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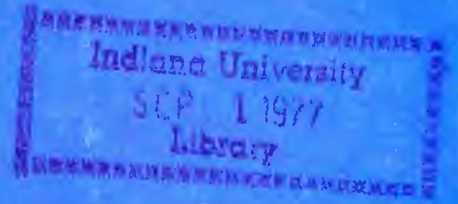


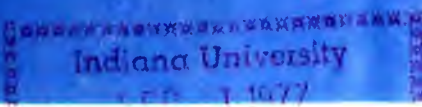
IMAGE ENHANCER ROUNDUP

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Audio distortion tests

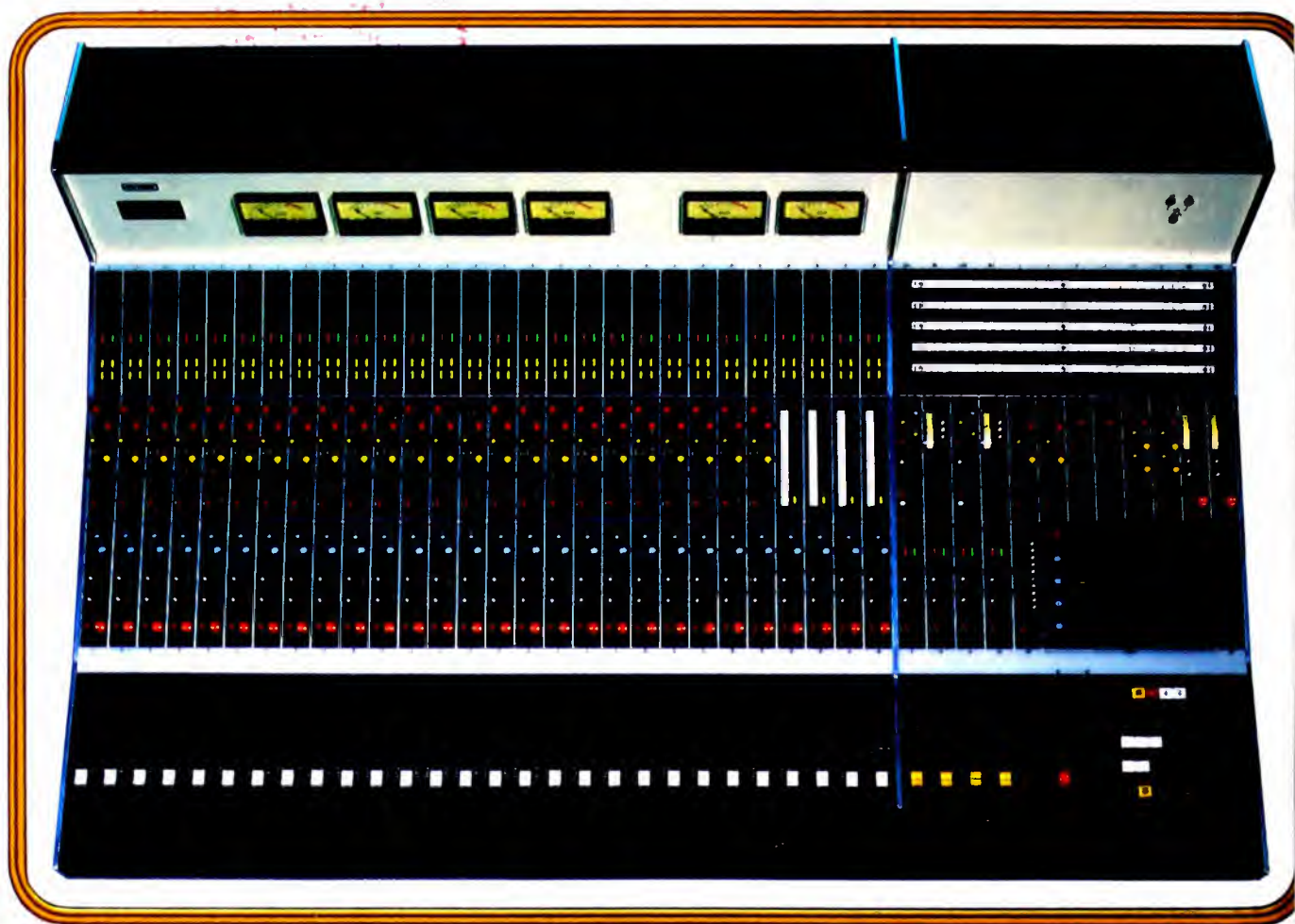
NRBA convention time

Basic STL review



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- 22 Image Enhancer Roundup.** A discussion of enhancer basics and a list of facts, features, and prices of enhancer equipment available today. *Joe Roizen.*
- 30 Slew Rate Tests.** Here's a new way to look at audio distortion and audio specs. The author tells why these tests are important and how to pull them. *Walt Jung.*
- 36 STL Operating Techniques.** First of a two-part series on the basics of STLs. Includes system variations and numerous examples. *John E. Leonard.*
- 42 NRBA Success Story.** Convention plans and sessions are detailed for NRBA's upcoming national meeting scheduled for October in New Orleans. *Ron Merrell.*
- 48 Digital Troubleshooting.** Our Digital Workshop continues with part 4 of tips for troubleshooting digital circuits. *Harold Ennes.*
- 57 How To Solve Your Tape Speed Problem.** Have a problem with tape recorder or turntable speed controls? The author tells how WCCO solves this nagging problem. *Hal Schardin.*

About the cover

The picture was taken from a monitor, showing a 13th generation copy of an image recorded on a single track. It proves the viability of digital video multi-dubbing courtesy of Ampex. *Photo by Donna Foster Roizen.*

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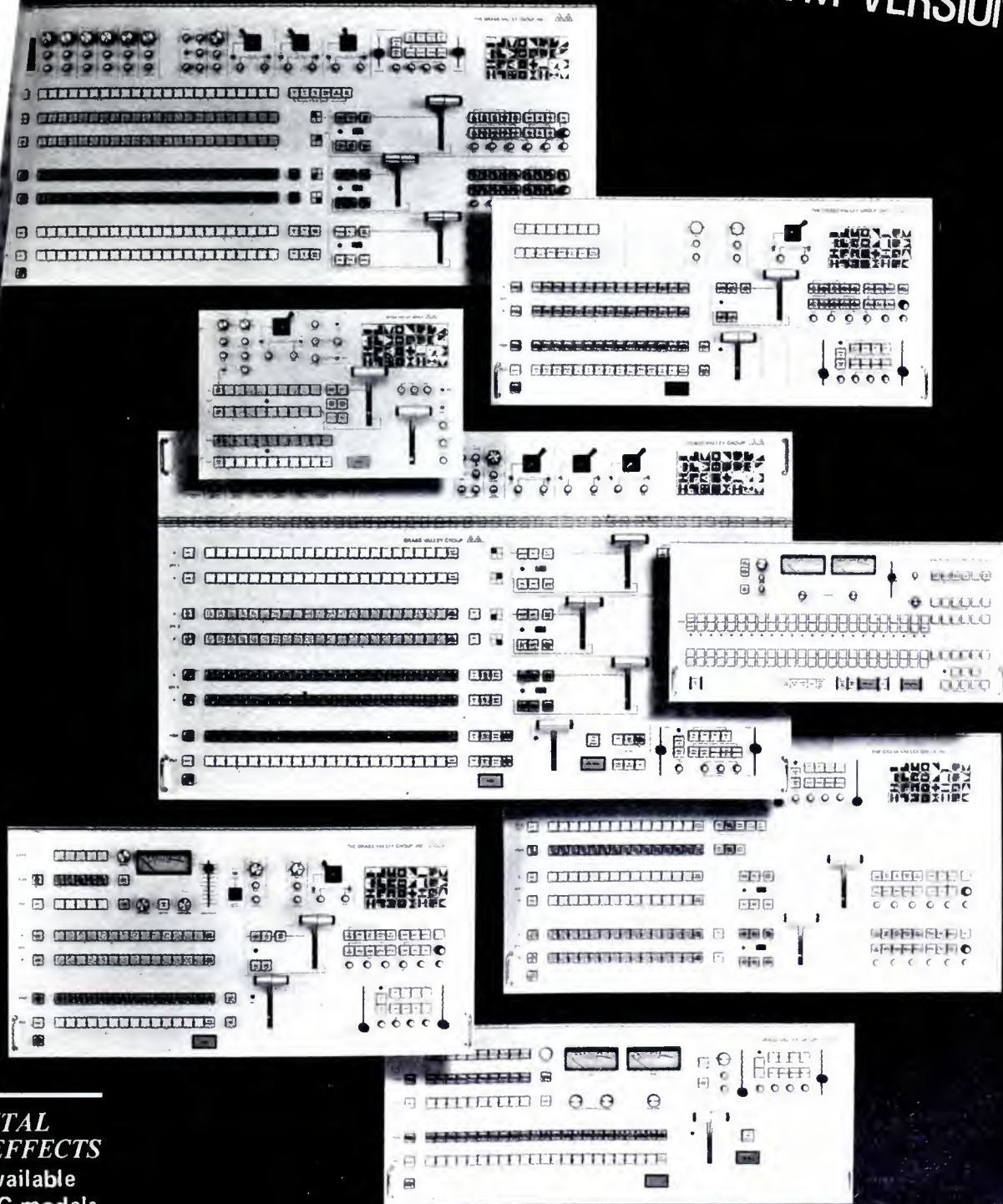
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DIRECT CURRENT FROM D.C.



August, 1977/By Howard T. Head and Harold L. Kasser

17th Reregulation Order Adopted

The Broadcast Reregulation Task Force has issued another Order relating and clarifying requirements. The sections (73.40, 73.44, 73.60 and 73.62) relating to changes in existing equipment, such as frequency control, are revised to make it clear when and under what conditions type-accepted equipment may be modified. Of importance also is a clarification which says that if you are modulating your AM station to 125% on positive peaks, you better have a modulation monitor which is type-approved to read 125%. This particular change becomes effective November 1 and fines will be levied shortly thereafter. New rules also make it clear that during operation under a Pre-Sunrise Authorization (PSA) you must have a meter with a proper scale to accurately read common point or antenna current for the lower PSA power. For base current or antenna monitor indications, readings taken at full power without modulation immediately before PSA operation will suffice.

SMPTE VTR Action

A working group of the SMPTE after long and arduous sessions in Chicago managed to hammer out a compromise agreement (primarily between Ampex and Sony) on a new format for non-segmented 1-inch helical VTRs. While there are some details to be worked out, it now appears that the major hurdles to a standard format are overcome and we can expect a rapid move to universal use of 1-inch machines.

Operator Examinations in Spanish

The FCC has issued a proposed rulemaking (Docket 21271) looking toward giving examinations in Spanish for radio-telephone third-class operator permits with broadcast endorsement. The rule is intended for those who are bilingual but who attest to a superior knowledge of Spanish. In a more recent action, the Commission ordered the staff to prepare the necessary paper-work to eliminate the third-class license permit entirely and to substitute the restricted permit for broadcast operation. The Notice of Proposed Rule Making (Docket 20817) should be out by the time you read this.

continued on page

1. ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐ 15. ☐ 16. ☐ 17. ☐ 18. ☐ 19. ☐ 20. ☐ 21. ☐ 22. ☐ 23. ☐ 24. ☐ 25. ☐ 26. ☐ 27. ☐ 28. ☐ 29. ☐ 30. ☐ 31. ☐ 32. ☐ 33. ☐ 34. ☐ 35. ☐ 36. ☐ 37. ☐ 38. ☐ 39. ☐ 40. ☐ 41. ☐ 42. ☐ 43. ☐ 44. ☐ 45. ☐ 46. ☐ 47. ☐ 48. ☐ 49. ☐ 50. ☐ 51. ☐ 52. ☐ 53. ☐ 54. ☐ 55. ☐ 56. ☐ 57. ☐ 58. ☐ 59. ☐ 60. ☐ 61. ☐ 62. ☐ 63. ☐ 64. ☐ 65. ☐ 66. ☐ 67. ☐ 68. ☐ 69. ☐ 70. ☐ 71. ☐ 72. ☐ 73. ☐ 74. ☐ 75. ☐ 76. ☐ 77. ☐ 78. ☐ 79. ☐ 80. ☐ 81. ☐ 82. ☐ 83. ☐ 84. ☐ 85. ☐ 86. ☐ 87. ☐ 88. ☐ 89. ☐ 90. ☐ 91. ☐ 92. ☐ 93. ☐ 94. ☐ 95. ☐ 96. ☐ 97. ☐ 98. ☐ 99. ☐ 100. ☐

DIRECT CURRENT FROM D. C.

continued from page 4

New FCC Forms

In its continuing process of up-dating its application forms, the FCC has announced new versions of the following:

- Form 302: Application for Broadcast Station License (March, 1977);
- Form 330L: Application for Instructional Television Fixed Station License (March, 1977);
- Form 348: Application for Renewal of TV or FM Broadcast Translator Station License (April, 1977);
- Form 349L: Application for FM Booster Station License (April, 1977).

Other forms in common usage at broadcast stations which have been done with their current edition dates are:

- Form 301: Application for Authority to Construct A New Broadcast Station or Make Changes in an Existing Broadcast Station (Feb., 1977);
- Form 301A: Application for Authority to Operate a Broadcast Station by Remote Control or to Make Changes in a Remote Control Authorization (March, 1977);
- Form 303: Application for Renewal of License of Commercial Television Broadcast Station (December, 1976);
- Form 303R: Application for Renewal of License for Commercial AM or FM Radio Broadcast Station (December, 1976);
- Form 313: Application or Authorization in The Auxiliary Radio Broadcast Services (February, 1977);
- Form 313R: Application for Renewal of Auxiliary Radio Broadcast License (May, 1976);
- Form 318: Request for Subsidiary Communications Authorization (March, 1977).

This is not the entire list of FCC forms, but these common ones are listed with a caution that you use the latest forms when filing an application. The Commission has the authority to return an application if out-dated forms are used and, on occasion, has done so.

Short Circuits

A cable system has been authorized to install its own emergency alerting system tied directly into the Civil Defense Office...A Berkeley, California company has been granted experimental licenses in the 1 MHz band to provide information on seismic activity of faults in the vicinity of the Humbolt Bay Nuclear Power Plant...An FM translator licensee was fined \$250 for moving his station without approval... Los Angeles man was convicted on two counts of manufacturing and selling power amplifiers which would increase the power output of CB stations to as much as 2000 Watts...The Commission no longer requires a prior coordination procedure when a radio station is built on government land.

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Whether you're the producer, director, cameraman or video man, field work isn't getting any easier. Neither is big studio work.

Elements are tougher. Production standards are higher. And schedules, shorter than ever. As you can see, we've been listening: our new PV25x20B is proof. A single, rugged, 29 lb unit that packs a lot of performance into a compact 546mm-long package.

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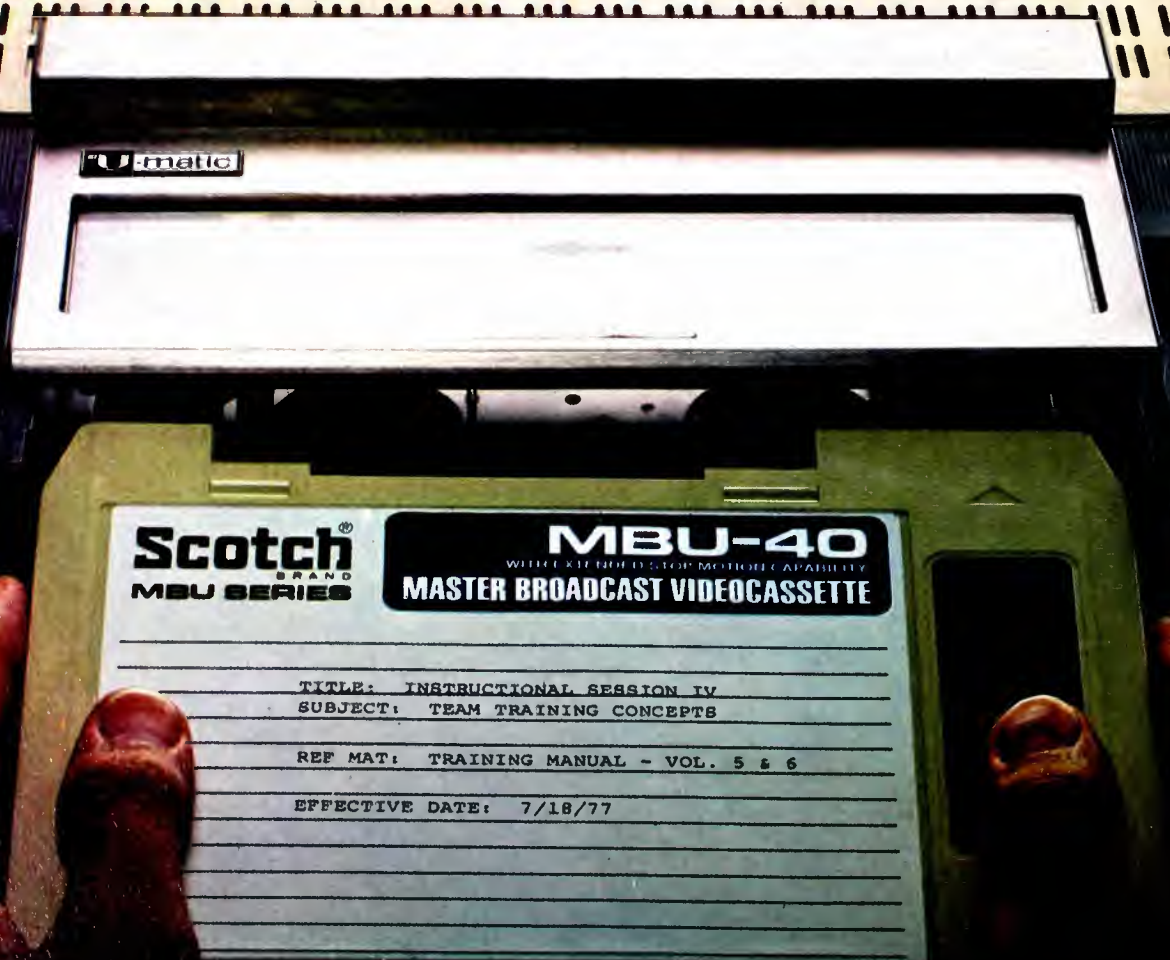
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*PV25x20B is 20-1000mm in 25mm format.
P25x27B is 27-1350mm in 30mm format.

For More Details Circle (3) on Reply Card

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We've found a way to control the size and shape of these oxide particles to create an extremely smooth recording surface. And it's so easy on your recorder's heads.

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"Scotch" videocassettes deliver the same high quality sharpness and color from the master down to the last frame. You get superior signal-

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We design our cassettes as carefully as our tape.

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Nobody, but nobody, knows tape like 3M.

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industry news

NAB TV board passes resolution on programming

The television board of directors of the National Association of Broadcasters has passed a resolution calling on NAB's Television Code Review Board to take positive, visible, affirmative steps to encourage industry and public awareness of both the spirit and letter of the Code."

Commenting on the resolution, NAB President Vincent T. Wasilewski said, "This action represents an attempt on the part of the Television Board and the NAB once more to reflect, in response to the concerns of the segment of the viewing public it represents, a dedicated desire on the part of the broadcast industry to serve the best interest of the total public."

