthly measurement, scheduled for the second Monday of each month. This results in some monthly measurements being greater or less than thirty days apart.

For example: A check of our monthly measurements for 1964 showed five measurements were 35 days apart, but seven measurements were only 28 days apart.

Is the Commission going to be sticky, and require each one of these monthly measurements to be exactly thirty days apart, or will they accept these occasional measurements that are 35 days apart?

MR. KELLEY: It is the intent of this rule that you measure your frequencies once each calendar month, and if you have a contractural arrangement with, let's say, a measuring service, that this schedule be set up, for example, the first Monday of each month, or the third Thursday of each month, or something of that nature, and there would be - let's see, sometimes it would be five days, five weeks apart. You've actually gone over four days of the ideal 31 maximum. But in a case like this, if

you actually have an arrangement with a measuring service, I think that would well satisfy the intent of the rule. What wouldn't be, I think, acceptable, would be the case where, let's say, you made a measurement at midnight on March the 31st, then one minute after midnight, you made another measurement on April the 1st. Then you made your next measurement 60 days later at the beginning or at the end of the following month. That would obviously be a violation.

MR. PARKER: What steps are being taken to relax the regulation concerning direct view of transmitting equipment, when more practical supervision can be accomplished with a few remote meters?

MR. HANSON: We had hoped by this time to have something to report. We're still working at it within the Commission, with the notice - looking toward the notice proposal - possibly spelling something out. But as of now, the policy is that the operator is supposed to be located and in charge of the transmitter. So, therefore, we say, if he is supposed to be in charge of the transmitter, then he has to be able to see it, and be near it and be able to control it.

Now, we have gone so far as to say, you don't have to be able to actually read the meter if the meters are visible to the operator. He has to read the meters every half hour but if he can see the transmitter through a window or a series of mirrors, that is acceptable.

The whole idea is that the operator has to be near and be able to get to that transmitter. We hope to have some rules out that will relax this requirement a little bit. But as of now, this is what we're telling the people who write in on this question.

QUESTION FROM THE FLOOR: I would like to go back to this question of maintenance logs.

We had a case where a client in west Texas was inspected some months ago and the inspector said that he didn't see how anyone could make the required daily inspection of transmitting equipment and certify to its operating properly in less than about two-and-a-half-hours. Would you care to comment on that, Mr. Kratokvil?

MR. KRATOKVIL: No, I don't think it's reasonable. I don't think that was contemplated. I think that this is a new rule and as is the case with all new rules, we generally have a few problems.

Incidentally, I concluded my inspection tour many years ago, and before the Chicago Convention, I made my first inspection in twenty-five years. So I went out and I was introduced to the maintenance log. If I recall correctly, it was a very simple thing, and at that time one of my subordinates, who was accompanying me, showed it to me and we took a rather tolerant view of the thing.

And as Mr. Scanlon of my staff here has indicated - the large number of violations isn't because of the contents but the fact that you just haven't recorded anything in the log. It's blank, in other words, or it's threadbare.

I would imagine that as your maintenance is conducted-you certainly have a maintenance schedule in your station, or you should have - you will record it.

The same manager that would be concerned with general operation should also be greatly concerned that there is a maintenance program in the station. And, as these entries would be made in a log, it seems to me that we'd finally get tired of reading and concede that you were maintaining this log.

So I don't see any two-and-a-half hour weekly inspection. I don't think it would have to be presented in that particular manner.

QUESTION FROM THE FLOOR: Section 73.111 requires that a person keeping the log shall sign the log when going on duty, and again when going off duty. This also relates to the maintenance log.

There is also a requirement in the maintenance log that the person making the daily inspection shall sign the log and indicate the amount of time that he has devoted to maintenance.

Isn't there a conflict between these two, or an overlap somewhere in the rule?

MR. KRATOKVIL: Well, that hadn't come to our attention before. I would say that we have been reasonably tolerant, or thought we were.

MR. PARKER: The maximum aural effective radiated power for television stations was recently reduced from 70 per cent to only 20 per cent of the visual power. I understand the new rules permit us to continue to operate with our present aural power until next March.

My questions are, first: Will the Commission automatically lower the aural power specified on our license, or do we have to file the usual applications and submit another set of proof-of-performance measurements?

MR. KELLEY: No, we would not automatically correct your license to reflect the new power. It would be necessary for you to file an application on an FCC Form 301 to make the change in aural power. That would be necessary so we would know what constant you are going to operate the transmitter at, and to be sure that the manner in which you wanted to operate would conform to the new 10 to 20 percent rule.

In most cases this will be done on a multiplication-of-license basis, rather than going through the CP, and later filing proof of performance for your aural performance. In other words, there would normally be one application involved. That would be 301 and we will try our best to treat that as a multiplication of license to simplify it for you and us, both.

MR. PARKER: The second part of this question is:

Should we wait until next March to reduce our aural power or may we do it sooner?

MR. KELLEY: The sooner, the better. And I want to emphasize that an application is necessary and I hope that you won't wait until March 1966 to file your application. I would hope that all applications would be in by the end of the year to give us an opportunity to process these well in advance of the deadline.