The resolution states:

"Whereas the recently announced Fall 1977 television schedules indicate a substantial reduction in the number of police action/adventure programs containing depictions of violence; and

"Whereas the Television Code Review Board has conscientiously responded to concerns expressed to the NAB Television Board of Directors by (1) holding meetings with broadcast industry leaders, consumer advocacy groups and members of the Hollywood creative community regarding depictions of violence in some television programs and (2) conducting in-depth reviews of the Television Code's Program Standards Section including the language on violence which was strengthened in 1972; and

"Whereas television programming, as an ever-evolving art, requires ongoing close attention by broadcasters to help assure that the programs presented to the American public take into account not only the in-home, family aspect of the medium but also the reasonable and sometimes conflicting expectations of the many and diverse audiences which comprise the viewing public;

"Now, therefore, be it resolved:

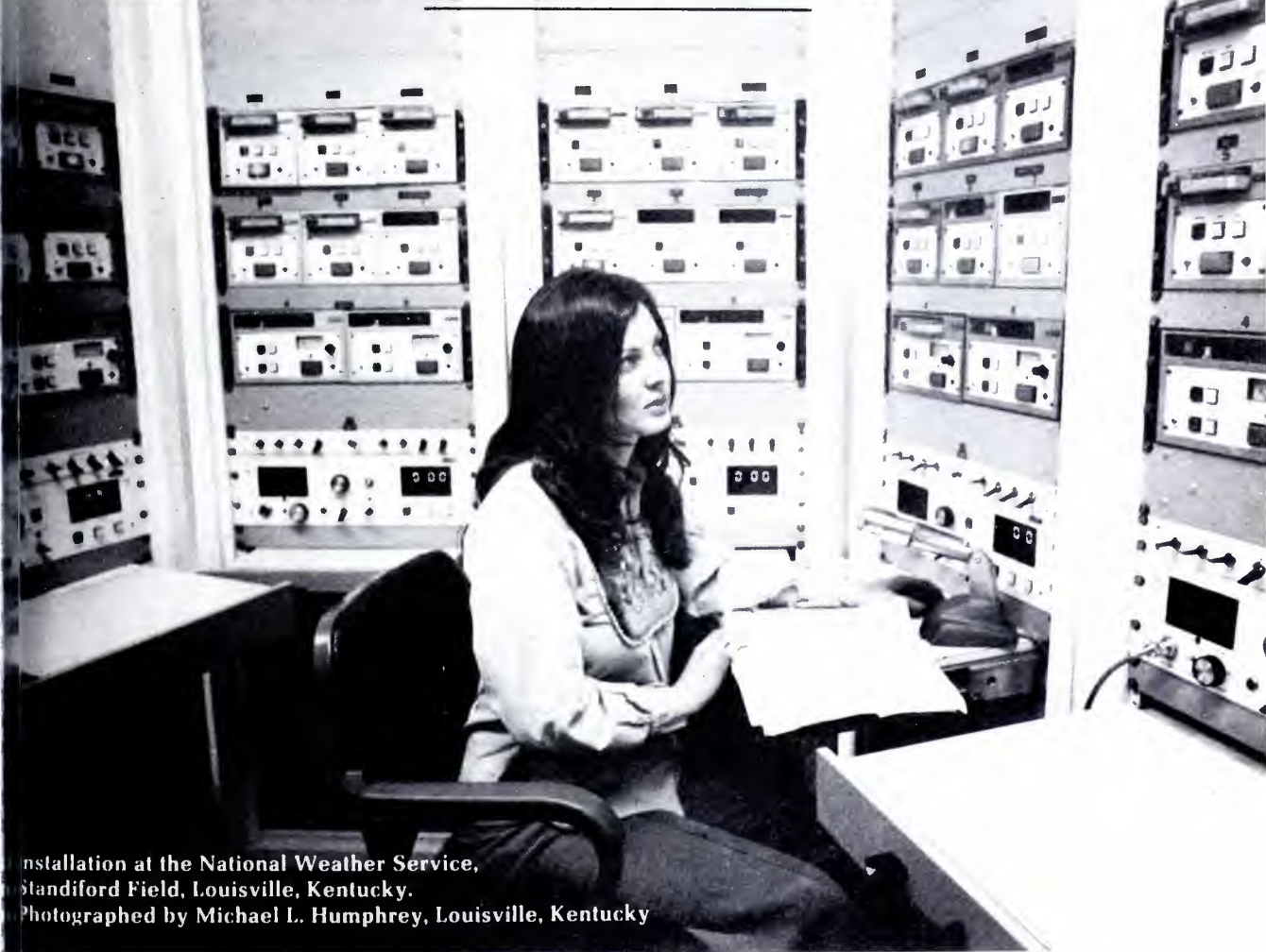
"[1] That the NAB Television Board of Directors, keeping with our industry's belief in the concept of freedom with responsibility, urges broadcasters to (a) encourage programs which reflect the established values and traditions of our society, (b) to exercise a high degree of critical judgment when presenting programs which reflect the changing or changing attitudes of substantial segments of our society and to continue their efforts toward assuring that depictions of violence or aspects of human sexual behavior in programs are handled responsibly;

"[2] That the NAB Television Board of Directors supports the plans of the Television Code Review Board to continue and to expand its dialogues on programming and voluntary broadcast self-regulation with industry leaders, the creative community, consumer advocacy groups and the viewing public in general;

"[3] That the NAB Television Board of Directors urges continuation of the Television Code Review Board's efforts to encourage industry and public awareness of both the spirit and letter of the Code."

continued on page 13

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Photographed by Michael L. Humphrey, Louisville, Kentucky

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Board's periodic re-examinations of Television program standards:

"[4] That the Television Board of the National Association of Broadcasters calls on the Television Code Review Board to take positive, visible, affirmative steps to encourage industry and public awareness of both the spirit and letter of the Code and further that the Television Board resolves to alter the language of the Code regarding the following matters:

- A) To reassert in more specific terms the industry's recognition of television as primarily a family medium and
- B) Delete the current language of section 8, paragraph 8 and replace it with language which specifies that material generally perceived as obscene, profane or indecent is unacceptable.

The language will be drafted by a committee appointed by the chairman of the Television Board and submitted to the Television Board at the September 1977 meeting for ratification;

"[5] The Television Board directs the Code Authority through all means available to it to provide for the widest possible dissemination of the revised language in particular and the Code in general throughout the industry, government, special interest groups, and the population at large."

Billboard restrictions

In another action the Board approved the Board's recommended deletion of Code provision XIV-1 which states that "the use of billboards, in prime time and all other time, shall be confined to programs sponsored by a single or alternate week advertiser and shall be limited to the products advertised in the program."

It also approved the inclusion of new language regarding non-program material in Television Code provision XIV-1. The provision's revised language reads:

"(1) Non-Program Material Definition: Non-program material, in both prime and all other time, including billboards, commercials and promotional announcements.

"Non-program material also includes: A) In programs of 90 minutes in length or less, credits in excess of 30 seconds per program, except in feature films, shall be counted against the allowable time for non-program material. In no event should credits exceed 40 seconds in such programs.

"The 40 second limitation on credits shall not apply, however, in any situation governed by a contract entered into before October 1, 1971.

"(2) In programs longer than 90 minutes, credits in excess of 50 seconds per program, except in feature films, shall be counted against the allowable time for non-program material. In no event should credits exceed 60 seconds in such programs.

"Public service announcements and promotional announcements for the same program are excluded from this definition."

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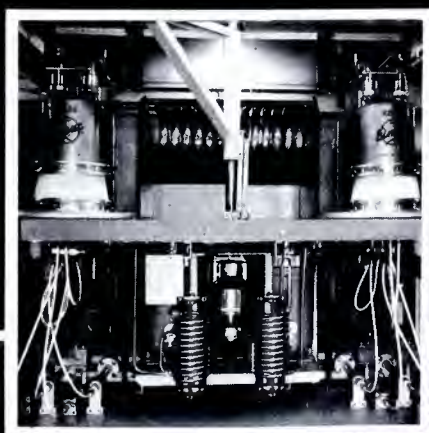
You've never seen a four tube, 2 megawatt amplifier. Until Now.

Look at this new generation Continental Electronics 323C medium wave broadcast transmitter. You'll see two EIMAC X-2159 tetrodes are used in each amplifier section, one as a carrier tube and the other as a peak tube. The two Doherty-type screen impedance modulated (SIM) amplifier sections are combined to provide a 2 megawatt carrier, 100 percent modulated.

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phase shift checked **the old way**



phase shift checked **the VACc way**

VACc's Burst Phase Meter (model BPM-1) is a \$599.00 replacement for most vectorscope applications. The unit requires only ac power, video and subcarrier inputs. An easy-to-read analog meter indicates phase shift in the video burst relative to the subcarrier over a full 180 degree range with 1/2 degree accuracy. (360 degrees phase range can be obtained with a coax delay line).

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H-Phase Meter

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NAB asks for review of Home Box Office ruling

The National Association of Broadcasters (NAB) asked the Supreme Court to review the decision of U.S. Court of Appeals for the District of Columbia in the Home Box Office case overturning rules governing pay-cable television.

In its opinion, the Appeals Court set aside regulations by the Federal Communications Commission (FCC) which prevented pay-cable from siphoning popular feature film and sports programming from free TV.

In asking the Court to review the case, NAB pointed out that the Appeals Court decision conflicted with the Supreme Court's earlier rulings affirming the FCC's jurisdiction over cable television and recognizing the importance of preserving the various benefits of free TV for the public.

NAB also noted the discrepancy between the Supreme Court's recognition that the FCC should act to prevent harm to the public before it occurs and the Court of Appeals' opinion that the FCC could not act until existing harm could be proven.

Overall, NAB said that the Court of Appeals' decision prevents the FCC from fulfilling its responsibility of insuring that the public receives continued entertainment programming on free TV.

Film camera maintenance seminar set for October

Cinema Products Corporation will hold a two-day "CP Maintenance Training Seminar" for working cinematographers, professional equipment dealers and technicians October 14-15 at the Cinema Products factory in Los Angeles. The seminar will precede the opening of the SMPTE 119th Conference & Equipment Exhibit.

According to Ed Clare, assistant-to-the-president and seminar coordinator, the program will also include a comprehensive training seminar for CP-16 reflex and non-reflex camera models and related accessories, led by Cinema Products technicians Marty Prager and Chuck Jackson. As in previous years, representatives from other equipment manufacturers will also conduct sessions on current practices and developments in their field.

One of the main features at this year's seminar will be a special Saturday morning maintenance and repair session for STEADICAM technicians.

For complete information and registration forms, write to: Wilbur Russell (if you reside in the United States) or Ray Tamba (if you reside outside the U.S.) c/o Cinema Products Corp., 2037 Granville Avenue, Los Angeles, CA 90025.

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Ampex, Sony agree to 1-inch helical format

By Ron Merrell

"In writing speed, the Ampex and Sony machines are within .1% of each other (1000 ips vs. 1010 ips). In longitudinal speed, the Sony is 9.63 ips as compared to the Ampex at 9.61 ips.

"While the track geometry also is different, it seems conceivable that a slight change in the Sony format would make it compatible with the Ampex machine."

Joe Roizen
Broadcast Engineering
May, 1976

The above statement was made by Joe Roizen in his video review of the 1976 NAB convention. Meeting in Chicago just over a year later, the SMPTE Working Group, assigned to tackle the problem of 1-inch helical VTR format compatibility, emerged with a statement that an agreement in principle has been reached between Ampex and Sony. As if everyone sensed the agreement was at hand, the meeting was packed with manufacturers, broadcasters, CCTV users and interested parties from across the US, Europe and Japan.

This agreement means that format compatibility standards for 1-inch machines have cleared their biggest hurdle, opening the way for the 1-inch invasion of the broadcast industry. Those closest to the machinery insist the video signal quality of these machines can match the 2-inch quad machines. Equally important are its other features:

- Three audio tracks, any of which would be better than current quad audio.
- Great reductions in operational costs. Roughly speaking, a 68% savings on videotape costs alone.
- Lower capital investment, since these machines are going at less than half the cost of the big quad machines.

There's more to come

Another consideration is the

maintenance costs, which would be reflected in such basic expenditures as head replacement. What's more, the sheer size difference is a consideration.

SMPTE has scheduled a meeting for September in San Francisco to hammer out further details of the agreement. Still to be settled are audio-head placement and video-head drum structure. The SMPTE's professional approach to engineering standards is not to release technical information in bits and pieces. They'll wait until the final details have been ironed out before publicly discussing the specifics. While CBS and ABC forced the format standardization issue at

*"...1-inch machines
have cleared their
biggest hurdle,
opening the way for
the 1-inch invasion
of the broadcast
industry."*

SMPTE's winter meeting, SMPTE certainly deserves credit for the part it has played in this decision.

Machine-to-machine compatibility

Before this decision became possible, it was necessary to prove that videotape recordings were compatible from one machine to another by the same manufacturer. One could reminisce about the years that went by before machine-to-machine compatibility was achieved for quad. The major effort this time around will be to eliminate that possibility before it has a chance to be a problem.

CBS's Joe Flaherty has been recognized as a pioneer in ENG. But it was during his presentation at the

winter SMPTE meeting that Flaherty demonstrated the application of 1-inch helical machines to original sitcom-type program production currently being shot on film.

CBS experimented with the popular Bob Newhart and Phillis Diller shows, which are done 35mm color film. For the experiment, the setup included parallel 35mm movie cameras, Thomson-CSF 1515 triaxial studio cameras and Thomson LM Microcams.

Consecutive sequences of the same images made by each of the three camera setups were replayed from Sony BVH 1000 recorders. There was little difference between the three different originations. The electronic cameras showed slightly higher chroma saturation than the film take, and high contrast exterior scenes exhibited some moire (similar to what we see when Johnny Carson wears one of his pinstripe jackets).

To prove the editing and multigeneration capability of the 1-inch format, Flaherty ran a program tape of a brightly lit scene involving a musical number that included highly polished musical instruments. The second generation was excellent and looked like a good quad reproduction. Surprisingly, the 12th generation shown right after was also acceptable broadcast quality, on a subjective evaluation basis.

Flaherty assured the audience that these tests were rigorously made, with multiple generations produced on a machine interchange basis, thus verifying the compatibility of the 1-inch format on a multigeneration machine arrangement.

Perhaps the most significant comment by the CBS engineering president, as far as future television production is concerned, was a statement that upon ratification by IATSE, CBS would provide 100 recorders to production houses to do some of the network's own programs. The program tapes in question continued on page 18.

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Communications Equipment Group

Ampex, Sony agree

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1-inch format could then be post-production edited either by transfer to quads or on other BVH 1000s equipped with editing accessories. The distribution copy of the master tape could then be made from the Sony format to whatever would be necessary for the recipient TV network or independent studio.

Network pressure

At this same SMPTE meeting a

"white paper" was presented on behalf of ABC and CBS deploring the proliferation of 1-inch formats. The paper requested that the Society's VTR standards committee consider a newly proposed format as a compatible compromise between the Ampex and Sony 1-inch formats.

A precedent for this kind of action took place more than seven years ago. At that time, the manufacturers of time code generators were starting to build five non-interchangeable code formats. An industry ad hoc group stopped this

activity and through the SMPTE IEC standards committee proposed and ratified a standard 80 address code that is now universally accepted and used.

Perhaps to avoid favoring either Ampex or Sony, the parameters of track geometry of the proposed segmented format in the "white paper" is different from either manufacturer's current format.

At this point there is some reluctance by manufacturers to any official reaction, much beyond the announced agreement in principle. Doubtless, there are many questions still unanswered.

Donald Kleffman, vice president and general manager of Audio Video Systems division for Ampex, told **Broadcast Engineering**, "We are particularly pleased that the proposed agreement represents a compromise by all parties concerned. Ampex is in the process of developing plans to insure that its current and future buyers of

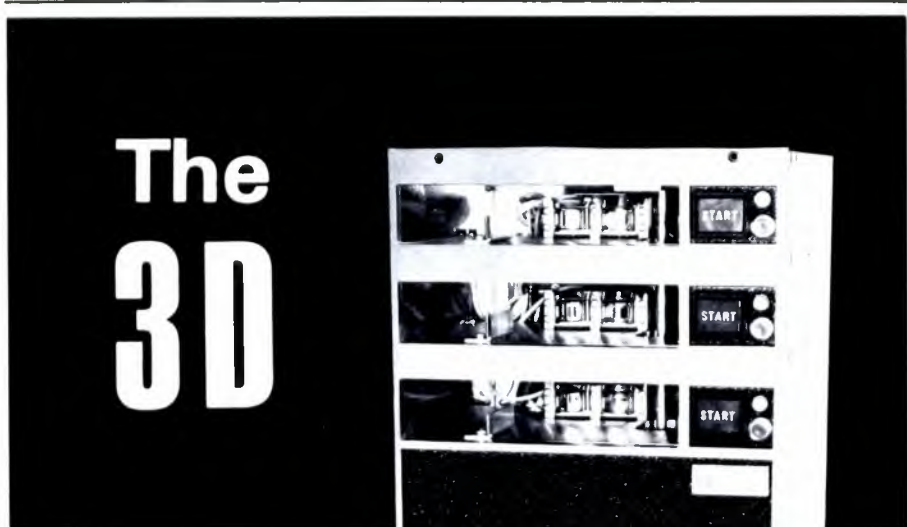
"As you would imagine, the task of compatibility is not as simple as the agreement might lead one to believe."

VPR-1 recorder will be able to convert to the proposed format."

Perhaps the September meeting will spell out some of the details. As you would imagine, the task of compatibility is not as simple as the agreement might lead one to believe. After all, according to SMPTE, "This potential format must provide complete interchangeability between 1-inch non-segmented helical videotape recorders that are built to the mechanical and electrical specifications chosen."

The SMPTE has said it feels the television industry should indeed be pleased that the accelerated procedure urged by CBS and ABC has yielded a comprehensive recommendation which will greatly benefit all videotape recorder users in the future. The SMPTE Working Group will continue to work toward specific standards and to clear up any remaining problems.

Obviously, considerable work must still be done to document the details of the format for ultimate consideration for international standardization. But because of the July agreement, the door is open



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21

IMAGE ENHANCER ROUNDUP

By Joe Roizen, TELEGEN

In the early '50s I worked for a TV station reputed to have the sharpest picture in town. The chief engineer, who had virtually built the transmitter by hand, purposely tuned the station so there was a healthy overshoot at transitions. The black and white home receivers of that era, which normally rolled off the video high frequencies, consequently would show sharper edges on this channel than on the others running their transmitters by FCC rules. Our intrepid and ingenious chief engineer had developed a way to provide picture enhancement long before the current crop of devices to perform this function were conceived.

To the purist, the perfect TV image could convey all the detail and colorimetric information the viewer may have seen if he had been at the original scene. Of course, no TV system is that good, for the chain of signal-handling hardware between the camera and the receiver or monitor adds some level of degradation to the final image.

Image enhancement, therefore, is

a technique which attempts to restore the image as close to what it originally was, or tries to minimize specific deficiencies inherent in cameras, VTRs or other video signal processing devices.

Going downhill

Before describing the various techniques used in image enhancers, it would be beneficial to review the major areas where an adequate television picture is rendered less acceptable or even substandard by the variety of gadgets it encounters before reaching the viewer.

The first "funnel" that narrows the overall picture quality is the encoder. Here the three-channel wide-band color signals are compressed and multi-modulated into a narrower, crowded spectrum that permits single-channel operation from that point on. While this is convenient for the subsequent switching, routing, recording and transmission, it imposes certain disadvantages, such as the presence of subcarrier, limited chroma bandwidth and intermodulation effects.

Today's solid-state distribution and switching systems in TV studios are virtually transparent to video signals, and therefore, don't add significant degradation unless there is a fault requiring maintenance. Unfortunately, the same cannot be said of videotape recorders. Since most programs today are taped for delayed airing, this is where the greatest emphasis on enhancement is usually placed.

Quad VTRs, or other segmented recorders in good operating condition, reduce video signal quality very little at the first generation. But multiple dubbing will cause cumulative degradation of factors such as signal-to-noise ratio, moiré, differential head banding, time base jitter, chroma/luminance displacement, differential gain, differential phase and others.

While the new crop of one-inch helical recorders (non-segmented) eliminates the banding problem, these recorders still have similar accumulations on multi-generation dubs which reduce picture quality by known factors. The worst re-

continued on page 22

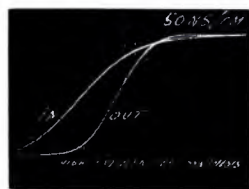


Figure 1 The input signal is the slow rise time coming from a color-under VTR, the application of high frequency synthesis produces the output signal which gives the video image improved subjective sharpness.

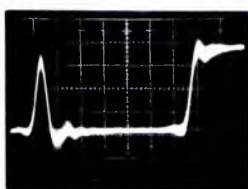


Figure 2 A sine² pulse and bar signal from a typical U-Matic recorder will exhibit noise, overshoots and ringing as seen in this waveform.

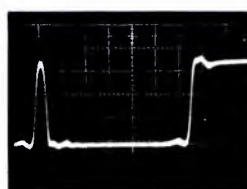


Figure 3 The same test signal applied to an enhancer clearly shows the noise reduction on the base line and improved K factor at the pulse edges.

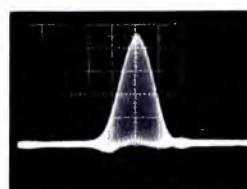


Figure 4 Chrominance/luminance delay appears in the bottom of the 20T pulse with subcarrier. Typical first generation U-Matic delay is 90 nanoseconds.

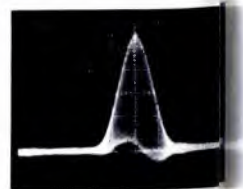


Figure 5 Corrected 20T pulse now shows near zero delay. Incremental 50-nanosecond steps can be adjusted until chroma/luma delay is minimized.

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Image enhancer manufacturers

	Manufacturer and model number	Model description and price
	Cohu, Inc.	
	9920	Encoder/enhancer two levels of enhancement manually or automatically controlled. Adjustable coring. Picture analyzed vertically and horizontally. Detail signal added to luminance signal. Ultrasonic delay lines. Comb filter in horizontal detail. Auto balance option works with Cohu 1550 broadcast color telecine. \$5,995
	Corning Electronics	
	6100	Combed detail and variable coring. Level dependent contours. Service bypass. Shuts down if incoming signal is enhanced. Options are timed sync output and remote contour control. Available in NTSC, PAL and PAL-M. Designed for ENG. \$3,995
	6200	Level dependent contours. Combed detail and variable coring. Contours derived from green video. Service bypass mode. This RGB enhancer has independent control of horizontal detail. \$3,995
	6300	RGB-Y enhancer with contours derived from and added to Y video. Combed detail and variable coring. Level dependent contours. Automatic bypass. \$3,995
	Dynasciences	
	888	This company offers a complete line of enhancers. They can provide high resolution enhancers on special order. The 888 is a color horizontal only enhancer. \$1,995
	470	This model is a vertical aperture equalizer for use with horizontally enhanced signals. \$3,995
	834	Enhancer for encoded color video or the luminance channel of a 4-tube camera, horizontal and vertical. \$3,995
	854	Contours from green for R-G-B enhancement. \$3,995
	877	Has automatic detail detection. Turns off if sufficient detail is present. All Dynasciences enhancers include front panel controls for horizontal and vertical enhancement and detail coring. A comb filter is used when appropriate. Signal to noise typically 65 dB or more. \$3,995

Image enhancers

continued from page 22

enhancers in the VTR area are the "color-under" machines which, because they use relatively low writing speeds, must separate the luminance and chrominance signals prior to recording. The signals are then recombined in playback.

These VTRs now are widely used

for ENG applications and for limited-budget field production. In addition, they are used in cable and CCTV applications. And, it is in these uses that image enhancers often make the difference between an acceptable image or something you would not want to put on the air.

To handle all of these problems there are a variety of enhancers made by at least 12 suppliers. They include: enhancers that work on the RGB signal ahead of the encoder; enhancers which work downstream from the encoder on the composite full bandwidth NTSC signal, either

**Manufacturer
and
model number**

Model description and price

Hitachi Denshi America

VE-101

Uses composite video input. For use with color cameras with horizontal aperture correction or enhancement. Crispening circuits suppress noise. Selection gate permits selection of enhancement point. Clipping circuit prevents negative going signals from going below black level. **\$1,495**

VE-102

Same as VE-101 but does not require external drives. **\$1,995**



Microtime

Image-EX™

This unit is designed for use with U-matic and other helical VTR formats. Reduces visual noise, corrects displacement of color and luminance by reducing crosstalk. Uses comb filtering and noise coring. Chrominance/luminance correction range is 200 nanoseconds. **\$2,500**

Image-PLUS™

Provides 6 dB video noise reduction in luminance and chroma. Includes horizontal detail synthesis, vertical aperture correction, automatic group delay correction, comb filtering to remove cross color errors, chroma crispening and chroma hue error reduction. For use with wide-band, direct signals, or narrow band heterodyne signals. Options include: dropout compensator; line error detection; and remote control capability. **\$4,000**

2020 PLUS

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Rank Cintel

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continued on page 26



a camera or from a direct-
very VTR; enhancers dedicated
e color-under VTRs; and com-
ion units that can be switched
perform more than one of the
e functions.

Color-under limitations

ere are four primary deficien-

cies of a video signal coming from a
color-under VTR that need correc-
tion by an image enhancer:

1. Soft pictures: The limited
luminance bandwidth imposed by
the low head-writing speed and
low FM carriers used to record
video on these machines requires

low pass filtering (under 2.5 MHz),
which in turn causes diffused edges
at transitions.

2. Color contamination: The proc-
ess of separating the chrominance
signal, dividing it downward for
recording and subsequent playback

continued on page 26

Image enhancer manufacturers

continued from page 25



**Manufacturer
and
model number**

Model description and price

Telemet

4600

Eliminates positive and negative tilt. Corrects frequency phase. Four separate time constants. Adjustable chroma boost. ± 3 dB gain. Monitor jack adjustment before switching unit into program line. Pass mode automatic if power is lost. **\$5**

Thomson-CSF Laboratories

Mark IV
8010

Mark IV enhancers are two-line units that adjust horizontal & vertical detail. Maintains sharpness and resolution of encoded video without double enhancement when processing previously enhanced signal. Available for NTSC, PAL, and PAL-M installations. **\$4,000**

Mark IV
8010-1

Same as above but with separate detail output. **\$54,000**

Mark IV
8310

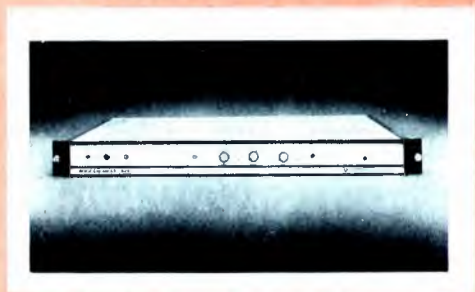
This model is designed for operation with 3-tube color cameras. **\$3,000**

Mark IV
8310-1

Same as 8310 with separate detail output. **\$4,000**

Mark IV
8410

Designed for operation with 4-tube color or monochrome cameras. Available (along with model 8310) for 525/50 and 625/50 unencoded systems. **\$3,000**



3M Company

6210

RGB enhancer features green-derived enhancement; 3.58 combing; adjustable noise reduction; horizontal/vertical enhancement balance; level-dependent aperture equalizer; coring controls. **\$3,000**

6220

In-line enhancer accepts video from camera & provides vertical/horizontal enhancement. Inertially generated output for chroma-key. Gain automatically adjusts previously enhanced signal. Controls include: coring; just; level-dependent aperture equalization; horizontal/vertical balance; detail gain; and by-pass. (This unit available in November.) **\$3,000**



Image enhancers

continued from page 25

multiplication and addition to the separate path luminance signal, produces unwanted spurious signals resembling color fringing around luminance transitions found especially in areas of fine detail.

3. Misregistration: Because the luminance and chrominance signals

travel separate paths which are not perfectly matched in time, the final image will exhibit displacement of the color component from its proper luminance position. This effect grows worse as the numbers of generations are increased, since the time errors are additive. It is also a

variable characteristic that changes with video head wear, which slowly delays the chrominance, therefore requiring periodic readjustment to maintain the best registration.

4. Picture noise levels: Both luminance and chrominance signals
continued on page 26

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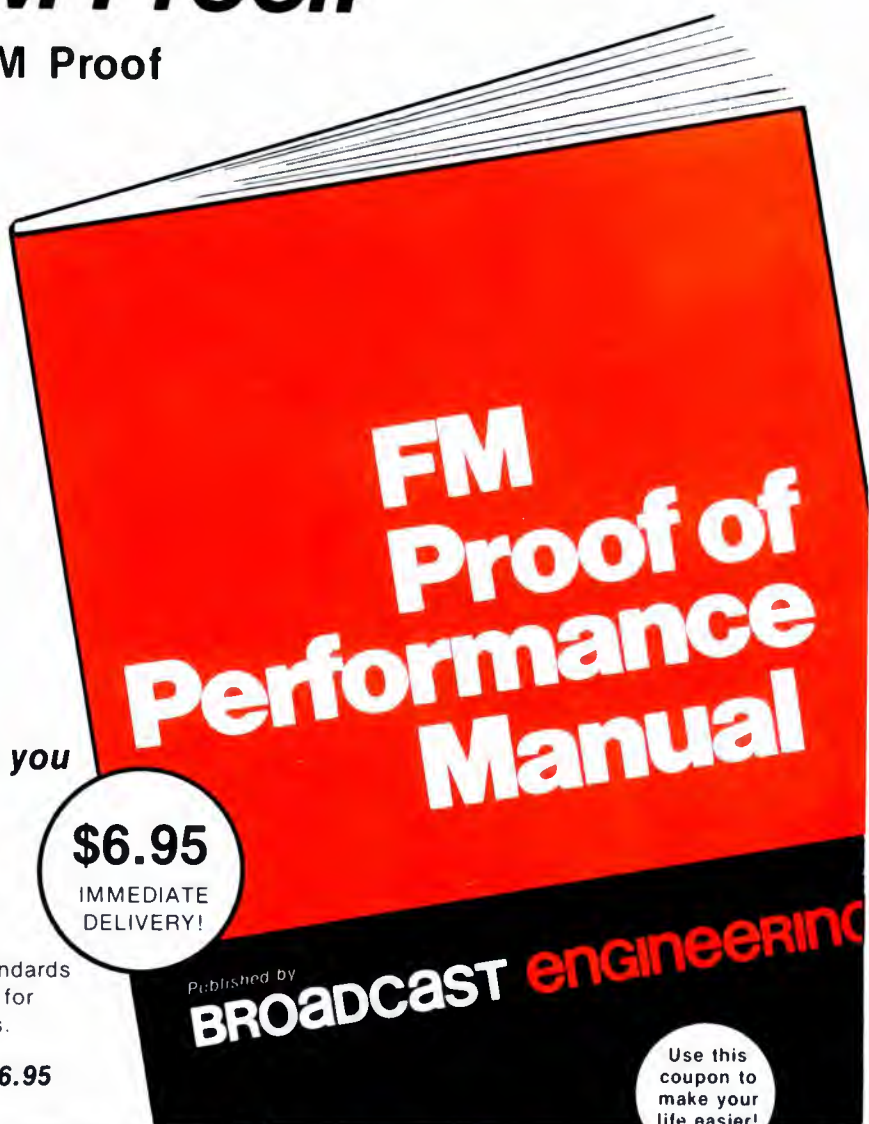
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Image enhancers

continued from page 26

to-noise ratios are reduced, sometimes differentially, by the recording and playback process, especially if sequential dubs are necessary for edited or distribution copies. An acceptable S/N ratio threshold of 40 dB or better is often hard to achieve under practical operating conditions without enhancers which include noise reduction features.

The image enhancers

Before dealing with the enhancers designed specifically for the color-under VTR problem, it is necessary to divide these VTRs into two distinct categories: analog and digital.

The analog may be a stand-alone unit or part of a digital TBC or

frame-store synchronizer. Conversely, the digital enhancer already has TBC and frame-store characteristics since it inherently includes a CODEC and a digital memory.

The analog enhancer does the following things:

- **Crispening soft pictures:** The circuitry in the luminance channel of the enhancer will look at transitions above some predetermined amplitude threshold (either adjustable or preset) and will assume that the original rise time of this video signal has been degraded by the limited pass band in the recorder. A new pulse with a steeper front is generated by a high frequency synthesizer and is inserted in place of the slower transition. The subjective result is that the image edges look sharper or crisper; visual impression is that the full luminance bandwidth of 4.0 MHz has been restored. Care must be taken so that the process does not produce overshoots or ringing. Also, filters and equalizing circuits must be carefully designed and adjusted for optimum performance.

- **Crosstalk elimination:** The method used to reduce or eliminate the spurious intermodulation components that result from mixing of high luminance frequencies, color subcarrier and FM signals used for recording is known as "comb filtering." By averaging the information in the chroma path through the use of (1)H increment narrow-band delay lines operating at the subcarrier frequency, the unwanted interference patterns generated by luminance components are significantly reduced. At the same time, this process yields a side benefit in that chroma signal-to-noise also is improved.

From a subjective viewpoint, the annoying color fringes around any sharp edges or fine detail in the picture are greatly attenuated or completely eliminated. Fine-line graphics or small lettering in titles or credits particularly benefit from this function of the enhancer.

Improving S/N ratios

The chrominance channel noise is reduced by the method already described relating to comb filtering. The luminance path is subjected to a technique used in camera enhancers known as "noise coring." This method separates the high frequencies by a band-pass filter and subjects them to a double threshold which only allows through signals exceeding the threshold. Noise along the quiescent signal areas is suppressed and the noise along the

transitions is subjectively not visible or annoying. Improvements of 3 dB or better are possible, thus overcoming one or two generations of VTR degradation when dubs are being made.

Cancelling misregistration

Since the luminance and chrominance signals travel along different paths, it is possible to route one of the signals through a step-delay circuit which provides incremental steps of approximately 50 nanoseconds on either side of a nominal delay value. By observing the image or test signal, the operator can cancel the inherent VTR delay error and bring the monochrome and color signal components back into near perfect superposition.

Even in the case of a cumulative multi-generation dub error, the error placement can be compensated for by selecting the appropriate increment of corrective delay. The enhancer's adjustable delay circuit is usually ± 250 nanoseconds, adequate for almost any practical situation encountered with color under VTRs.

There are more specialized enhancers which perform highly sophisticated signal manipulations to achieve their goals. Converting the video signal into digital form, then storing it in a frame memory, provides an opportunity to apply frame interpolation techniques to suppress random noise while retaining or enhancing the predictable signal changing components. This system can achieve phenomenal noise reduction figures of 12-16 dB.

Summary

The largest number of image enhancers in use today are still the type that are integrated into color cameras. These are familiar devices in use for several years.

The newly developed enhancers fall into the categories described previously. This new family of devices is rapidly changing the applicability of less-than-broadband VTRs, or other signal sources, for on-the-air applications.

Much of the ENG work currently being achieved by lightweight cameras and portable color-under VTRs is being subjected to enhancement before editing or airtime. The recent program, "A Day in the Life of Jimmy Carter," used portable equipment and post-production enhancement to make the production material adequate for network lease. This is a relatively new field in which improved versions of both analog and digital enhancers undoubtedly continue to appear.

Image enhancer mailing list

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Slew rate tests for audio distortion

By Walt Jung

If you follow the hi-fi press to any extent, in recent years you may have come across a term which is a relative newcomer to the stable of audio performance parameters. The term "transient inter-modulation distortion" (or TIM for short) has caused a great many people to wonder just what it means, I am sure. What it means, and how it affects audio quality can be explained without an excess of theory, and is really quite simple when you get the right perspective on it.

TIM is a form of dynamic distortion which is related to an audio circuit's **slewing rate**, or **output rate of change ability**. A more general (and more complete) term for such forms of distortion is slewing induced distortion, or SID for short. SID is often prevalent in solid state circuits (particularly op amps), but it is by no means limited to just solid state forms of active circuits.¹

Briefly, slewing limitations within a circuit come about because of a fundamental relationship. This is

simply that the maximum rate of voltage change (slew rate) will be determined by the available charging current (I) and the capacitance to be charged (C). Mathematically it is simply:

$$SR = \frac{I}{C}$$

With I in amperes and C in farads, SR comes out in volts per second.

It does not matter whether the current I comes from a tube, transistor or IC circuit; or whether C is a passive circuit element, capacitance or strays. In any case, the ultimate limit of SR is determined by the available charging current and the capacitance to be charged. When the relationship is inadequate (too low), serious distortion problems result.

A sine wave signal at a given frequency can be related to an equivalent slew rate, if only its peak voltage amplitude is known. The mathematical relationship is:

$$SR = 2\pi E \nu$$

For example, suppose we had a peak signal at 20 kHz. The SR of this signal would be 1,260,000 v/μs, or in terms which are usually seen, 1.26v/μs.

This is a deceptively simple relationship. continued on page 31

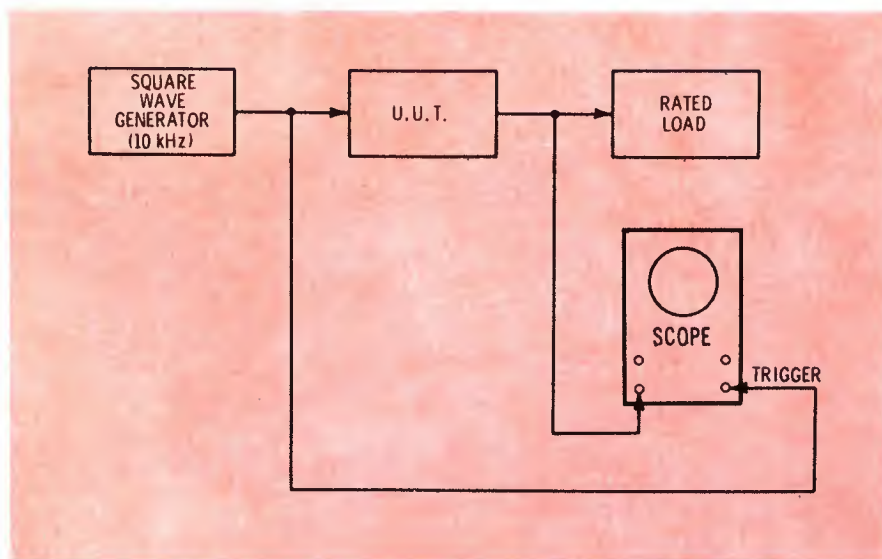


Figure 1. Test setup for slew rate check.