MR. PARKER: The rules have recently been changed, reducing the maximum permissible aural power to 20 per cent of visual. This question that we have next relates to the permissible power for the auxiliary, or emergency transmitter. If the visual power of the auxiliary transmitter is less than the authorized visual power for the main transmitter, is it necessary to reduce the aural power proportionately when you go to emergency operation?

In other words, is it necessary to maintain the same ratio of aural to visual power for emergency operation as that which is authorized for the main transmitter, when the emergency operation is a reduced power?

MR. KELLEY: My theory is, on emergency operation, where you have auxiliary transmitters, that it's sort of like any port in a storm, to operate them any way that you can to maintain your service.

Now, our position also is that whatever auxiliary transmitting equipment you might have should obviously never be operated in excess of that permitted for your main facilities.

Remembering that, we should take the position, I think, that we do not want to maintain exact ratios on an emergency operation, as we would for the regular main operation.

We won't insist upon these 10 and 20 per cent ratios of the aural with respect to the visual during emergency operation, remembering that regardless how you operate it, we wouldn't want you to operate it greater than that authorized for the main facility.

I want to point out that we don't normally specify the ERP of auxiliary transmitters for this reason. You operate them any way you see fit, in any manner you see fit to maintain your normal operation.

MR. PARKER: The next question I have here is:

The FCC recently permitted TV stations to operate without a frequency monitor. How soon will this permission be given AM stations? Are there cases of stations being off frequency to not permit this?

MR. JOHNSON: First of all, I don't think there is anything contemplated to permit AM stations to operate without frequency monitors.

I think our experience indicates we probably have problems proportionately greater in AM than we do in other services. We have a great many stations that are operating on a marginal basis. I think that if we start again giving the impression that we are relaxing technical rules, that this gives stations another chance to increase the margin profit. And I think that we'd go awfully slow in trying to relax the frequency monitor requirement as far as AM is concerned.

MR. KRATOKVIL: Actually, the number of off-frequency violations in the standard broadcast service is very, very small. In other words, there are very few standard broadcast stations caught off frequency. Now, how many of them operate 19-1/2 and 18-1/2 cycles off frequency, I don't know. But the way we look at it, if you're under 20, we sort of feel you are within the spot.

I don't have the Chief of the monitoring systems here to straighten me out on it, but I don't believe we've had very many off-frequency citations.

MR. JOHNSON: Assistant Chief Broadcast Bureau: The other problem on that, since we've got a little controversy here, it's just a feeling I guess I have, as far as the aural service is concerned. I think the aural frequency monitor is probably a much simpler device to operate, as far as a station is concerned. It has been through the mill. It's probably more effective, as far as the frequency monitoring system is concerned, than some of the other services.

But my feeling still is, that if we took the frequency monitor out of AM broadcast stations, that Frank's work would undoubtedly increase.

MR. KRATOKVIL: I think so.

MR. KELLEY: I just want to make one comment. This question reads: "The FCC just recently permitted TV stations to perate without frequency monitor."

That isn't exaclty true. We don't require frequency monitor for daily use per se as we have known it up to this point. But I want to remind you that the rules do require a frequency check at least once each day, not an actual measurement, but a check against some type of apparatus which will satisfy you that you are within the operating tolerance.

MR. PARKER: Since the inception of the emergency broadcast system, EBS plan, in early January, 1964, are we still required to maintain receivers capable of receiving the notification signal two carrier breaks and the tone?

MR. McNAUGHTEN: Yes, this is true. I was a little surprised that Frank didn't mention this in the percentages of violations.

There are quite a number of them that come through. But the rule is still there, that receivers must be maintained. And this is one of the functions of our field liaison officers, that I mentioned earlier, to assist you in selecting the station to which you should listen and keep that receiver tuned.

While I'm on it, the rules are also in effect, that each and every station, AM, FM and TV must still, once a week, at a time of their option, conduct this test for the reception of other stations.

Sometimes they are little difficult to come by - that is, answering the citation - because a man may, in fact, be in a very difficult georgraphical location, and at that point you need some help. This is one thing that our field liaison officers in the OCD regions can do for you.

Part two will appear in the December issue.

THE "HIGH BAND" APPROACH TO TELEPRODUCTION

Joseph Roizen
and
Paul Welcome

Ampex Corporation
Redwood City, California

In 1956 the recording of television programs on magnetic tape gained immediate acceptance as a means of providing time-delay. Almost ten years later, recent developments enable the magnetic medium to be used for teleproduction. The word teleproduction in this context means the ability to duplicate and expand upon the well known film techniques of splicing, editing, single frame animation, and synchronous matching of sound to picture or picture to sound. Teleproduction is now a useful operational tool because the present state-of-the-art makes possible the attainment of hitherto impossible performance in the video recorder. These extended performance characteristics can be logically grouped as electronic, electromechanical and operational. In each of these major parameters of operations extensions have come about through the refinement of the signal system, the servo system and the flexibility of utilization.