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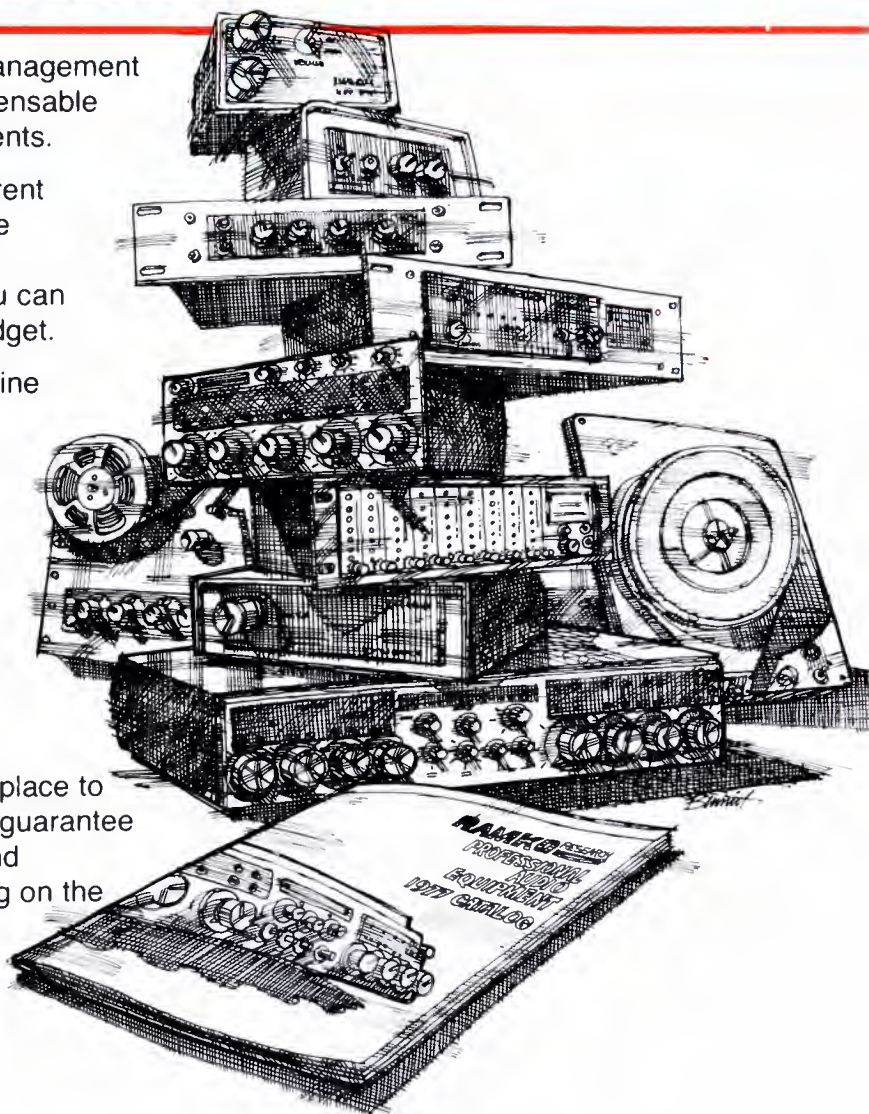
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relationship, and unfortunately does not tell the whole story. What is missing is this—an audio amplifier with a slew rate specification just **equal** to the slew rate of a signal, as shown, will actually produce serious amounts of THD and IM distortion. It will also produce measurable distortion for signals down to about 1/5 of this so-called "full power" frequency, as calculated above. At the full power frequency, THD will be about one percent, a fact which may be easily verified by simply observing a sine wave output waveform on a scope. As the slew rate limit is reached, the waveform will become triangular in shape. As it is exceeded, amplitude will drop and the waveform becomes more and more triangular.

If this full power frequency is within the audio range, the amplifier can rather easily produce IM distortion from the mixing of signal components, due to the nonlinearities. In fact, this can even occur on **supersonic** signals, which can cross modulate and produce audible low frequency beats.

The sounds of SID are generally very irritating, ranging from dulled high frequencies (in mild forms of SID) to edginess, hardness and grit if full slew limiting is actually triggered. As mentioned, **for complete freedom from SID it is necessary for the circuit to possess an inherent slew rate several times**

that which can be calculated from the rated peak output voltage and maximum frequency. Fortunately, this particular mechanism of distortion behaves very predictably from one form of circuit to another. In practice, this means that once we know the key relationships it is relatively easy (with simple tests) to spot a piece of gear which is susceptible to SID. The results can be better performing gear and better sound, when we know the exercises which can pinpoint SID.

Tests For SID

The slew rate of an audio amplifier can be very easily checked, simply by feeding it a fast risetime square wave, with amplifier signal output level adjusted for rated voltage swing. A suitable test setup is shown in Figure 1.

Here, the U.U.T. could be any form of audio signal processing gear, line amp, distribution amp, equalizer, power amp, etc. It should be set up for operation into its rated load impedance, with the output voltage monitored by an oscilloscope. The input square wave is set to a frequency of 10 kHz.

While observing the output waveform, increase the drive level until the output waveform becomes ramplike.² Then set levels precisely for the device's rated p-p sine-wave output swing. This may require some simple calculations; for ex-

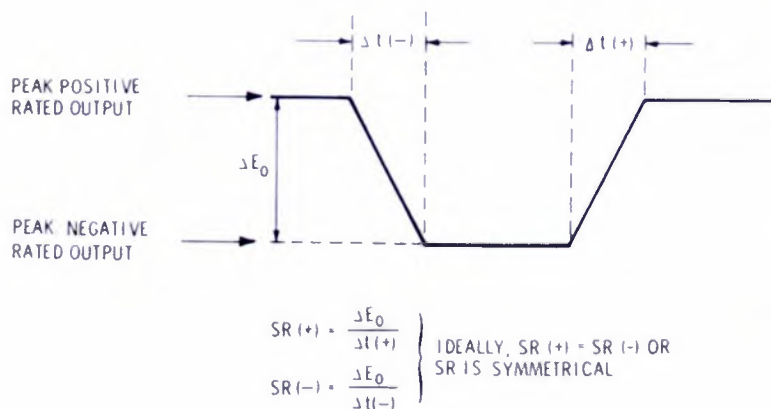
ample +19dBm into 600 ohms, output level in terms of wattage, simply 20v p-p measured across 60 ohms.

With the output square wave displayed on the scope, measure the time interval for the (+) and (-) slewing intervals, as illustrated in Figure 2. Slew rate is then calculated just by dividing the voltage swing by the time interval measured, which will give so many volts per microsecond—for example a 20v rise and fall in a time interval of 4μs is a 5v/μs slew rate. The sample photo demonstrates a 20v/μs SR.

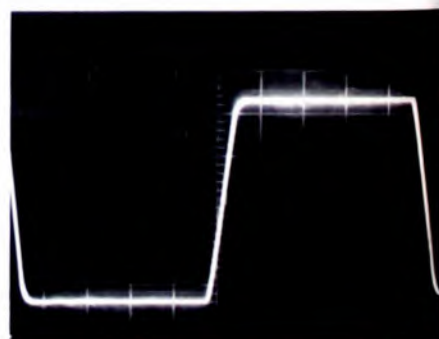
Ideally, slew rate should be symmetric, if not the distortion which will be generated will not be at its minimum which occurs when slewing is equal (+) and (-). This check does, of course, require a well-calibrated scope (and probably for the time measurement, otherwise it is meaningless.

The square wave source should also be high in terms of quality, with rise and fall times 100 nanoseconds or less. If a square wave generator (or function) is not available in the shop, one can be built simply and inexpensively around a 555 timer³ as shown in Figure 3. This circuit can use any available positive supply voltage from 5 to 15v and produces a max p-p output equal to the supply voltage. It re-

continued on page 31

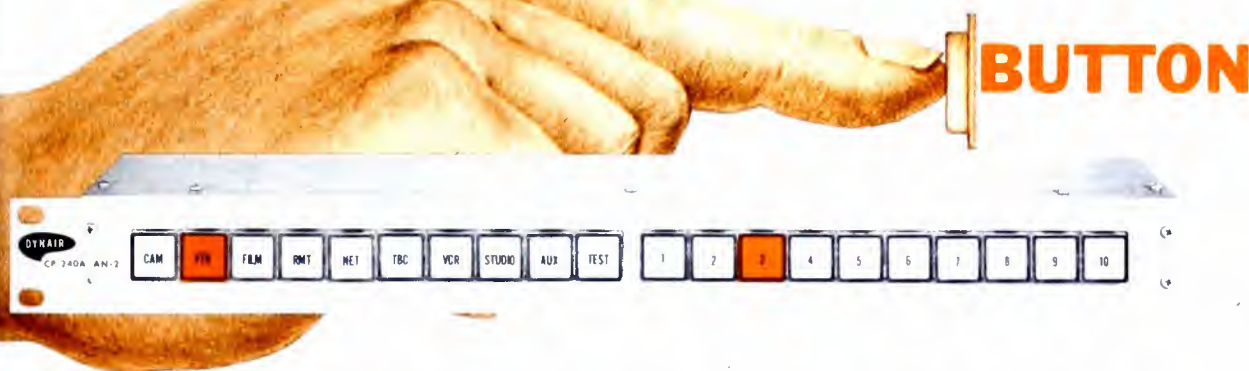


A. Method of calculation.



B. Example: 10 kHz output square wave, power amp. SR = 20V/us. (10 us/division horizontal, 20V/division vertical.)

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Slew rate tests

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at 10 kHz, but you can vary the frequency by changing R_t . Output is at a low impedance level, so reasonable cable capacitance will not deteriorate the waveform.

What SR Numbers To Look For

As a general rule, the SID which will be generated by a given audio circuit can be related to its slew rate. Thus, the simple oscilloscope check can serve as a minimum indicator of relative quality.

A very reliable figure of merit I have been using is a minimum SR which is related to the amplifier's peak output voltage. For SID to be minimal in terms of both measure-

ments and audible defects, the SR of an amplifier should be as a minimum, **$0.5\text{v}/\mu\text{S}$ per peak output volt.** For high quality circuits, the figure should be **$1\text{v}/\mu\text{S}$ per peak output volt.** Thus, for the 20v p-p level mentioned above (which is 10v peak) the U.U.T. should possess a $5\text{v}/\mu\text{S}$ slew rate as a minimum; preferably it will be $10\text{v}/\mu\text{S}$. Sample results demonstrate how this criteria works.

You can easily see that as voltage output levels go up, so does the required SR for good quality. In power amplifiers, the SR requirements can reach as high as $50\text{v}/\mu\text{S}$, for high output levels and high load impedances.

THD Tests for SID

A more complete and thorough check for SID can be performed sweeping the U.U.T. for THD, full rated output voltage, beginning at 100 Hz, and to as high a frequency as is practical. The upper limit will be determined by either the gear under test, or your test equipment, but 100 kHz as a limit will yield all the information necessary (if you can make it). If the gear is line level and does not have transformers in the path you can usually make the sweep to 100 kHz without major difficulties. Power amps generally do not like test frequencies above 20 kHz, and such tests are not recommended for them.

The general setup for a THD measurement is shown in Figure 4 and is similar to the square wave test setup, with the exception of the signal source. This signal generator is a high purity sine wave source with a residual distortion on the order of 0.002 percent. The analyzer portion must be capable of measuring to this degree of resolution in the 100 Hz to 100 kHz range. The Sound Technology type 1700 and 1710 are suitable.

While it is not absolutely essential to have this degree of resolution and range to measure THD, it is a fact that high quality audio circuits can easily have distortions between 0.01 percent up to 20 kHz. Therefore an instrument must be capable of better performance to truly assess its relative quality. This performance is shown.

Figure 5 shows actual measured THD on a solid state line driver circuit, one which uses an ICP amp as its gain element. Data is taken at an output power level of +19 dBm, or a $\pm 10\text{v}$ swing across 600 ohms.

There are three different curves shown, representing three test conditions. The first of these represents performance as measured through a 600/600 ohm transformer into the load. There is a rise in THD below 1 kHz (due to the transformer), but our area of interest lies in the 2-10 kHz range where THD rises rapidly to all

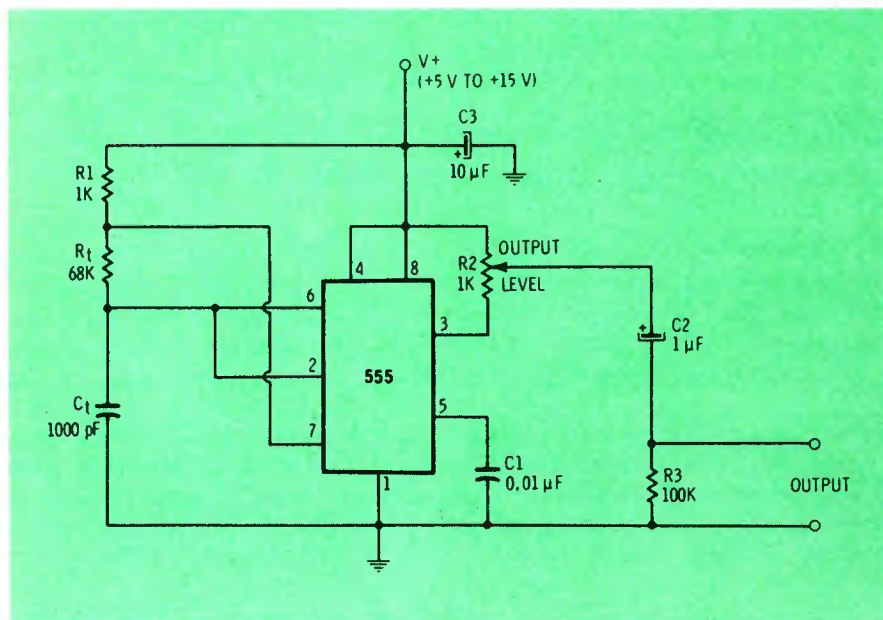


Figure 3. 10 kHz square wave generator.

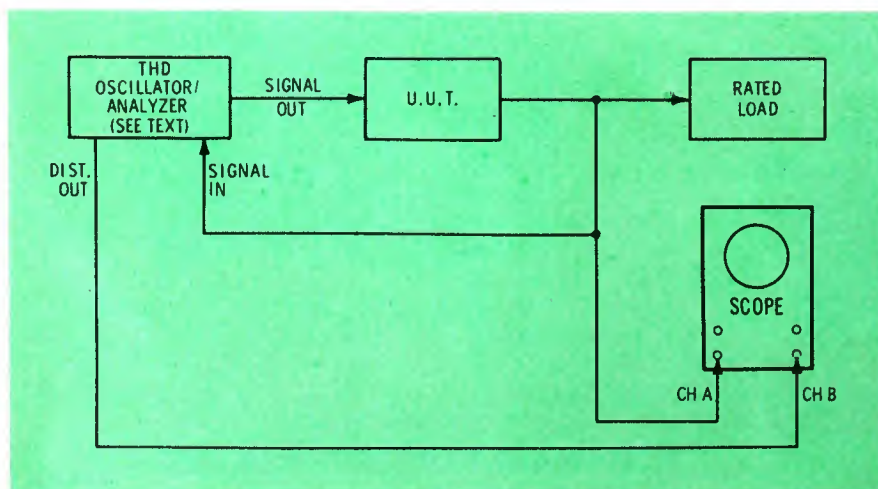


Figure 4. Test setup for THD check for SID.

percent. This very sharp rise is indicative of SID, and its characteristic shape should be noted for future reference.

Just to the right of this curve is a label, also labeled $0.6\text{V}/\mu\text{S}$. However, in this case the data reflects performance of the circuit as measured before the transformer. The THD is gone, but the sharp peak in HF THD is essentially the same. The very slight upward tilt in frequency is due to the smaller output swing required, without the transformer's 1 dB loss. You can see that the basic circuit is virtually distortionless up to a few kHz, then it rises to over one percent in about two octaves. One percent point is reached at 10 kHz, which corresponds to the $0.6\text{V}/\mu\text{S}$ slew rate of the circuit.

The very same circuit was also measured, but with conditions adjusted for a $4\text{V}/\mu\text{S}$ slew rate. From this it can easily be seen that performance is greatly improved, as THD is only 0.012 percent at 20 kHz and one percent is reached at 100 kHz. The ratio of one percent THD intercepts is the ratio of slew rate—or 6.7/1 (or 62 kHz to 100 kHz).

Although this is only one specific example, there are many other circuits which will show similar behavior. In almost all cases performance can be predicted from SR criteria. In the case here, the SR for $0.6\text{V}/\mu\text{S}$ case is just shy of the $0.6\text{V}/\mu\text{S}$ per peak volt criteria, and THD is reasonably low up to 20 kHz. Other forms of measurement such as two-tone 1:1 HF IM and THD will show results of corresponding quality, if the above mentioned slew rate criteria is met.

In summary, slew rate (or its relation products of SID) can indicate very poor quality in audio circuits, if certain minimum standards are not met. This poor quality shows up as THD and IM distortion, and is audibly very annoying. It is relatively easy to check SR however, and it can be done using only a square wave generator and an oscilloscope. This check (as a minimum) should be included in maintenance or the evaluation of equipment for potential

purchases. A THD check can also be revealing for SID, if proper precautions are taken in their use. In general it has been found that a circuit which shows a 20 kHz THD within a factor of two or three of the 1 kHz level will probably be SID free.

Equipment Specifications

Equipment specifications and general industry awareness do not presently reflect the importance of slew rate, unfortunately. In time this situation will improve to a point where it will be routinely specified for audio equipment, and standard test methods employed to exercise equipment. For the time being, we can profit by the knowledge of its functioning, by using some simple tests as outlined, as positive checks for SID problems.

In evaluating equipment, you should look for SR problems, which can easily predominate as performance limits, if proper care has not been taken in design. Since its specification is not current general practice, the lack of spec sheet limits does not necessarily mean it will be bad. But you should check

for it, nevertheless. Ask what it is for the equipment, or ask for a graph of full level THD, where it will show up. Single frequency THD specs don't mean much in themselves, as they don't give the complete picture needed.

If the recommendations above are adopted, you should be rewarded with better equipment, better sound and a higher degree of confidence in your station. □

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3. Jung, W. G.: *IC Timer Cookbook*. Howard W. Sams & Co., 1977.
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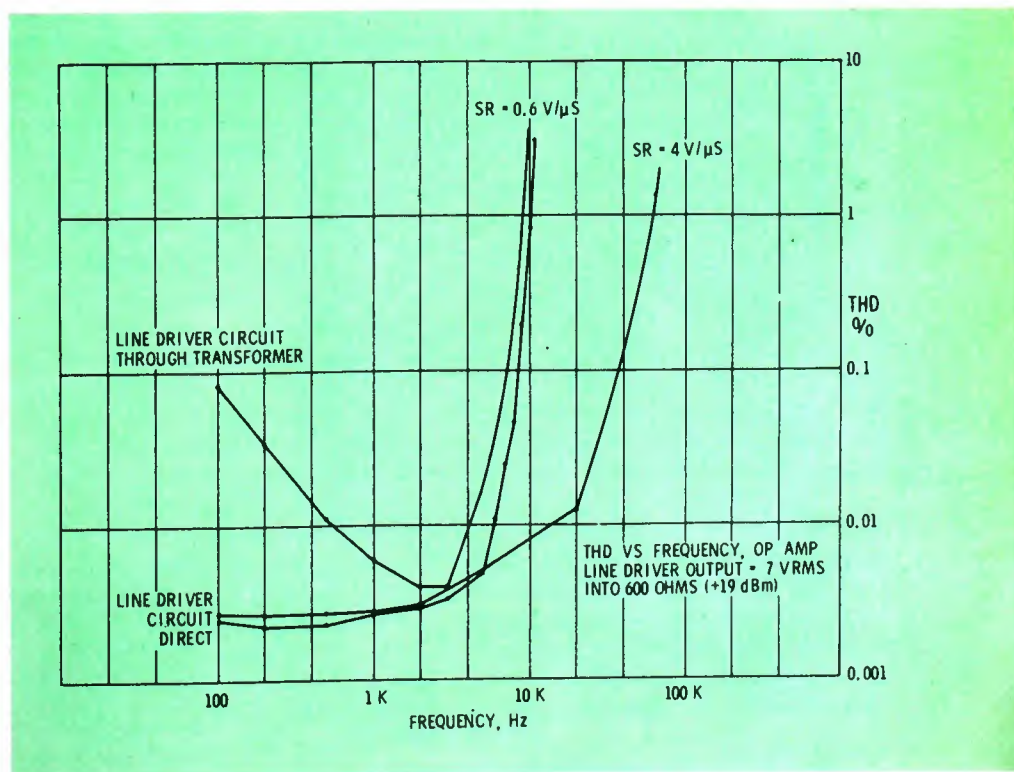


Figure 5. Percentage of THD vs. Frequency. (Normally you would see this on a log graph.)

STL Operating Techniques

Part I of a 2-part series

By John E. Leonard, Jr.*

Two types of facilities are normally used to relay program audio from the studios of an AM or FM station to its remotely-located transmitter plant. These are either leased telephone circuits or station-owned facilities. Station-owned facilities are classically comprised of an RF link that provides this program feed and is called an aural studio-transmitter link, or more simply, an STL.

In the United States, aural STL

service is permitted by Part 74, Subpart E of the FCC Rules and Regulations, and is limited to the 94.7 MHz to 95.2 MHz spectrum. The National Association of Broadcasters (NAB) has filed a petition with the FCC requesting the reassignment of 94.2-94.7 MHz spectrum to STL service. All interested parties should contact the NAB Engineering Office for further details and file comments with the FCC. This article will explore the

"how's" and "why's" of the aural STL, including operating techniques and requirements.

Why Select An STL?

Many reasons lead to the selection of an STL. One of the most compelling of these in recent years has been the unavailability of telephone circuits. In mid-October of 1976, WRSQ, Geneseo, Illinois, completed studios and a transmitter plant. It was at that time

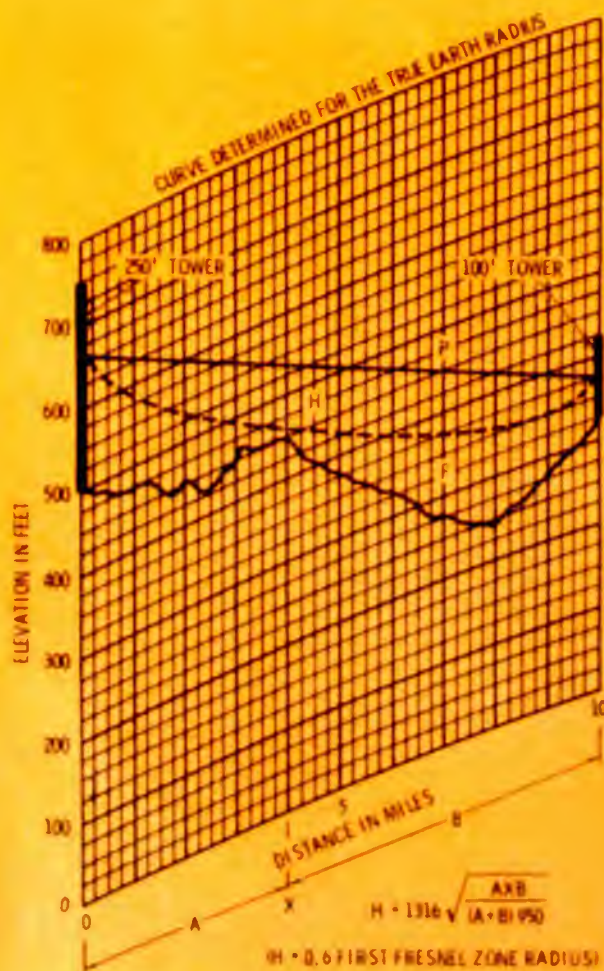


Figure A. Typical Aural STL Path Profile drawn on true earth radius graph paper. Line "P" between the studio and transmitter site represents the center of radiation between STL transmitting and receiving antennas. The dashed line ("F") represents 0.6 First Fresnel radius from the center of radiation, and represents what is normally considered as minimum clearance above possible obstruction. This distance from the center of radiation can easily be calculated. In this example, a possible obstruction exists at Point X. Using the format shown above, we find that a minimum clearance of 66 feet is required at Point X. By using this information, the minimum height above ground for both STL transmitting and receiving antennas can be determined. In the graph, it can be seen that heights lower than those shown could be used for this path.

Figure B. Typical STL Antenna-Scala Radio Model PR-450U Paraflector. Identical antennas are normally used for both transmitting and receiving in STL installations.



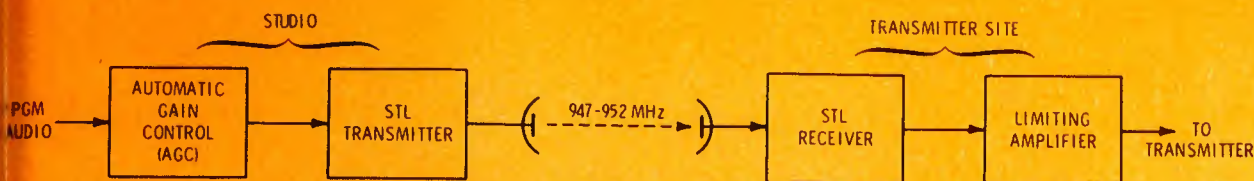
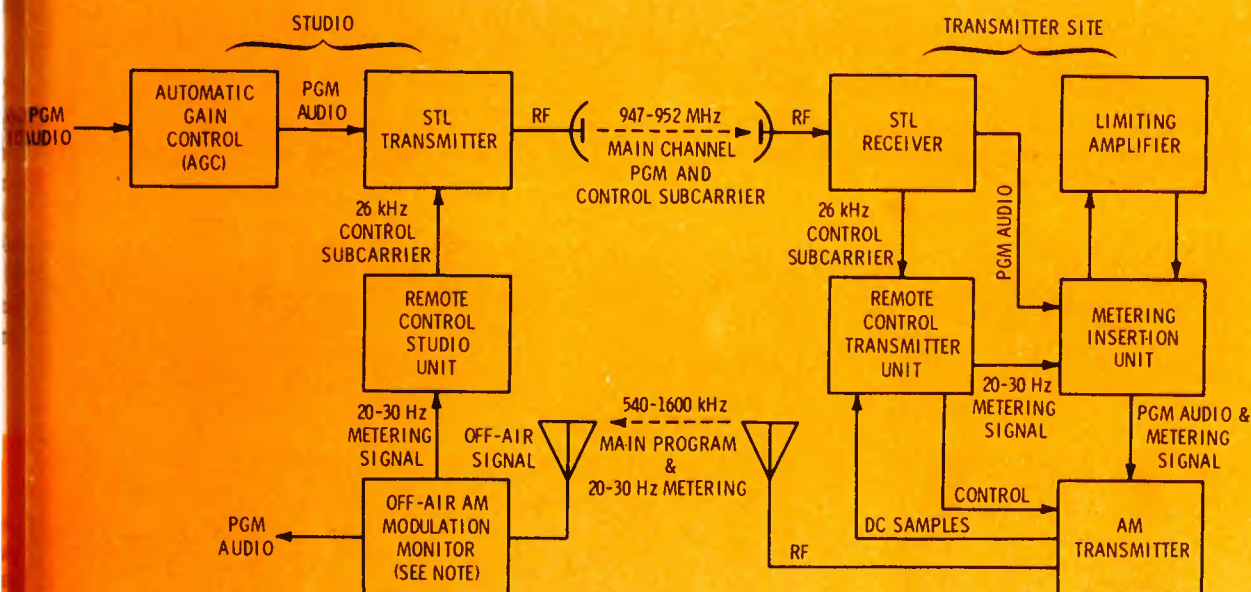


Fig. C. Monaural STL. This configuration is typical for AM and FM applications.



NOTE: OFF AIR REMOTE MODULATION MONITORS MAY BE USED TO RECOVER THE SUBAUDIBLE METERING SIGNAL.

Fig. D. AM STL with Wireless Transmitter Remote Control System. The metering insertion unit mixes program audio and the subaudible (20-30 Hz) metering signal. Additionally, this unit contains a high-pass audio filter to remove low frequency audio components from the program audio that might interfere with the subaudible metering signal. The limiting amplifier is shown such that this high-pass filter is actually inserted ahead of the limiting amplifier, with the output of the subaudible metering signal and program audio following the output of the limiting amplifier.

Bill Dorman, Operations Manager, learned that telephone circuits that had thought would be available for interconnection of the studio and transmitter sites could not be obtained by the local telephone company. This left only the STL as a means of getting WRSQ on the air. By diligent effort, he was able to obtain an STL and was on the air by the end of November.

All stations are faced with the same situation as WRSQ. A number of other reasons usually enter into the selection of an STL. These are: (1) Better Quality; (2) Higher Reliability; (3) All Operations Under Station Control; (4) Flexibility/Versatility; and (5) Sav-

ing on Operating Expenses.

Quality has become the key word to many stations. The audio response, distortion, and signal-to-noise ratio of an STL classically exceed that of a leased wire circuit.

One of the most often-expressed comments following installation of an STL where wire lines had previously been in service is that the improvement in the brilliance or presence of the on-air sound is very evident. This can be attributed to the transient response of the STL, particularly at the lower audio frequencies. This single attribute of the STL is one that cannot be equalled by other services. The baseband performance of a dedi-

cated radio link cannot be duplicated. In New York City, a system is operated by one station over a distance of some ten blocks because of its desire to have the best possible on-air sound. This FM station is consistently rated among the leaders in the nation's largest market.

With the higher performance characteristics comes a higher degree of reliability. STLs are not subject to some of the causes of telephone outages such as downed poles from traffic accidents or natural disasters, or other similar failures.

This dependability is also related
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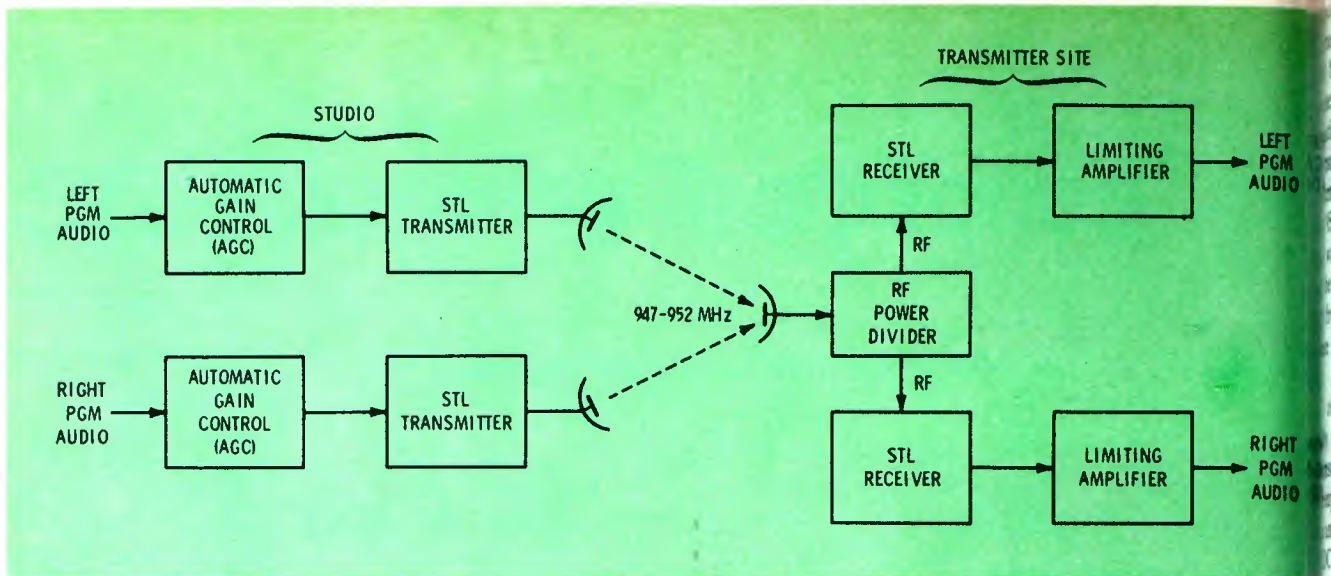


Figure E. Dual STL for FM Stereo. This configuration utilizes separate monaural STLs to relay left and right program audio. Separate STL transmitting antennas are normally used. An RF power divider can be used to operate the two receivers from one antenna.

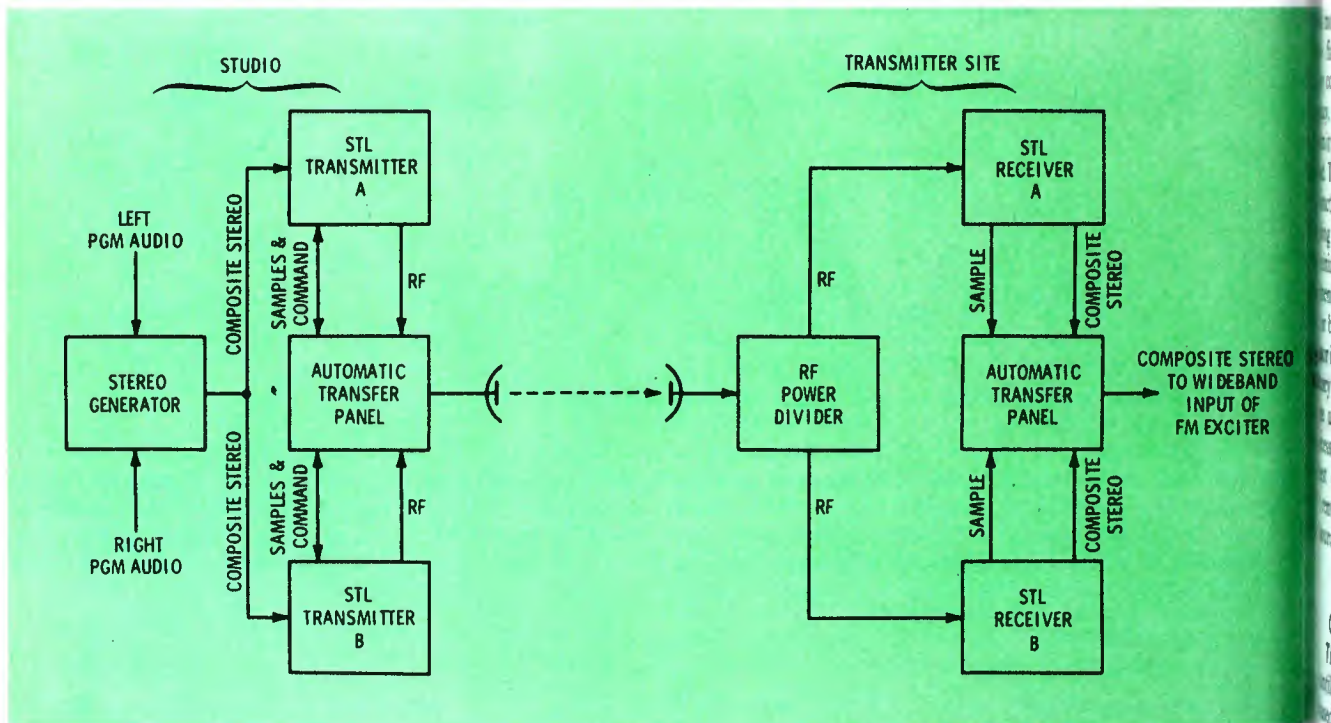


Figure F. Composite STL for FM Stereo with Automatic Changeover to a Backup System. The composite STL provides single-link service for FM Stereo. For this STL configuration, the stereo generator is located at the studio with the relaying the composite stereo waveform. The automatic changeover system shown functions from the presence of a carrier. With a failure, automatic changeover to a backup STL is provided.

STL Techniques

continued from page 37

to the third reason for selecting an STL—all operations being under station control. This control enables preventive maintenance and proper servicing of the STL by station personnel. A third party, not under the control of the station, is no longer depended upon to make sure the interconnecting circuits are

shipshape. This does mean that proper planning must be done to insure continued quality and reliability from an STL system.

Time should be allotted on a regular basis for routine maintenance. Depending upon the STL equipment being used, this can be as simple as observing operating

parameters. Test equipment should also be available in the event of failure. Here again, the STL equipment selected will determine exact requirements, but some basic instruments are worth noting. A volt-ohm meter is normally used for basic measurements of DC operating parameters not metered

equipment itself. Should the transmitter not have a true VSWR bridge built in, an in-line meter can be extremely useful in locating faults with RF connections on the transmission line and antenna. Remember, the STL operates in the 950 MHz region and any external wattmeter or VSWR bridge will be capable of operating at these frequencies. Constant impedance Type N connectors are a must!

An oscilloscope can greatly simplify many checks, particularly problems relating to the audio and power supply sections of both transmitter and receiver. An oscilloscope with DC response is particularly useful in stereo applications. The frequency response characteristics need to go to 1 GHz. While 100 MHz capability can be extremely useful, a 1 GHz oscilloscope may be more within most budgets.

The final instrument is a frequency counter or meter of known accuracy. The frequency of the STL transmitter must be periodically checked. This counter or meter need not function at the actual output operating frequency. The frequency-determining oscillator in current equipment typically operates at 100 MHz or below. Verification of this oscillator is acceptable. Of course, a frequency measurement service also can be used for this check. It is unnecessary to actually own all of the test equipment if it can be rented or borrowed from a local source.

Other Services Through An STL

Until now, all comments have been based upon the STL relating to programming. Other services can be combined on an STL, providing flexibility and versatility. As will be seen below, these will be dependent upon whether the STL is functioning with an AM or FM station.

The addition of remote control is a function enjoyed by both AM and FM. A variety of equipment enables a number of methods for obtaining the desired service. This is particularly true of the FM broadcaster. Both AM and FM equipment configurations will be detailed below.

One of the most compelling reasons for using an aural STL is

the savings realized through ownership of capital equipment as opposed to the incurrence of operating expenses through monthly telephone charges. Some stations are able to recover the investment in an STL from less than one year's equivalent telephone service charges. More common payout periods are three to five years.

An interesting example is KTHO, licensed to South Lake Tahoe, California but with transmitter facilities located in Nevada. Even though the two locations are separated by only a few city blocks, because service was interstate, monthly telephone charges were prohibitive. An STL provided an affordable solution. As it is not the purpose of this article to explore accounting procedures, it is suggested that authorization periods for capital equipment be discussed with the station accountant. With the ever-increasing telephone tariffs, an STL will continue to be an appropriate and economically viable investment.

The Path And Equipment Selection

Once the decision to use an aural STL has been made, the first step is to insure that the topography or terrain between studio and transmitter site will permit operation. With topographic maps, a paper survey can be made of the proposed STL path (the route between studio and transmitter site).

Station engineering personnel or their consulting engineer can prepare such a study with some equipment manufacturers providing comments and assistance for such studies. This study consists of preparing a profile (side view) of the proposed path. Two types of graph paper are used for such profiles. Each represents the earth's surface as an arc. For video microwave systems and many communications uses, a graph whose arc represents 1.33 percent of the earth's radius (referred to as a 4/3 earth graph) is often used. Such an arc is optimistic and assumes that the best of all forms of propagation, including refraction effects in a standard atmosphere, will occur.

In many instances, aural STL paths are evaluated with true earth

continued on page 40

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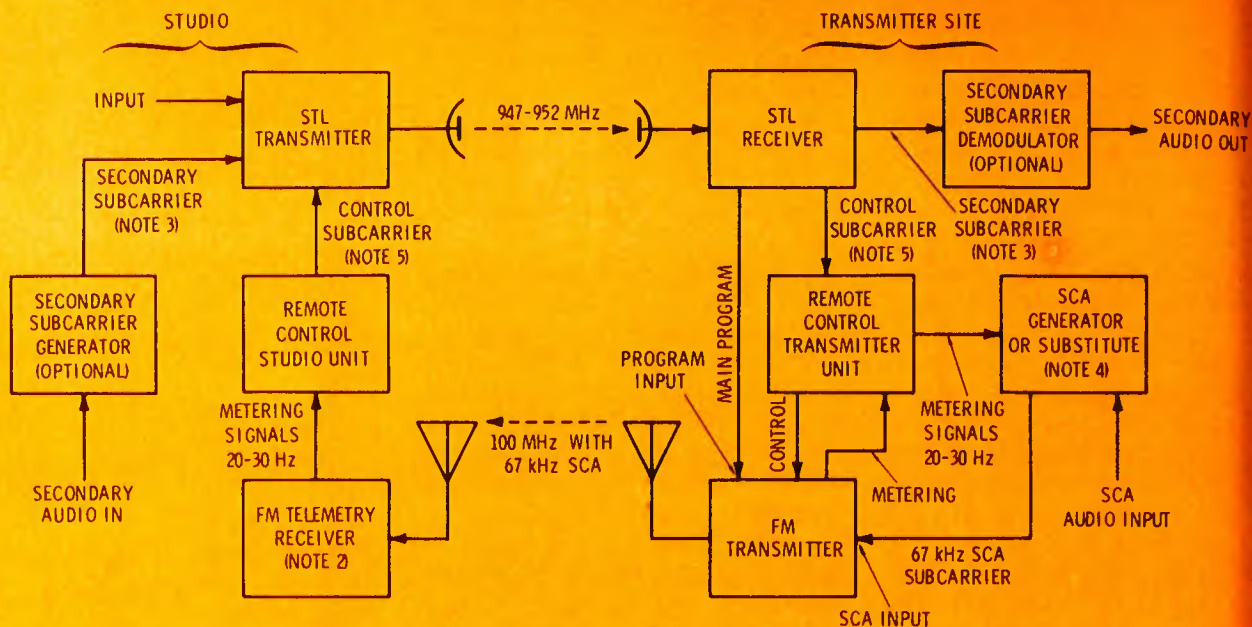
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3. TYPICAL FREQUENCY IS 67 kHz FOR MONAURAL STL; 185 kHz FOR COMPOSITE STL.
4. IF SCA PROGRAMMING IS NOT USED, REPLACE WITH TELEMETRY SCA GENERATOR MODULE.
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Figure G. FM STL with wireless transmitter remote control system.