Signal System

One of the major limitations to multiple regeneration of video tape program material has been the marginal signal-to-noise ratio and poor transient response in the video system, both record and playback. Each subsequent copy from an original tape introduces about a 3db loss in signal to noise. The final distribution copy, which was assembled from a number of pre-recorded segments, usually turned out to be at least a third generation tape. The noise would then be in the order of 36 tp 37 db and not acceptable by many quality conscious broadcasters. Even the most technically naive viewer notices the reduction in quality of some multiple generation programming, even though he may not know why.

Even more noticeable was the effect of limited transient response, which introduces visible ringing at each sharp amplitude transition in the image. Trailing effects became very objectionable when several consecutive dubs were made. In the recording of color signals especially, even a second generation was in the objectionable region because of moire and inter-modulation distortion in saturated areas.

Since these problems are inherent in the signal system, which was established in 1956, Figure 1, it is necessary to re-examine the parameters of operation and to determine which ones are significant. Two things become apparent. The signal-to-noise ratio may be improved by wider deviation, but the price is inter-modulation which produces unwanted spurious signals, that result in a visible interference in the picture. This generation of unwanted spurious signals is due to the proxmiity of the carrier and deviation signals to the higher video frequencies, Figure 2. The obvious remedy here is to move the carrier and deviation frequencies, since the video frequencies are fixed. We have arrived at the point of moving the carrier frequency up, but how far up -- and why choose any particular point? If the carrier frequency is increased, there is not a linear or direct proportional reduction in spurious output. Instead, the reduction of spurious output occurs in discrete steps on which second, third and fourth order harmonics exist. Figure 3. At this point, the solution to the problem of signal-to-noise and transient response in the signal system is to operate on the highest shelf of operation which is consistent which present "state-of-the-art", Figure 4. One of the first stumbling blocks to operating at these higher frequencies is the resonant frequencyof commonly used head assemblies. This limitation is now overcome by the use of modified head assemblies,

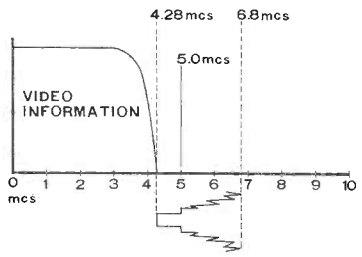


Figure 1

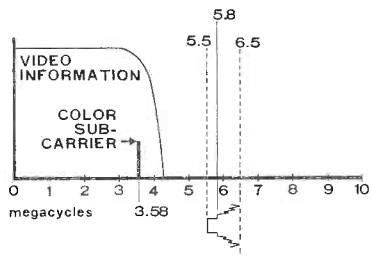


Figure 2

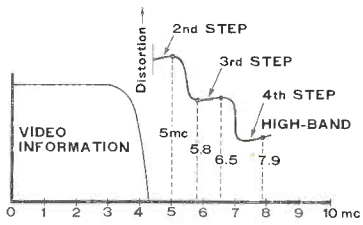
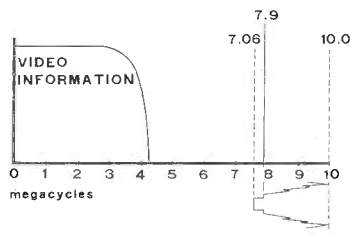


Figure 3



10 MEGACYCLE HIGH BAND

Figure 4

which include the intergral pre-amplifiers and rotating transformers that not only raise the head resonance to the desired level but also effect a significant decrease in the crosstalk between heads. We are now able to operate on the fourth order shelf and this provides a basis for a level of performance that meets tele-production requirements.

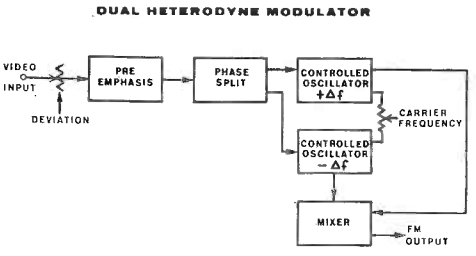
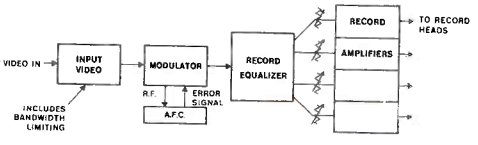


Figure 5

The design of the system must also assure that maximum linearity is maintained from input to output, in order that differential effects are reduced to an insignificatnt amount. The modulation system which has developed and proven, utilizes a modulator that eliminates the characteristic non-linearity of a single-ended modulator. This is accomplished by utilizing dual-driven oscillators that are operated in anti-phase, Figure 5. The oscillators are controlled by varactors, and operate at 100 and 108 megacycles respectively, their outputs being mixed and applied through a low-pass filter to the record equalizer and record amplifier.. The varactors (variable silicon diodes) change their capacity in direct proportion to the cube root of the applied voltage. Since the frequency to voltage ratio follows the sixth power, only a few percent deviation is needed. The end result is that better than one percent linearity is achieved over a 5 megacycle range AND even order non-linearities cancel out due to the opposite phase modulation. Only video pre-emphasis is used, and the signals are applied to the head through low impedance circuitry, which effectively damps out head resonance, Figure 6. Under these conditions, even with 100% multi-burst test signals applied, the RF envelope of the FM signal contains very little AM component and is symmetrical.