STL Techniques

continued from page 39

radius graph paper. This graph has an arc representative of the true earth's surface and is considered pessimistic. It must be remembered that, above all, reliability of the path must be maximized by insuring proper distance. Figure A represents an example of such a path profile and some of the methods used for assessing its usability.

If conditions permit, first-hand observations to confirm the information appearing on the profile are strongly suggested. From the path profile, the length of the path and the height of the STL antennas are established. With this information, antennas having the necessary gain and transmission line having known attenuation can be selected to obtain the best performance at optimum cost.

Figure B shows one style of antenna in common use with STL systems. Free space calculations are the classic method employed to verify the "useability" of the se-

lected antennas and transmission line.

The selection of equipment is dependent upon the required service. Aural studio-transmitter link equipment that has been specifically designed for both AM and FM applications is available. From the variety of equipment currently available, most requirements can be satisfied. The versatility and flexibility of an STL was briefly mentioned. These traits become more apparent when the capabilities of an STL, beyond just relaying programming, are considered. For AM and FM stations, the STL provides a means of operating a transmitter with a remote control system without the need of leased circuits. Secondary program material (SCA) or communications also can be transmitted on the STL.

For the AM station, the current need is for monaural program feeds. Further requirements will include AM stereo. The National AM Stereophonic Radio Committee

(NAMSRC) of the Electronic Industries Association (EIA) is investigating the various methods of accommodating this service. Figure C is a block diagram of the basic STL for monaural service. Suggested positioning of audio processing equipment is shown.

In the use of an aural STL, it must always be remembered that the STL transmitter is an audio transmitter. Varying amounts of audio pre-emphasis are used on STL transmitters. As with broadcast transmitters, 75 μ sec pre-emphasis was common at 400 Hz. Although 400 Hz or 1000 Hz test tones are used at a level of -40 dBm for testing purposes, programming should be applied at -5 dB to prevent overmodulation of the STL transmitter. More recent STL equipment has been designed specifically for AM applications. This equipment has a flat audio response and does not employ pre-emphasis in the transmitter and emphasis in the receiver. System

type are easier to set up and operate in AM service as the pre-emphasis curve does not have to be considered in establishing actual program levels.

Remote control is easily added to totally wireless operation of the transmitter. In 1962, Moseley Associates, Inc., petitioned the FCC to allow the return of a subaudible telemetry signal directly on the AM carrier. A configuration depicting this operation is shown in Figure 1. Operation of such a system requires communications paths to and from the transmitter site. Command or control information in the remote control system is relayed over the STL by an FM subcarrier in the same manner that an SCA channel is used on an FM broadcast transmitter. Metering or telemetry is returned as a single subaudible tone varying in frequency from 20 Hz to 30 Hz. This tone is mixed with program audio and applied directly to the AM transmitter. The tone is recovered at the studio and fed to the remote control system.

STLs for FM service can be

essentially the same as those for AM. If the FM programming is monaural, Figure D is again applicable. For stereo, two possible configurations exist. The first of these consists of two monaural STLs, and is typically referred to as a dual configuration (see Figure E). This configuration resulted from Rule changes in 1961 initiated by Moseley Associates, Inc. Both systems operate in a single STL channel with one conveying left program audio, the other right program audio. Licensing of this configuration will be covered in Part 2 of this article.

The second FM system is the composite STL—the single STL link for FM stereo. With the composite STL, the stereo generator is located at the studio and the composite stereo waveform is relayed directly to the wideband input of the RF exciter in the FM broadcast transmitter (see Figure F).

In recent years, the composite STL has become more commonly used than the dual configuration. One operational advantage of the dual STL is that, should one STL

fail, a second exists for backup. This backup, however, is only monaural. With the two composite STLs, the same number of links, full stereo backup exists. Figure F reflects automatic transfer panels which, with a carrier failure, change over to the composite backup STL.

Remote control of FM is as easily accommodated as with AM. Figure G represents the typical FM remote control configuration. It functions very similarly to the AM system described above. An FM subcarrier is utilized to relay command information from the studio to the transmitter site. Metering, however, is not returned directly on the carrier, as is the case with AM. The FCC Rules and Regulations require that telemetry be returned on an SCA channel on the FM. As with AM, subaudible telemetry may be applied to the SCA channel, allowing it to be programmed.

In the second part of this article, we will explore other operation aspects such as quadraphonic stereo for FM, license applications, and the current Rules and Regulations as they relate to the aural STL. □

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NRBA success story moves into New Orleans

By Ron Merrell

It really shouldn't come as any surprise that the National Radio Broadcasters Association has sold out all their exhibit space for their annual national conference and exposition. The meet is scheduled for October 9 at the New Orleans Hilton.

The four-day conference will feature survival courses in the real world of radio. In what they are calling a no-nonsense agenda, you'll find out more on how AM stations can compete with the FM sound, the ins and outs of an FCC inspection, what's happening right now in quadrasonic FM and AM stereo, and a host of other vital topics.

The success formula

It isn't really by chance that this association has become a viable voice for the radio broadcaster. Once they shed their old name (NAFMB) and reorganized, the NRBA moved in all the right directions. And manufacturers soon found that here at last was a bona fide working convention where new methods and the new technology would be covered.

Probably the highlight of any NRBA convention is the true engineering give and take that starts in the meetings, continues in the exhibit area, and even

permeates the halls. The NRBA calls it "just straight engineer-to-engineer talk about survival and success in a tough competitive business."

What else is new?

One of the membership questions that's asked most often is, what do I get for my membership dollars? There are lots of stock answers, but the best shot going is service. You can't mistake the NRBA position on almost anything pertinent to the business. Take the latest ruling on the new radio service for the high and low end of the broadcast band. The NRBA was opposed to that move. If you were a member, you'd instantly know where the NRBA stood and why. Through their "Monday Morning Memo," the association keeps in touch with its membership on all FCC news and key issues.

Just a few weeks ago the NRBA announced that they plan to work with Arbitron Radio on a number of key issues affecting the radio broadcast industry.

Ted Dorf, NRBA Director-at-Large, announced that the NRBA ratings committee will have regularly scheduled meetings to review complaints about the rating services from AM and FM stations

owners throughout the country. The NRBA committee then plans to meet with Arbitron Radio management to evaluate those complaints which the NRBA believes merit attention by Arbitron. Meeting together, the two organizations will be able to place certain of the complaints in proper perspective for the complainant, and where complaints merit action, the NRBA will work with Arbitron in an effort to develop corrective procedures to improve the overall service which Arbitron provides the broadcasting industry and thus the public. Dorf stated that "in this manner, the NRBA will ensure that the voice of its over 1000 radio station members will be represented in those matters directly related to audience measurement."

The NRBA has also offered to assist Arbitron on such important matters as audience diary security, unauthorized use of Arbitron Radio market reports and educating stations owners about the detrimental effects upon the entire broadcasting industry of dialing out during radio sweeps.

The convention routine

The convention will open with registration at 9 am October 9. Registration will remain open until

m. The first sessions will run
on 10 am until noon.. Then at
10, the exhibit area, with the
greatest number of manufacturers
to show at NRBA, will be open
business until 5:30.

On Monday the general sessions
begin at 9 am. The sessions
schedule will include special pro-
gram emphasis on management,
programming, research, and
engineering. From the looks of the
scheduled sessions, this is one
convention where the entire staff
could attend meaningful sessions.
Of course there will be some
large benefits as well. There are
at least 55 hospitality suites
already set up. Cocktail receptions
will be held daily at 5:30. And
immediately following the recep-
tion on Tuesday, you'll have to
choose between a riverboat cruise,
the suites, or the night life of New
Orleans.

The convention agenda

SATURDAY, OCTOBER 9
10 AM TO NOON

Management
"Your Cash"
Moderator:
Jack Geismeyer,
Ch. Covenant—C

Pam Strauss—C
KIKI-Honolulu,
Hawaii

Jim Fox—C
KTNQ-Los Angeles,
Calif.

Bob Pittman—C
WNBL-New York

Bob Hanneberry—C
Consultant

Sall Market
"Panel"
Moderator:
Peter Colman,
WV-Ventura, Calif.

Promotion
"101 Station
Promotion Ideas"
Moderator:
Dick Ferguson—C
WEZN-Bridgeport,
Conn.

Urban Radio"
"Fillippi,
D-Aurora,
Ohio

Paul Newhoff
WERE/WGCL
Cleveland, Ohio

Dunn—C
Utica, N.Y.

Lee Abrams—C
Burkhart/Abrams,
Inc.

Programming
"ing a Market
"form"
Moderator:
Herpe—C

continued on page 44

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NRBA

continued from
page 43

Phil Roberts—C
NTC Sales Mngr.
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Engineering
"The Ins and
Outs of An
FCC Inspection"
Moderator and
Panelists
TBA

"How to Appraise
the Value of a
Radio Station"
Paul Kugan—C

"Buying and
Selling"
Richard A. Shaheen
—C

"How to Raise
the Money"
Gary Pease—C
Society National
Bank-Cleveland,
Ohio

CPA/Attorney/
Appraiser

Sales
"Answering Format
Objections"

Moderator:
Jim Conner—C

Jim Duncan—C
American Radio

"Good Music—
the Golden West
Study"
Bill Clark—C
KDBL

"Rad Shed"
Ellen Hulleburg—
McGavern/Guild

"Katz/Prob"
Bill Shrank—C

"Old Line—Your
Audience is
Too Old"

"Brain Plan"
Bob Galen,
Blair Radio

"Rock—I Can't
Stand Your Music"

"Country—Your
Listeners Have
no Money"
Karl Hirsh

Engineering 2 Concurrent Sessions

"How to Compete
With FM Sound"
Moderator: TBA;
Allen Roycroft,
Pres. Broadcast
Services;
Augie Prestal,
A. D. Ring

Programming
"How Many Kinds
of Rock Are There?"
Moderator:
Eric Hauenstein—C

"Improving FM
Coverage for Bett
Ratings"

Moderator:
Gunther Meisse,
WVNO-Mansfield,
Ohio; Eric Small,
Eric Small Assoc.
Peter Onagan,
Jampro; Bob
Bernish, Starr
Broadcasting

"Soft Rock"
Dick Drury—C

TBA—"Magic
Music"

TBA—"TM Rock"

Research
"New Applications"
Moderator:

**TUESDAY, OCTOBER 11
9:30 AM TO NOON**

Management
"Keeping the
Government Away"
Moderator: Tom
Shattenfield—C

Sales
"The National Re
Panel" Moderator:
Jack Masla—C

"EOE" "Labor
Relations"

"Is There a Place
in the Sun for a
New Rep Firm?"
Lew Faust—C

"Sales Matters"

"Rep Networks"
Allen Torbet—C
Torbet, Lasker, In

"Double Billing
Lotteries"

"Payola"

"Small Market
Reps"
Bob Walton—C

"Promise vs.
Performance"

"Minorities in
Broadcasting"

"Group Owned
Reps" Bob Duffy-
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Kemp-C
H-Houston
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W E/WECL,
Cleveland
Adamson-C
K), Seattle
Viands-C
Mini

Promotion
"Promotion Promotion"
Moderator:
Latto-C

"Take it Away"
McDaniel-C
WVZ, Huntington

TUESDAY, OCTOBER 11
8:1 PM TO 5:00 PM

Legal Panel
Moderator:
Schattenfield

WEDNESDAY, OCTOBER 12

Management
"Success is Where
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Moderator:
Mellgren-C

"Classical Music"
Richer, WNCN,

"Beautiful Music in
Small Market"

Bonin-C
A, New Iberia,

"Country in the
City"

August, 1977

"Stay Beautiful"
Joyce Bose-C
KBIG/KBRT, L.A.

"The First Quarter"
Timothy Ives-C
WJBC, Bloomington

"Launching a New
Format" Stanley
Cohen, WYNY, N.Y.

Engineering
"A New Technology"
Moderator:
Harold Kassens -
A. D. Ring Assoc.

"AM Stereo"
Arnold Meyer-Belar;
Al Kelsh-Magnavox;
Norm Parker-
Motorola; TBA; TBA;

"FM Quad"
Jim Gabbert-NQRG
Larry Middlecamp-
FCC Labs; TBA

Panelists To Be
Announced

To Be Announced

"After NIS"

Lee Morris-C
WSOC

Sales
"The Major Market
Sales Panel"

Moderator:
Bernie Mann-C

"Rates-To Grid or
Not to Grid"

"Inventory Control"

"Compensation
Plans"

Programming
"Adult Music-
Where Will It Come
From"

Moderator:
Jim Schlicting-C
Pres., Starborne
Prod.

Phil Stuart-C
SRP

Bob Chandler-C
WGAY

To Be Announced

Research
"The Future of
Broadcast Research"

Moderator:
Ted Dorf

"Arbitron"
Small Markets,

Large Markets &
Radio Aid

Bill Engle-C

"Media Stat"

Jim Seiler

"Radio Index"

Todd Wallace

"Pulse"

Engineering
Audio Processing
Moderator and
Panelists To Be
Announced

**9:30 Small market
idea exchange**
For Markets Under
50,000
Moderator:
Dutch Doelitzsch
WDDD, Marion, Ill.

continued on page 46

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Micro Controls
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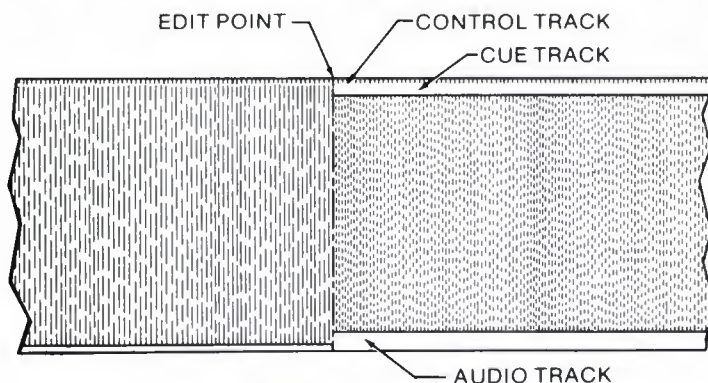
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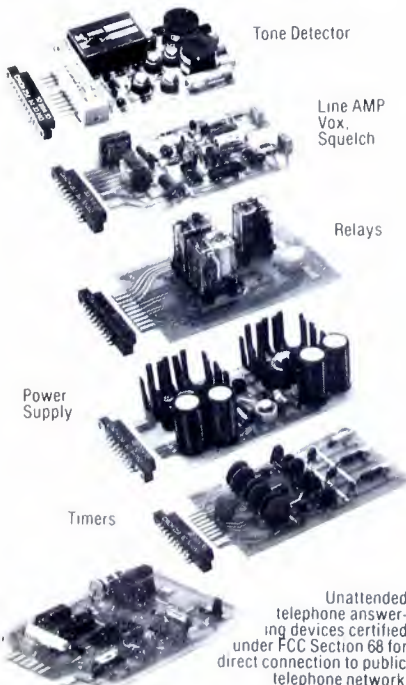
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digital lab

Teach yourself digital troubleshooting

Part 4/By Harold Ennes

This series has considered only logic gates for a good reason; this is usually your "first step" in isolating problems in a digital system. In complex circuitry consisting of flip-flops, shift registers, encoders, decoders, memory circuits, etc., you will normally find logic gates somewhere in the path. These are easy to check from the appropriate truth table.

In tracing a fault, start at the point where you see the error, (a light not lighting or a single control function failure) and work back from there. Locate the logic gate nearest this output, and work back in fairly large jumps until you find an output not compatible with the input(s).

Open circuits

The effect of an open circuit (internal or external) is that the gate will respond to a bad level as though that pin is a static high level. See Figure 1 and let's (hopefully) assume that only one open can occur at a given time. Point 1 is an open output bond internal to gate 2. All ICs driven by that output are left to float. An open at point 2 is external to gate 3. This would be evident by a signal at gate 2 output and gate 4 input, but the B input of gate 3 would show a "bad level." An open of the internal bond of gate 3 (point 3) will cause the B input of gate 3 to show normal, but the output will be such that it assumes the B input to be a fixed HIGH level.

Don't get stuck in low

Now go back to the open at point 1. Even though the circuit of gate 2 is not connected, you will have an indication of bad level at this output which is "fed back" from the floating pins of gates 3 and 5. Thus this

line is stuck in the bad level condition.

Other internal problems of gates could cause the output to be stuck high or low. The important characteristic is that the output is changing when input signals are normal.

Does this mean that you have determined that the IC containing gate 2 is faulty? No! The gate could be stuck high due to an external short of the output line to V_{CC} . It could be stuck low due to an external short to ground. And by "external" could mean the inputs of the driven ICs as well as printed wiring.

In checking for opens in printed wiring paths, a magnifying glass is helpful to detect the tiny hairline cracks that usually occur. If the IC is on a removable board, flexing the board while looking at it under the magnifying glass will reveal a break.