RECORD DIAGRAM

Figure 6

In the playback mode, head resonance cannot be damped out without amplitude loss from the transducer. Special circuitry is included to permit conjugate equalization of this resonant peak. The frequency of the resonance and the Q of the equalizing circuit are altered by C and R components, resulting in a flat amplitude, versus frequency response for each head channel. It should be noted here that the frequency compensating circuitry is located externally from the head assembly and enables the interchange of heads on different machines without additional adjustment satisfying even the engineer with a penchant for splitting hairs. This provides a signal to the demodulator which is free of differential phase effect. Push-pull limiting and detection, through a pair of delay lines, is followed by a linear-phase low-pass filter. The over-all singal system is capable of a better that 2% K factor response, with the 2 T sine-squared pulse. The differential gain and phase is less than 5% and 5° respectively. The signal to noise ratio with a 4.5 mcs reproduced video signal is 46 db, and it is 43 db when a six megacycle video siganl is reporduced.

Servo Systems

Synchronous operation with studio reference signals is one of the established methods of operating video tape recorders today. One of the major limitations in present servo systems is the band-limiting effect of the power transformers in the final motor power amplifiers which drive the head motor. Even when head velocity errors are sensed and corrected rapidly, the large inductive elements of power amplifiers limit the response rate of the feed-back loop to the motor itself.

There has been a considerable improvement in the reliability, stability, and incremental control in servo systems now coming into use Figure 7. An entirely new techinque is used in the operation of the head drum motor. A solid state 130 volt dc supply acts as the source of motor power. The three phase square wave drive is supplied by switching transistors, controlled by digital circuitry, which gates on the dc supply at the appropriate times. This method inherently provides a high phase-to-phase balance, since each phase is derived by

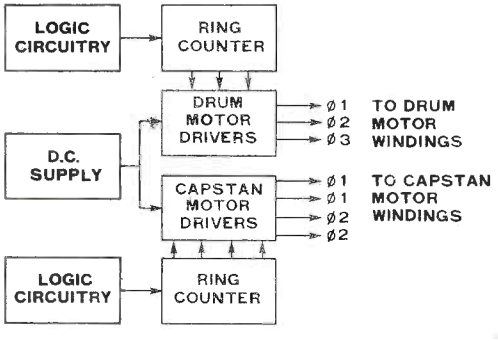


Figure 7

a switch between two fixed voltages and all phases receive an identical voltage. Binary counting circuits provide the three phase signal, insuring 120^0 phase displacement, which is precise and stable. The elimination of the bulky transformers and other components reduces the over-all size, weight, and heat dissipation yet improves the efficiency of the system. A three phase staircase waveform produces torque with no third harmonic component. This, coupled with accurate phase-to-phase balance, elininates all even order components and significantly reduces "once around" errors common to previous video recorders. The improved action of the servo loop and the use of an air-lubricated head assembly increases the pull-in range and reduces high frequency jitter to an unbelievably low level.

It is possible to reproduce 525-line NTSC color images without the use of color-corrective device, since high frequency time-base displacement in the head drum is extremely small. The capstan servo system incorporates a change from direct drive to transmission system which uses a dual field capstan motor and a considerably thicker capstan. The flutter and wow figure for this new combination at 7-1/2 ips is equal to the previous 14 ips specification and is significantly better at 15 ips.

Editing and Animation

A comparison of video tape recording with the methods used in the film industry for teleproduction has, until recently, revealed the superiority of film editing techinques. Several problems plagued the magnetic tape process when in direct competition with film. The first was precise control of the onset and termination of recording to a degree which would permit frame-by-frame control. The second problem was an extension of the first, similar control of longer segments in assembling actual productions. The last problem, with no film equivalent, was the wear of the tape with repeated passage across the video head assembly. It would be pointless to produce an animated sequence which required over 100 re-scans of the same segment of tape, only to find that the entire recording was useless because the tape had been worn out.

The first development which has helped to overcome these problems is the use of electronic editing Figure 8. This method of editing compensates for the time-displacement between the erase head and the video recording head, permitting consecutive, non-consecutive, or insert recordings to be made.

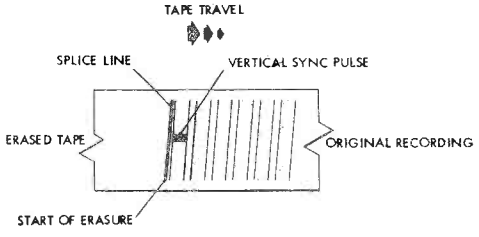


Figure 8

At this point it was necessary to asses what operational features were still lacking in order to have a flexibility equivalent to that possible in film editing. It was apparent that the electronic editing was essentially limited by the reaction time and skill of the operator. This deficiency has been overcome by the use of cueing pulses which provide the single frame accuracy required. Figure 9.

These cueing pulses are located in the auxiliary audio channel (cue channel for the video recorder) and are of two varieties. Two different frequencies are used and are labeled "remote" and "edit" cues. The edit cues perform the switching functions previously mentioned, while the remote cues are used to actuate external equipment such as other recorders, film or slide projectors, or live camera tally lights.

Simultaneous editing of both the video and audio tracks or editing of the video only, leaving a pre recorded sound track to which a picture can be sychro nized, are now a reality. After cues have been placed on the tape, a picture monitor preview of the inserted or added scene can be viewed without committing the material to the tape, or erasing what is already there. If the preview indicated that the switching point is inaccurate, it may be shifted forward or backward in single frame increments or may be changed in amounts up to eighteen frames. When the precise cueing point has been established, the old cue mark us automatically erased and rerecorded at the new location.

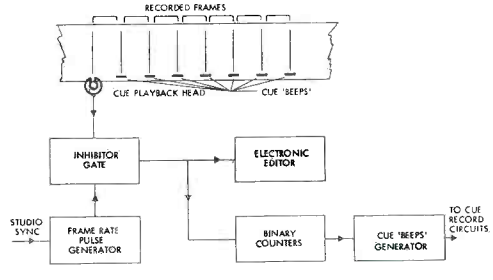


Figure 9

In the animation mode, the recorder can be operated in "automatic" which will allow the recorder to insert the frame increments selected, (from one to 37) to stop, to start, and to recue itself without an operator. That sounds a little complicated and hard to believe. When the animation mode is operated in "automatic" the initial start is actuated by the operator, and then the recorder is synchronized to the

external reference, provides a record cue (tally light), records the scene, rewinds itself, holds for a preset period, provides a cue, and if a scene requires changing later starts up automatically and repeats the process over and over until it is manually stopped or runs out of tape. In the event a longer segment of material is required within the established frame intervals, a record over-ride feature permits manual insertion of this segment. Upon completion of the manually inserted segment, the recorder will return to full automatic operation.

REPEATED RECORDINGS

The animation procedure requires a great number of passes on any given segment of the tape. If frame by-frame animation were attempted on an older recorder, it would cycle approximately 120 times. Several changes have been made in the transport system to minimize wear effect and to reduce the duty cycle of the head on tape. The installation of a retractable full width erase head, which does not contact the video tape except during the actual recording, lowers the tape wear by eliminating redundant contact between erase head and tape. The elimination of this element in the tape path during shuttle and play modes greatly minimizes scratching and tape wear. Search and lock-up period has also been reduced by programming the female guide so that its pull-in period is delayed and the tape is only brought in contact with the video head for a period of thirty frames, rather that the normal 240. In this way, any given segment in the tape is contacted by the head only 12 times even in the maximum animation mode. The audio and control track monitoring is done from the lack (or Mylar) side of the tape. The finished tape is adequately polished without suffering any deterioration.

New circuitry and new techniques, which include the improved signal system, more precise servo systems, and frame by-frame control, combined with high band operation, now give video tape an edge over film as a production tool.

Recent improvements in the inherent signal to noise of the video recording tape itself, combined with the improved signal to noise of the recorder, with interference-free recordings, make a third generation copy which rivals the "original" recording of yesterday. The magnetic tape medium has the further advantage of immediacy (no time lag for processing) and the ability to rehearse and to preview edits and animation sequencies ON THE SPOT. By the utilization of the teleproduction advantages and by including the ability to have third generation elements, as a result of transfer editing, the end result picture quality is now completly acceptable.

TECHNICAL TV FOR GRADE SCHOOLS

by Charles D. Bowen
Staff Engineer - WKBW - TV
Buffalo, N. Y.

A visit to a newly-built grade school in Suburban Buffalo for a routine parent-teacher conference was the genesis of one of the most rewarding experiences of my fourteen years in broadcasting. The rumor had preceded me that a certain eight-year-old's Dad was employed by Buffalo's channel 7 for the express purpose of keeping those nice Saturday-morning cartoons appearing, and the third grade teacher lost no time in initiating a discussion of the current science project, a study of the world of communications. She told me that she had sought some sort of contribution on the subject from a number of industries engaged in communications of the manufacture of communications equipment, and received aid only from the local telephone company. They had supplied a wealth of excellent literature, besides equipment demonstrating the well-known "dial tone" and "busy signal". With this the children were learning to recognize the sounds and to practice good telephone etiquette. Then came the request, "Please, Mr. Bowen, would you come to the school and give a lecture and demonstration of how television works?" My first reaction was to get out of this in any way I could, but before I could answer she said, "Go home and think it over, please. It would mean so much to the class."

So I went home and thought it over, and the more I thought about it, the more I realized that someone had to do this, and it looked as though I were elected! I didn't relish the idea; as a technical man I've always been content to do my job in the background and leave the spotlight to others, but this involved something infinitely more important. Too many of us are content to leave our children's education to the teachers, and then complain if things don't work out as we had hoped they would. In this chaotic age of rapid scientific advancement we are so busy with our own kaleidoscopic whirl or social and business activities that we are seldom made aware that school studies are becoming more and more complicated even in the earliest grades. Consequently, it comes as a surprise--even a shock--when Junior comes home from school with a knowledge of such subjects as diesel engines and retro-rockets. We who built crystal sets at the age of twelve find it difficult to adjust to the fact that our sons are ready for this by the time they are seven or eight.

I knew that there were many people far more qualified than I go give a lecture on the mechanics of television, even to third graders, but this was my son's class, and I saw before me an open door leading to an improved relationship with my boy. And his teacher had assured me that the entire class would benefit as well. I felt I had but one choice. I would give the lecture.