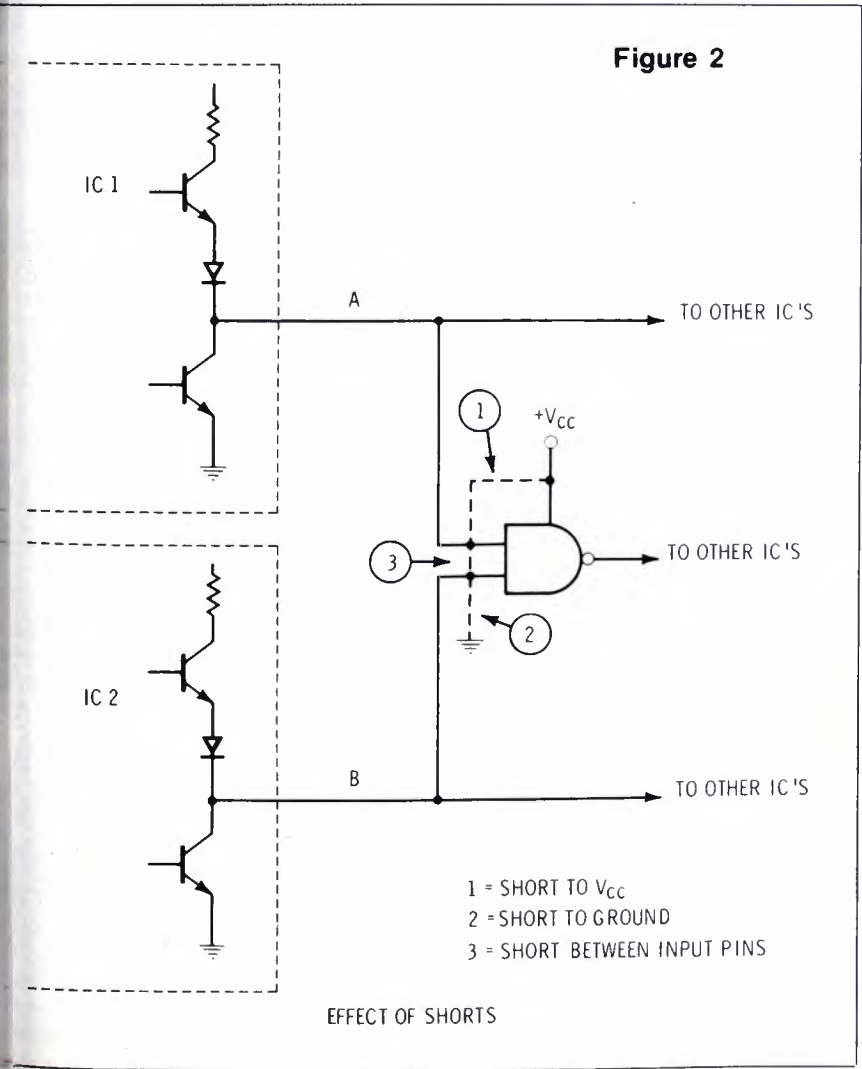
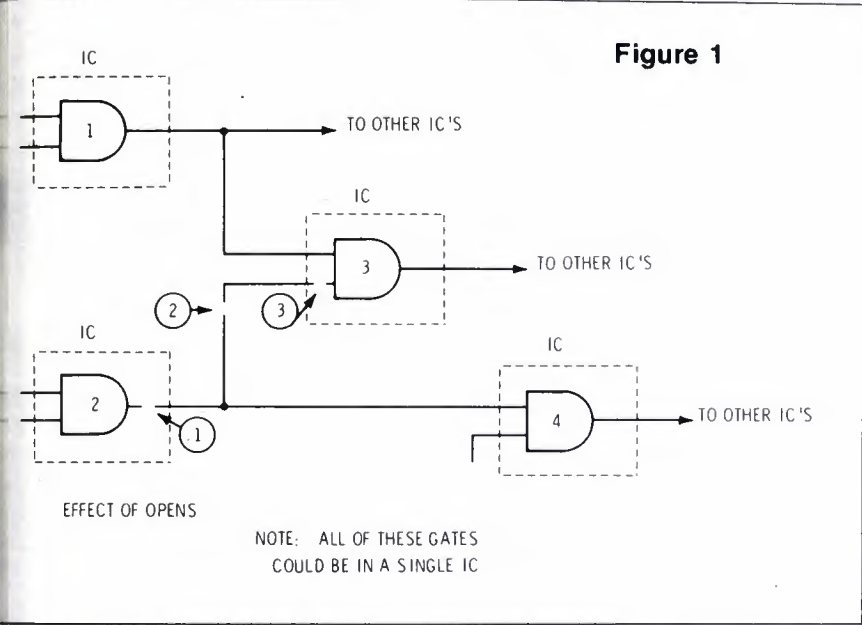
Just as with tube circuitry, the best "check" for an IC is to replace the suspected unit. **This is easy: the IC plugs into a socket, if you are careful NOT TO INSERT IT BACKWARD.** Always note the position of the index before removing. In the case of soldered-in ICs, you need to assure that the fault is not in the external wiring, before unsoldering all the pins of an IC.

Short circuits

A short between any node (accessible operating point) and V_{CC} or ground external to the IC is indistinguishable from a short internal to the IC. Either will cause the signal lines connected to the node either to be stuck high (for shorts to V_{CC}) or low (for shorts to ground). When this type of failure is encountered, a rigorous physical examination of the printed wiring

th is required to isolate the use. Solder "bridges" are commonly encountered. Examine closely all soldered joints on the circuit board that are in close proximity to another conductor. Solder "tails" can be found by close inspection. A magnifying glass may be necessary to detect hairline shorts. If you find one, run the sharp point of a scribe gently

continued on page 50



"The Ikegami HL-77 gives me the best picture I've ever seen on a portable camera."

That's what Jack Everette, Executive Vice President of Midwest Television, Inc., Champaign, Illinois, quotes Midwest news teams as saying about their Ikegami HL-77 ENG cameras. Midwest Television, Inc., has three cameras at Champaign (WCIA), a fourth at the state capitol in Springfield, Illinois, two in Peoria, Illinois (WMBD-TV), and two in San Diego, California (KFMB-TV).

Other comments:
"Our newsmen say they're proud to be working with the most advanced equipment in the business."
"Other news teams tell us they wish they had cameras like ours."
"Ikegami cameras give great mobility to news cameramen."
"Excellent pictures, even at low light levels."

That's why more TV news teams use Ikegami ENG/EFP cameras than all other ENG cameras combined. For more reasons, contact Mort Russin, V.P. Sales, Ikegami Electronics (USA) Inc., 29-19 39th Avenue, Long Island City, N.Y. 11101 (212) 932-2577

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digital lab

.....
continued from page 49

between the runs to remove the short.

Figure 2 shows the three most commonly encountered shorts, as well as the typical totem-pole output circuitry of DTL and TTL logic ICs. A short at point 1 will hold line A at high level. A short at point 2 will hold line B at low level.

A short between input pins (point 3) is not as easy to analyze. Note the typical output circuitry of logic ICs in Figure 2 for the purpose of analysis.

Whenever the outputs of IC1 and IC2 go high simultaneously or low simultaneously, the shorted pins will have no effect on operation. However, if one output tends to go high while the other output tries to go low, the circuit operation will fail. The output attempting to go high will supply current through the upper saturated transistor of the totem-pole output stage while the output attempting to go low will sink this current through the saturated lower transistor of its totem-pole output stage. The saturated transistor to ground pulls the shorted pin to a low state. Note that the output of the NAND gate shown in Figure 2 would be stuck in the high mode (low only when both inputs are high). If the gate was an AND circuit, the output would be stuck low.

Probing opens

In tracing high-impedance paths (opens), the straight logic probe or scope is most efficient. This is also highly efficient in locating the fault from shorts. However, for tracing the low-impedance path caused by a short, the current tracer such as the Hewlett-Packard model 547 is most efficient.

In lieu of a current tracer, a sensitive ohmmeter with milliohm resolution can be used. Remove the circuit board, if possible. Using the lowest scale on the ohmmeter, place one probe on the input or output pin and other on ground or V_{CC} depending on the nature of the short. Hold the probe lead very steady on the ground or V_{CC} point and move the other probe from the IC pin along the printed circuit run. You will notice a decrease in resistance as you approach the locality of the short, and an increase in resistance as you move away from the short. Move to the point of minimum resistance.

From blue bananas to bag tails

Dead silence

That was always the most grim, depressing but necessary segment of our morning programming recently provoked an unexpected grin when our local funeral home's obituary report swallowed a blue banana. The obligatory organ struck up a painful dirge as our morning announcer announced the funeral arrangements of the previous evening's dearly departed. After he intoned, "And now, today's prayer," he began to play the tape that was supposed to contain the pre-recorded prayer, only to find dead silence. With the listening audience placing their heads in reverential silence, awaiting the daily prayer, the DJ angrily groaned, over the top mike, "Oh, GOD!!!" Rick Robinson, WBHN Radio.

And on the same wavelength... As with most small class IV stations, WBAT has had many announcers come and go, each with many tales of "blue bananas." One of the announcers related an experience that happened to one of the Sunday morning announcers at a small FM station in Maine, back in all religious programs came from the old 16-inch transcriptions. After sign-on the announcer inserted the disc, locked up and walked across the street for breakfast. The preacher started his program during the opening prayer—"and the Lord Jesus Christ"—the disc stuck in the groove and the phrase "Jesus Christ" was repeated. The telephone started ringing but there was no one to answer it. After about 10 minutes the irate listeners began calling the manager at home, woke him out of bed and told what was heard. The manager dashed to the station and, upon arrival, met the announcer returning from breakfast. After correcting the stuck disc the manager promptly fired the announcer and completed the program. Warren Arnett, WBAT Radio.

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COULD BE A RECORD!



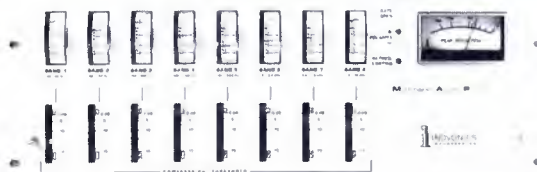
It's 3 watts, six pounds and very portable. Report in first with the new McMartin RPU-1103, a self-contained 150 MHz battery-operated, remote pick-up transmitter. It exceeds all the latest F.C.C. requirements. The RPU-1103 has dual frequency operation and an audio compressor that functions on both line (portable cassettes, etc.) and microphone inputs to allow simple talk over operation. This ENG machine is the latest addition to the McMartin broadcast line.

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use by professionals. Critical adjustments can be made by the audio engineer such as soft compression, transmitter power (can be switched to legal maximum), and internally supplied power for Electret microphones.

To learn more about the System 22 or our new executive and universal lines call or write HM Electronics, Inc. 6151 Fairmount Avenue, San Diego, Ca. 92120 Ph. (714) 280-6050

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from blue bananas to sag tails

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continued from page 51

House calls are not a thing of the past

As a TV newsmen, regular telephone calls from viewers who want to comment (or complain) about a news story are usual for me.

Some callers, however, quickly wear out their welcome with repeated complaints about the same thing. The news staff had a particularly difficult time with one caller, but a new employee solved the problem—and gained for himself a warm niche among the more experienced personnel.

After listening with understanding concern to the complainant for several minutes, the new man spoke up sympathetically: "Madam, we're really sorry you're having so much difficulty with our broadcasts. If you'll just give me your name and address we'll send a crew out for something in the morning to disconnect our station from your set."

The surprised caller hung up the telephone and we heard no more of that complaint! *J. Tom Badger, Princeton, W. Va.*

Clipping the problem at the source

The story about how I came to be the chief engineer at my present station must have a few of the "blue bananas" in it.

Our station never had a broadcast chief, all the maintenance work had always been contracted out. With a construction permit for a new FM station to go along with the AM, and knowing that we planned on putting in an automation system, the owner of the station decided to hire a chief. In this case he hired a young man who was fresh out of space (literally, he was always high on something). The young chief immediately set out to rebuild the entire station, even though the operation had been working smoothly before his arrival...all of this the owner patiently tolerated until one night about two weeks after he arrived, the young engineer decided he was going to tear into our five-spotter. He called

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ended the sign-off DJ to help him immediately started to destroy with five-spotter, during which the machine became unplugged from AC receptacle. The DJ noticed and tried to tell him, but he insisted he was the engineer and the DJ was not technically inclined. He could not possibly know what the problem was.

In order to find the supposed break in the power line he started pulling the power cord (at the machine) one inch at a time until, about ten minutes before sign-on, he finally discovered the problem plugged at the wall. Not having a power cord handy, he wired in an old one-spot machines and had them placed all over the control board.

Needless to say, when the station owner arrived that morning and to the mess, the young engineer showed his final pay check and I (thankfully) received a phone call. Greer, KVOW Radio.

Look, up in the sky, it's a bird,
it's a plane, it's....SPLASH!
While running camera for
"Edge Podge Lodge," a clever

nature show for young people, it seemed there was always an unsuspected calamity befalling the crew.

When shooting outside we made it a practice to acknowledge any aircraft which flew overhead, instead of suffering with audio irregularities. So when Miss Jean pointed out to the boys and girls that "even in the woods you can sometimes see an airplane fly overhead," the command came down the headsets to get a shot of the plane. Since camera one was on the discovery table, and camera three was on Miss Jean and her friends, that left me on camera two to get a shot of the plane.

So I did a big tilt up into the cloudless sky, swung around 180 degrees, and fell right into the newly created discovery pond. I got the shot alright as the old 44 was balanced, and the director got off me fairly quickly (don't want to waste too much time on the incidents). It was kind of hard to keep Miss Jean from laughing out loud though when she looked up and saw her cameraman covered in green algae. Mary F. Zoller.

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"No problems at all. Fantastic for their reliability."

That's what Len Eden, Director of Engineering, Broadcast Division, Evening News Association and Chief Engineer at WWJ TV Detroit, and his colleagues have to say about their Ikegami HL-77 ENG cameras. Other comments by the WWJ news crew include:

"We're very pleased with their performance and lack of need for maintenance."

"Temperature conditions are rough in Detroit, but our Ikegami ENG cameras work reliably."

"Super for news."

"Our Ikegami HL-77s are for everyday use. Reliable."

News-gathering teams use more Ikegami ENG EFP cameras than all other cameras combined. And if they all feel the same way about Ikegami the way they do in Detroit, it's no surprise.

Hear what we have to say about Ikegami ENG cameras. For further information contact Mort Russin, V.P., Sales, Ikegami Electronics (USA), Inc., 29-19 39th Avenue, Long Island City, N.Y. 11101 (212) 932-2577

Ikegami



For More Details Circle (37) on Reply Card

station-to-station

How To Guarantee Single Play Carts

By Don McGuire, KYW Radio, Philadelphia

If your station uses a bank of Gates Criterion compact cart machines for "on the air" playback, here is a simple, reliable circuit addition that guarantees that a cart won't be aired twice when it should have run only once.

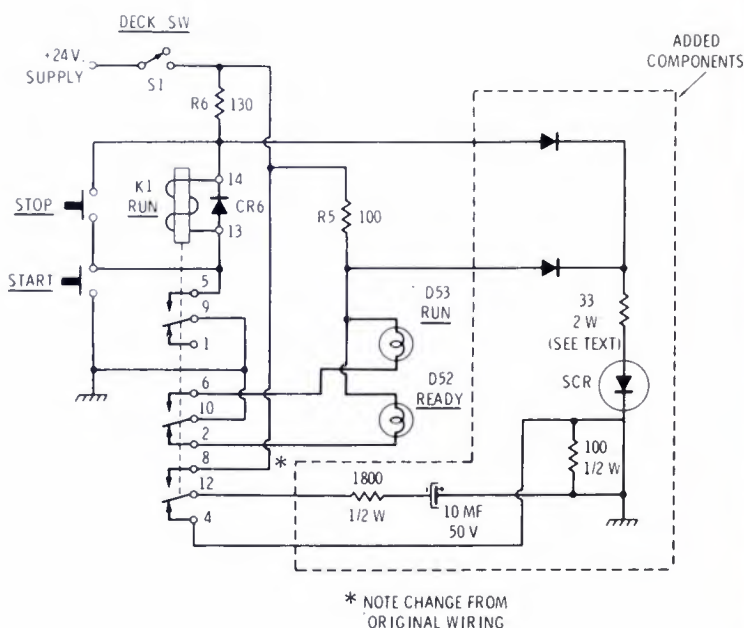
If the operator has neglected to remove an already-aired cart, the machine is disabled until a new cart is inserted. Existing panel lamps will indicate which status the machine is in at all times. Faced with a "do something **now!**" panic situation, the operator can, without reading labels, instantly punch off a cart and know it won't be the wrong one.

The accompanying schematic shows only the appropriate portion of the Criterion Compact's wiring, along with the additional seven components required. No holes need to be drilled in the front panel, and no mechanical changes are required.

Note that one change is required to the original compact wiring. The green wire on pin 12, K1 Relay socket (carrying the 24 V supply) is removed and reconnected to pin 8 of the same socket.

When a cart is playing, K1 is energized, closing contacts 8 and 12. This charges the added capacitor in the 24 Volt supply. When the machine stops and K1 is released, contacts 4 and 12 close. The capacitor then discharges through the 100 and 1800 Ohm resistors, triggering the gate of the SCR into conduction until its anode supply is interrupted.

The SCR anode current flowing through R5 and R6 reduces the voltage available at K1 coil and DS2 Ready Lamp to a level (about 11 volts). This disables the Relay. At the same time the Ready lamp is **nearly** extinguished, indicating that the cart has already aired.



the SCR continues as long as the
is left in the machine. When it
removed, the Deck Switch S1 is
ied, removing the 24 Volt
ply from the SCR, and conduc-
ceases. Inserting the next cart
resumes the supply, but the SCR
fire off again due to the gate
apacitor now being discharged.
to the new cart can be played.
Run Relay has normal supply
age and the Ready lamp is
onal, indicating the machine is
a "go" condition again.

the value of the SCR anode
resistor was chosen so that the
lamp is just barely lit, not com-
pletely out, during SCR operation.
In this way a burned-out lamp will
not cause operator confusion. The
value I arrived at was 33 Ohms
minimum, but you can increase
it to a value giving the lamp
brightness you prefer. With this one
exception, component values are in
no way critical. The two diodes and
resistor may be any with a minimum
50 volt rating. I used a 2N5061
diode. I would advise replacing the
original 100 Ohms 1/2 Watt R5 with
a 1 Watt size, due to its increased
current flow during SCR operation.

If desired, you can implement
this addition so that its operation
can be readily defeated. The capaci-
tor and the two resistors are wired
directly at the K1 socket, and a
wire then run from pin 4, K1
socket, to an unused pin of J1, the
Pin Remote Control socket. (Pins
17 and 18 of J1 are available.)
Another wire is run from pin 9, K3
secondary Cue optional relay
socket, which is the junction of R5
in the Ready and Run lamps, to
another unused pin of J1. The
function of R6 and K1 already
appears at pin 7 of J1.

The remaining additional compo-
nents (the SCR, anode resistor, and
steering diodes) are now wired
into the J1 mating plug (supplied
with the machine) by using pins 7,
11 (ground) for the SCR
anode, as tie points. Then, to
return the machine to a repeata-
bly function, merely remove the
remote control plug.

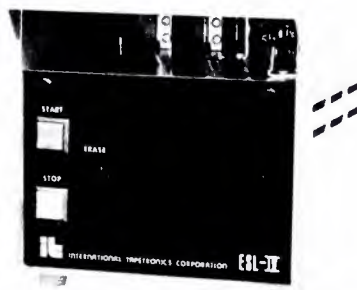
If you prefer the machine to
be in the repeatability function
to only notify the operator
when the inserted cart has already
been used, by way of a dimmed Ready

continued on page 56

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Station-to-Station

continued from page 55



"I ORDERED TAPE CARTRIDGES, ...T-A-P-E!"

Another Look At Aliasing

Dear Editor:

Let me begin by expressing our appreciation of the fine article by Dennis Ciapura which appeared in the March issue of **Broadcast Engineering**.

One point which may have caused some readers confusion is the term "aliasing." I would like to clarify how we interpret "aliasing" in the context of an FM stereo system.

In a traditional sample-data system, "aliasing" is well defined: the Nyquist Sampling Theorem states that if the bandwidth of the data is limited to one-half the sampling frequency, then the data can be perfectly restored. However, if frequencies in excess of one-half the sampling frequency are presented to the sampler, on decode, these frequencies will be decoded incorrectly and in fact will "fold around" the frequency equal to one-half the sampling frequency. For example, if the sampling frequency were 2 kHz, and a 1.2 kHz sine wave were sampled, its frequency on decode would be 800 Hz (i.e. 200 Hz below half the sampling frequency, rather than 200 Hz above, where it started out). This decode error is commonly termed "aliasing."

The FM stereo system is not a classic sample-data system, because it uses the available bandwidth

lamp, eliminate the diodes, connect the SCR anode directly to the junction of R5 the lamps. In this case, the K1 Relay is not affected and the switch can be re-aired. Because of increased current flow through the anode resistor, its value should be increased to 75 Ohms minimum to maintain the same lamp voltage.

I think you'll find this idea easily adaptable to other makes of triode playback machines with additional modifications, such as adding series resistors in the timing relay and lamp circuits. In any event, it is well worth the small investment in components and time so as to eliminate program interruptions and red faces!

somewhat inefficiently. The same information currently carried on a double sideband suppressed-carrier subcarrier could be carried just as effectively on a single sideband, the upper sideband being redundant and useful primarily in that it simplifies the receiving hardware substantially.

The effective sampling frequency is 38 kHz; thus, the upper frequency limit is 19 kHz. If we were to encode a 20 kHz tone, it would move from main channel to subchannel and be decoded at 18 kHz.