Once the decision was made there was no more hesitation. The greatest problem now was determing how much of the complexities of television the eight-year-old mind could grasp. My own son, of course, was the testing ground, for this, and I found him eager to cooperate. Since cameras, microphones, microwave equipment, etc., would be meaningless without practices, I decided to make a series of posters which I would use during my lecture, and which could then be left with the teacher for classroom display.

After a great deal of thought on the subject, I decided to limit myself to four posters, three of them tracing the signals from their origin in the studio to their eventual appearance on the children's TV screens, and the fourth poster showing the "rabbit ears", sound receiver and picture tube of a TV set. Simple silhouettes would be

most effective, I decided, since more detailed drawings would only confuse the youngsters. My first poster depicted a camera (including a simple outline of the image orth inside) and a Kleig light both focused on Suzy, who, with a floor mike before her, was doing a milk commercial. The talk began with a basic explanation of light rays and sounds waves in relation to the eye and ear, showing that we could see and hear Suzy in the studio, but our electronic eye and ear wear necessary to start her on her way to their homes. Picture number two showed the microwave transmitter, reflector, and microwave receiver, along with the transmitter building and the tower with its batwing antenna. Arrows were used to indicated the path of the signal. The third picutre showed the signal traveling through the air to the houses; the accompanying explanation included the classic "pebble dropped in a pond" comparsion. I purposely excluded the control room and the interior of the transmitter building from my pictures, as I felt the processes involved in these areas would be too complicated for the children to understand. I mentioned them in their proper sequence by saying that the engineers here make sure the picture and sound are good enough to be sent out to their homes. The fourth poster was accompanied by an explanation of the signal being changed from electricity in the antenna to light in the picture tube and sound in the speaker, and this light and sound traveling through the air to the children's eyes and ears, thus enabling them to see and hear Suzy in their homes, just as we could see and hear her in the television studio.

My lecture lasted less than ten minutes, after which I gave the children some gifts which my company had been generous enough to send along. This really loosened them up, and there followed an hour-long question-and answer period. I was amazed at the intelligent questions asked by these youngsters. I spent a good part of this hour with chalk in hand, drawing a number of diagrams which I had considered too complicated to be included in my original talk. These eight-year-olds have alert, active minds; they are quick and eager to learn. They asked a multitude of questions, covering a broad scope of subject matter. Queries on the making of a monster were many, as might be expected from children in this age of ghosts and ghouls, but so were questions involving such things as color, remote broadcasts, Telstar, and video tape, as well as the inevitable "Can you fix a TV set?" Of particular interest to these children is special effects--there were requests for explanations of things they have seen in specific shows.

We in the broadcasting industry are fortunate to be associated with something which is so vital a part of every day life; today's child can no more imageine life without radio and television than he can imagine life without rain and sunshine. We have, therefore, a unique opportunity to participate in our children's education by presenting to them something in which they already have a genuine interest. But no matter what Dad's job is--whether he's a milkman, a draftsman, a tree surgeon or a butcher-- he is a part of our way of life. He has something to offer these children who are so eager to learn, and the benefits Dad himself can derive from an experience such as mine are many. I urge you to try it. You cannot make a finer investment than to contribute a small part of yourself to the future of your child.

BOOK REVIEW

Standard Electronic Questions and Answers, Volumes I and II. Authors: Steve Elonka and Julian Bernstein. Published 1964 by McGraw-Hill Book Company, 330 W 42 St., New York 30, N.Y. Price (both volumes) $15.95.

In simple, nontechnical language, this two volume set provides comprehensive and dependable coverage of basic and partical electronics for the man engaged in all fields of technology. The books are broad in scope, and all major topics are presented in easy-to-read, question-and-answer form. A minimum of mathematics is used.

Volume I, entitled Basic Electronics, presents the fundamental principles of electronics simply so that the reader will easily understand this complex science without having to wade through chapters of mathematics. The material covered in this volume includes direct current, magnetism, inductance, capacitance, alternating current, vacum tubes, semiconductors and transistors, voltage amplifiers, and power supplies.

Volume II, entitled Industrial Applications, presents the many basic industrial circuits in their simplest form and explains exactly what happens inside each circuit and device to make it function. This volume covers oscillators, special circuits, transducers and sensors, control systems, closed-circuit and color TV, industrial processes and devices, and test equipment.

This has a lot of "meat" even for the advanced station engineer who may have forgotten some basics!

J. H. B.

Book Review

Title:	Methods of Information Handling
Author:	Charles P. Bourne
Pages:	239 Chapters: 9
Price:	$12.95
Publisher:	John Wiley and Sons, New York

The author has attempted, and succeded, in producing a volume that is excellent as an introduction to the design of an information handling system. As the title infers, various methods of information handling are described, manual, punch card, computer, etc. Unfortunately, each method of information handling is so complex and subject to such rapid transformations that cohesive study is almost impossible, therefore, the author presents the different methods in a general manner.

From the viewpoint of an engineer not familiar with any of the sophisticated methods of information handling, this volume, with one chapter excepted (Chapter 3), should be sufficient to acquaint him with the overall field.

Especially interesting to an engineer are the complete descriptions of various types of tabulating equipment.
(Continued on Page 16)

OFFICIAL REGISTRATION FORM 1st ANNUAL

CONVENTION NORTHWESTERN REGION

SOCIETY OF BROADCAST ENGINEERS

Name_____

Address_____

City_____ State_____

Telephone Number:_____

Company_____

Title_____

AREA of interest:

____AM ____FM ____TV ____CATV

Residence phone_____

/For office use only /
/ /
/____RR____CS____NmCP /
/ /
/____M1____M2____M3 /

Registration fee of $10 must accompany this application.

The convention will begin at 10:00 A.M., Monday, October 3 at the Yogo Inn in Lewistown, Montana.

All registrations must be in the hands of the convention chairman as soon as possible.

In the event of cancellation the registration fee will be refunded.

A minimum of 50 registrations are needed to round sufficient support for the equipment displays.

From a sampling of the response received from key-people in the industry this convention has all the earmarks of being a fine success.

You do not have to be a member of the Society of Broadcast Engineers to participate in this convention.

Please Mail the registration to:

Mr. David L. Sather
S.B.E. Convention Chairman
P.O. Box 620
Lewistown, Montana

PROFESSIONAL
CARDS

(Continued from Page 15)

In one chapter the author describes and presents pictures of most of the tabulating equipment, one could possibly be used in setting up a punch card information handling system. Unfortunately, some of the equipment presented is out of date, but the basic principles of operation remain the same. F. G.

Chapter News
Charles Hallinan, Chr.
Chapter One

Chapter One held its eighth and last meeting of the 1964-1965 season, Tuesday 15 June 1965 at the Colonial Motor Inn, Vestal, N.Y.

Mr. Allen Byers, President of Waveforms, Inc., delivered a talk on "Automatic Frequency Response Plotting". His talk was accompanied by a demonstration of audio sweep generating equipment. The usual good attendance was experienced and the Annual Elections were held with the following officers installed:

Chairman:	Charles Hallinan
Vice-Chairman:	Gino Ricciardelli
Sec.-Treas.:	Louveer Stantz
Membership Chairman:	Art French

SUSTAINING MEMBERS

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.

The Alford Manufacturing Company*
299 Atlantic Avenue
Boston 10, Massachusetts

Manufacturers of Antenna Systems, transmission lines and equipment, etc.

Burke and James, Inc.
333 West Lake Street
Chicago, Illinois

Suppliers of every conceivable form of photographic equipment for TV.

Electro Voice Incorporated*
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Noted for top quality broadcast microphones and loudspeakers.

Andrew Corporation
Box 807
Chicago, 42, Illinois

Coaxial transmission line, switches, transmitting antennas and masts, etc.

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The home of the "Pro" and "Super Pro" 16 mm S-o-F Cameras for TV

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Top quality television monitors and video receivers for rebroadcast purposes.

*Also an advertiser. SBE JOURNAL rates available on request.

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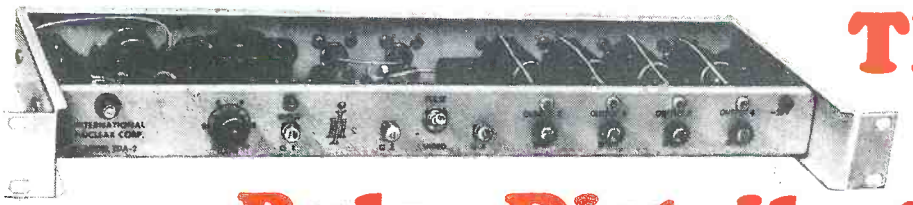

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The TDA2 is a completely solid state instrument transistorized all the way with a regulated, built-in power supply. The circuit was designed to meet exacting color standards for the TV industry. These TDA2s will accept composite or non-composite video at a bridging type input of as little as 0.25 volt and will deliver four individually isolated 75 ohm outputs of 1.0 volt, peak to peak. They replace all tube type amplifiers without alteration of existing cables. Weighs under four pounds and is only 1¾ x 19 x 7 inches overall.

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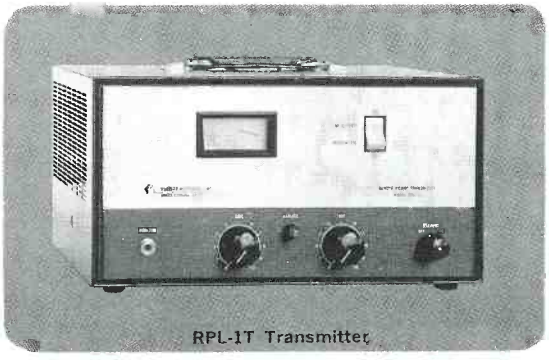

RPL-1T Transmitter

Broadcast REMOTE CONTROL SYSTEMS

Model RPL-1 148-174 mc/s

Professional broadcast design provides unmatched performance and long term reliability.

FEATURES

- Forced Air Cooling
- Auto Peak Limiter & Avg. Leveling Circuit
- Two Channel Operation
- Separate AC Power Supply
- Combined Control Head/DC Supply
- Separate Mike and Line Inputs
- Complete Line of Antennas

"Studio sound away from home"

SPECIFICATIONS

Audio Response	50 - 10,000 cps ±1.5 db	Transmitter Output	Continuous 30 watts
Distortion	Less than 1.6%	Receiver Sensitivity	0.5 db for 20 db quieting
S/N Ratio	50 db below 100% mod.	Receiver Selectivity	100 db @ adjacent carrier

STUDIO-TRANSMITTER LINKS

TELEVISION AURAL ● STANDARD AM ● MONAURAL FM ● STEREO FM ● INTERCITY RELAY ● SCA MULTIPLEX ● REMOTE PICKUP RELAY

REMOTE CONTROL SYSTEMS

RADIO and WIRE for **AM ● FM ● TV**

For over seven years, Moseley Associates, Inc. has been engaged in the development and manufacture of STL and remote control equipment. During this period, hundreds of systems have been installed to serve the broadcaster's varied and individual requirements.

Moseley custom-designed STL and Control systems are built around time-proven cataloged equipment such as:

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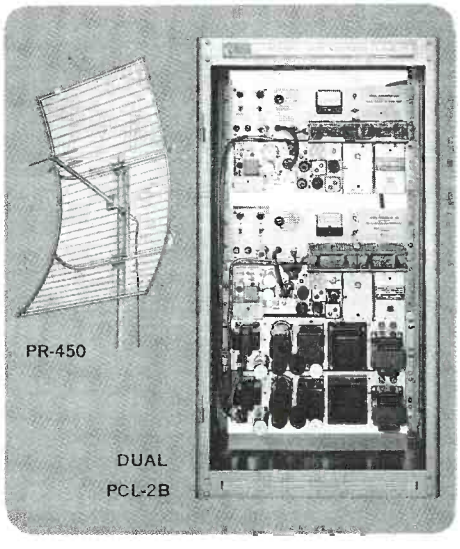
- Dual PCL-2B STL
- SCG-5 Solid-state Multiplex Generator
- PR-450 Paraflector Antennas
- SCG-4 SCA Multiplex Generator
- MFA-1 Multiplex Filter Amplifier
- PBR-21 21 Channel Solid-state Remote Control System
- SCD-1 Solid-state Multiplex Demodulator

All Moseley systems operate within the Rules and Regulations of the FCC and exceed the basic technical requirements by a margin that simplifies proof-of-performance checks.



PR-450

DUAL PCL-2B

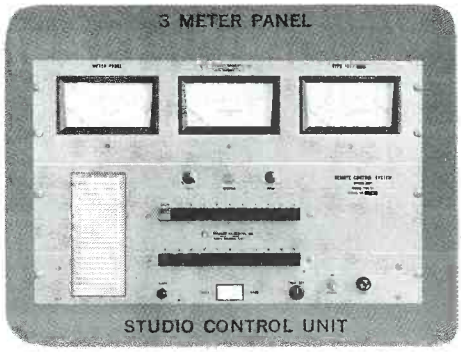
MODEL PBR-21

21 CHANNELS ● ALL SILICON SOLID-STATE CIRCUITS ● 42 CONTROL FUNCTIONS ● PUSH-BUTTON CONTROL GOLD-PLATED CIRCUIT CARDS ● ONE TRANSISTOR TYPE

Requires only one signal grade line or STL

The Model PBR-21 operates over wire or radio systems. Control and fail-safe frequencies are between 2000 and 3000 cps. Telemetry tones are 400 - 750 cps and in certain radio applications, the frequencies are between 22 - 36 cps. A complete line of accessories including Voltage Sampling Kits, Reversible Motor, etc. is available.

MODEL WRC-10T is an economical, solid-state 10 channel system for less demanding wire control requirements. One DC line is required.



3 METER PANEL

STUDIO CONTROL UNIT

write or phone for complete data and prices for any of these products. Our technical staff will be pleased to assist you with any special requirements.

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15 Years Old and Still Ahead of the Times!

It may not look revolutionary today, but fifteen years ago the E-V 655 shown here was unique. Then it was the only truly omnidirectional dynamic microphone on the market. And it offered ruler-flat response from 40 to 20,000 cps, plus plenty of output for critical broadcast applications.

Even today, those specs are first rate. Many of the early 655's are still proving that in dependable daily service. But during the years, E-V has continued to refine and improve so that today's Model 655C can set even better records for performance and service.

Having proved the point, the 655 inspired a complete series of Electro-Voice omnidirectional microphones that serves every need over a wide price range. The full benefit of our fifteen years of design leadership is lavished on even the most modest model in the line.

For instance, every slim E-V dynamic microphone uses the famed Acoustalloy® diaphragm. This E-V exclusive insures more uniform response while withstanding the effects of high humidity, temperature, corrosion and shock. It makes E-V omnidirectional microphones almost indestructible.

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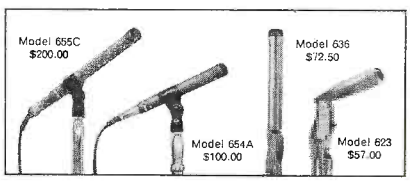

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