Regardless of whether lowpass filters are employed, the maximum bandwidth of the FM stereo system is 19 kHz. Thus, lowpass filters have three functions: to prevent aliasing distortion (which is highly offensive to the ear, being harmonically unrelated to the desired signal and sounding like telephone crosstalk); to prevent interference to the pilot; and to prevent out-of-band emissions and interference to SCA subcarriers. Since our OFDM MOD-FM successfully deals with the problem of overshoot in the filters, we can think of no advantages whatever in omitting them from the stereo system—only serious disadvantages.

I hope this will, to a certain extent, assist your readers in understanding this term.

Robert Orban
Chief Engineer
Orban/Broadcast
San Francisco

BROADCAST ENGINEERING



How WCCO solved their speed problem

By Hal Schardin, WCCO Radio, Minneapolis

Varying the speed on synchronous clocks may be needed for a number of reasons:

To correct speed variation. Portable recorders may have recorded too slowly due to weak batteries, or operation in cold weather. Winter temperatures sometimes turn the best lubricating oils into the consistency of peanut butter. To correct tape speed errors, record the material at normal speed onto a tape machine, and then vary the playback speed of the studio machine to compensate.

More songs per hour. Perhaps you have heard of the crazy idea of increasing turntable RPMs so your

station can play the most hits per hour. Some stations do it to "brighten" their on-air sound.

For special effects. Yet another use of variable speed occurs in special effects, such as "Donald Ducking" audio, or flanging. To flange audio with this system, set two tape recorders recording the same audio simultaneously. Then combine the audio from their playback heads, each at the same level. As you vary the speed of one machine slowly, you will notice the audio sounding as if it were arriving via shortwave broadcast.

To provide a means for accurate time-keeping. With an appropriately

accurate frequency source, this unit could drive station clocks to stay right on time. Our local electric utility has caused our clocks to vary as much as five seconds per hour!

To power special equipment. Depending on the load, you may be able to generate enough 400 Hz AC to power some of the oddball gear on the surplus market.

At WCCO, we use one unit to vary the capstan motor on one of our tape machines.

Criteria of the project

- The oscillator must be stable.

continued on page 58

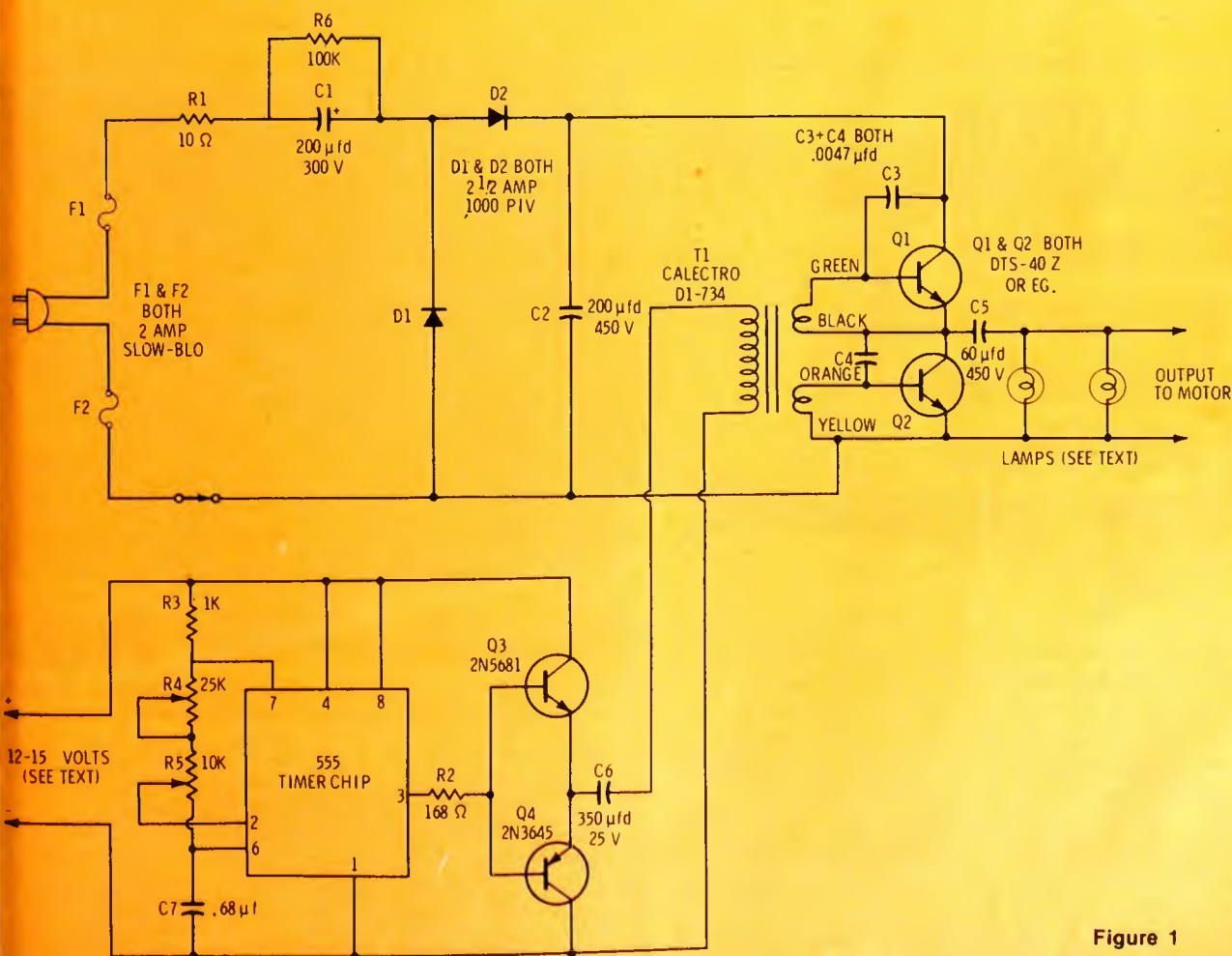


Figure 1

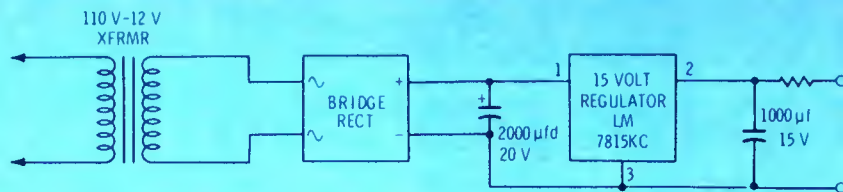


Figure 2. A possible low voltage power supply for the oscillator section. The resistor should be selected for proper drive (see text).

Speed problem

continued from page 57

- The unit must be economical.
- The unit must not damage the capstan motor (\$300+).
- The unit must not be damaged by no-load operation.
- The unit must vary speed in small increments.

The oscillator section of the project uses a 555 timer chip and RC components for frequency determination. This type of time base has all the needed stability for our use at WCCO. However, if turntables were to be driven, you may wish to use a capacitor with a low

temperature coefficient. And if you were going to drive a clock system, a quartz crystal time base would be essential.

All of the existing material I've seen on variable AC frequency systems use high power amplifiers driving transformers to match the load. There are two faults I can find with that sort of system. Transistor amplifiers driving a transformer must have the transformer properly loaded. Otherwise, in a high power system, the inductive load can ruin the amplifier in short order. And secondly, high power amplifiers and transformers are expensive.

I thought of using the transistors

in their linear region and have more of a sinusoidal output, why should we? The motors v quite well on a square wave, the transistors dissipate less l when going right from saturation cutoff (switching mode). And lin operation would require the usi biasing and temperature compi mating components.

This unit is not affected by no-load operation (as is the previously mentioned power amp-tr transformer combination). However a shorted output would raise ha with the output transistors (e true with the amp-transformer tem).

In case both of the output tr sistors short, the fuses will blow. Q1 shorts and Q2 opens, capac C5 will charge through the mo and, once charged, little curr will flow, saving the motor. If shorts and Q1 opens, any charge C5 will discharge through the mo and current flow will cease, ag preventing damage to motor.

Varying the speed in small inc ements was accomplished by using a 10-turn pot for R5. A vernier on ordinary pot would accomplish the same thing.

Since you're already aware of RCA quality, it makes sense to find out how to buy these famous microphones.

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In ribbon microphones, our polydirectional 77DX is virtually the symbol of broadcasting. From sub-to super-audibility, the 77DX delivers smooth response from 30 to 20,000 Hz. The cardioid ribbon BK-5 is the ideal directional subminiature offering excellent speech balance. The subminiature BK-12 dynamic microphone is ideal for tv talk shows. The slim BK-14 and BK-16 are omnidirectional types with 40 to 20,000 Hz response. BK-14 includes a wind screen and integral "pop" resistance.

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BROADCAST ENGINEER

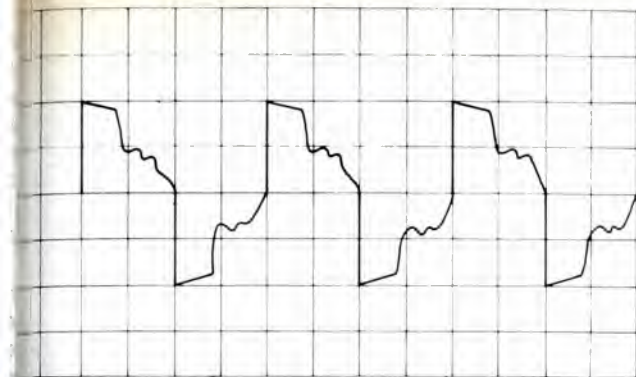


Figure 3. Shows transistors not turning on completely, due to insufficient drive. Note small amount of ringing.

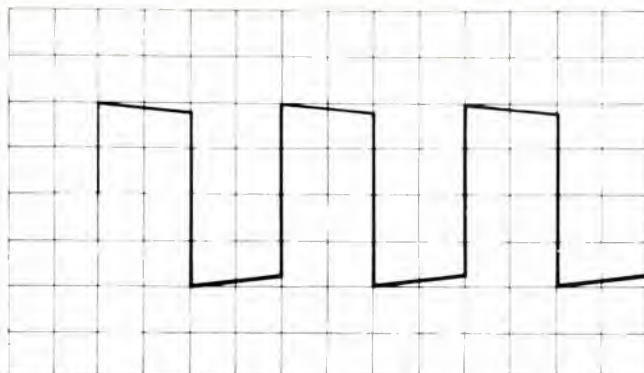


Figure 4. Shows proper drive on the transistors. Slight slope is due to capacitor C5 charging.

Circuit description

This circuit would best be described as a voltage doubler, and a series-shunt chopper. Q1 is the series element, Q2 the shunt element.

The AC line enters through two lines (one on each side of the line), goes through a switch, and a surge protection resistor to a voltage doubler. Here the 120 volts AC becomes about 300 volts DC. The 300 volts is applied across Q1 and Q2. When a square wave is put into Q1's primary, during half the cycle

Q1 conducts, and Q2 turns off. The junction of the emitter of Q1 and the collector of Q2 rises to the +300-volt level, with respect to the emitter of Q2. During the other half of the cycle of the square wave, Q1 turns off and Q2 turns on. The net result is a square wave at the junction of Q1's emitter and Q2's collector.

The only problem with this square wave is that it has a +150-volt DC component. To eliminate that, capacitor C5 is hooked in series with the load. The net result is a

square wave essentially AC in nature. Capacitor C5 also would protect the load if Q1 were to short and Q2 were to open. Capacitors C3 and C4 eliminate any oscillation problem in the chopper area as transistors Q1 and Q2 switch through their linear region.

You will notice two lamps in parallel with the output. These lamps do more than just indicate the unit is on. They tend to damp out any ringing in the motor (load), and they discharge C2 and C5 when the

continued on page 60

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RCA Broadcast Systems

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Speed problem

continued from page 59

unit is turned off. The original version utilized only one 7C7 120-volt 7-watt bulb. However, a couple of 10SC6 230-volt bulbs will last longer. You may wish to abandon the use of bulbs altogether and substitute a fixed power resistor of the proper value. Transformer T1 is driven by the oscillator section.

The oscillator section is comprised of a 555 timer chip hooked up as an astable multivibrator with a mostly square wave output. The timing element consists of the R4-R5 and C7 combination. R4 is a 25K trimmer. R5 is the front panel 10-turn 10K pot. C7 is a midget electrolytic.

The output of the timer chip goes through a 168-ohm resistor to drive the bases of Q3 and Q4. The value of 168 ohms was chosen only because I have a large quantity of this value. A normal value of 180 ohms should work quite well. Q3 and Q4 are small power transistors (TO-5 case). They are used to boost the current for driving T1's primary. Again, a capacitor (C6) is used to eliminate the DC component

of the square wave from the emitters of Q3 and Q4, as C5 did earlier.

No attempt was made to build the 12-15 volt supply for the oscillator section as I had a variable supply which I picked up on the surplus market for next to nothing. I'm sure you have some pet circuit which will provide less than one amp with a

The author adjusts tape speed in WCCO, while CE Chuck Kunze watches the operation. (Photo by Der Long, WCCO)

12-15 volt range. If not, you may wish to check the various transistor manuals, or hobby books. The untested possibility of a circuit is shown in Figure 2.

Upon completion of the project hook the load onto the output, and

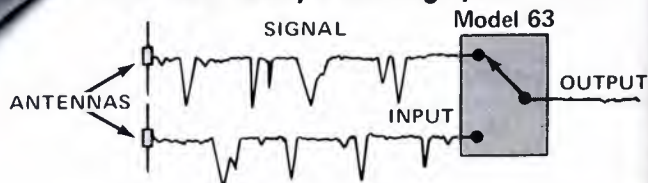


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BROADCAST ENGINEERING

PARTS LIST

C1,C2 200 uf / 300 volt electrolytic	Q1,Q2 DTS-402 NPN silicon transistors (Sylvania ECG 163, or eq.)	R4 25K trimmer
C3,C4 .0047 uf / 600 volt ceramic disk	Q3 2N5681 NPN silicon transistors (Sylvania ECG 128, or eq.)	R5 10K ten turn pot (see text)
C5 60 uf / 450 volt electrolytic	Q4 2N3645 PNP silicon transistor (Sylvania ECG 129, or eq.)	R6 100K / 1/2 watt
C6 350 uf / 25 volt electrolytic	R1 10 ohm / 20 watts	S1 On / off switch
C7 .68 uf / 15 volt electrolytic	R2 168 ohm (180 ohm) / 1/4 watt	T1 Callectro D1-734 Transformer
D1,D2 2 1/2 amp / 1000 p.i.v. diodes (Sylvania ECG 125, or eq.)	R3 1000 ohm / 1/4 watt	Also—Heat Sinks for Q1 and Q2
F1,F2 2 amp slow blow fuses		

scope across the load, then apply 12 volts to the oscillator section.

NOTE: In the next step, the scope will be hot with respect to ground, so proceed cautiously. Apply AC power and observe the waveform. It will probably look like the waveform in Figure 3. Start increasing the voltage to the oscillator section and stop when the output looks like the wave in Figure 4. The transistors are being properly driven at this point.

In initial operation have R4 and

R5 at mid-rotation. Apply power and adjust R4 for normal speed. You now have the ability of varying the motor speed above and below normal. If you want more variation at one end than the other, adjust R4 accordingly.

Caution

This unit deals with raw 125-volt AC power and even doubles the voltage, creating a potentially lethal shock hazard. If you cannot adequately isolate this project from

fingers [both yours and the non-technical staff], use an isolation transformer at the AC input.

Also, I have no idea what kind of breakdown voltage transformer T1 is good for. In our construction, one side of the primary as well as the mounting strap is grounded. The AC plug has been reversed and no breakdown has occurred. Be sure not to eliminate the fuse on either side of the line. Once again, an isolation transformer might be a good investment. □

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people in the news

Jim Bennett, an acknowledged authority on television transmitter technology, has been promoted to the Board of Directors of Pye TVT Limited, a director of transmission engineering. Bennett formerly was chief engineer.

The Hughes Aircraft Company has appointed **Norman P. Weinhouse** as manager of satellite earth stations for their microwave communications products. ...**Frank D. Baker**, former manager of engineering services at Trans-American Video, has joined Vertile Video Inc., a teleproduction center located on the San Francisco peninsula, as chief engineer.

E. G. "Ted" Atlee has been named manager of market planning for National Semiconductor Corporation's Computer Products Group. ...**Allen Collier** has joined Automation Electronics, Inc. as sales manager.

Paul R. Beavin has joined Scientific-Atlanta as national sales manager of their Cable Communications Division. ...**John Dale**, manager of the Magnetic Tape Division of Fuji Photo Film USA, announced the addition of **Michael J. Carney** as broadcast video specialist. Prior to joining Fuji, Carney was with Memorex.

Jim Simna, former announcer/producer and public service director for WCLV, is the new music director. He succeeds **Albert Petrak** who resigned to become assistant general manager for WQED-FM. The Star Broadcasting Group, Inc. has announced the appointment of **Doyle Peterson** as director of marketing.

Wilson C. Wearn, president of Multimedia, Inc. and chairman of the Joint Board of Directors of the NAB, and NAB President **Vincent T. Wasilewski** have appointed two broadcast executives to the Association Engineering Advisory Committee. They are **William H. Hansher**, vice president for engineering, The Broadcasting Co., and **William E. Garrison**, vice president for engineering and government relations, Multimedia Broadcasting Co., Greenville, S.C.

Paul Kelley, general manager of WMEX Radio, announced that **Lloyd Raskop** has joined the sales department. Raskop was the general sales manager of WEEI-FM.

James A. Skwarcan has transferred from being local sales account executive of WSJV-TV to the news department as a reporter and photographer. ...and **Patricia A. Fogarty** has joined WSJV as a local sales account executive.

John L. Richer, former broadcaster and for several years president of the National Association of Broadcasters, has joined NRBA as executive vice president for administration. Richer will be responsible for all administrative activities and for implementing the plans and goals established by the Board of Directors.

Peter Burk has moved from WQUA Radio, Moline, Ill. to WKBW Radio, Buffalo, N.Y. as chief engineer. In addition to his job with the radio station, Burk

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.....

Broadcast Engineering's "Radio Workshop" editor.

The promotion of **Miles G. Moon** to manager of creative services for RCA's Commercial Communications Systems Division, Camden, N.J., was announced by **Neil R. Vander Dussen**, division vice president and general manager.

Moon, who previously was the manager of broadcast advertising and promotion, will now be responsible for the advertising and promotional activities of the division's three major businesses: radio and TV broadcast equipment, two-way radio communications systems and avionics systems.

In other news from RCA, **Julius Koppelman**, group vice president, has assumed full responsibility for the company's communications group, consisting of RCA Alaska Communications, Inc., RCA American Communications, Inc., and RCA Global Communications, Inc.

Gary C. Schmidt has been appointed sales representative for RCA Broadcast Systems...and **Jerry E. Smith** has moved from broadcast field sales representative to manager of southern broadcast sales for RCA.

Moving right along...**Edward M. Mullin**, former vice president of engineering of Ampro Broadcasting Co., Inc., has been appointed president...and **Joseph Novik** has joined Ampro as sales manager.

Datatron, Inc. has elected **Herbert M. Perkins** as president. Perkins served as general manager of the marketing division prior to his advancement...**Linda K. Webb** has been appointed vice president of Imero Brentino Associates, Inc.

Ken McKenzie has been named national sales manager for Gauss loudspeakers at Cetec Audio, according to **Mort Fujii**, president. McKenzie is replacing **Tom Carlisle** who resigned to form his own company, Tom Carlisle Sales Co.

Harry Lefkowitz, chairman of the board of GBC Closed Circuit TV Corp., has announced the election of **Dar Hyatt** as executive vice president...**Lynd J. Carter**, formerly of Tektronix, has been appointed sales manager for TV products for CCA Electronics Corporation.

James F. Lucy has joined the Broadcast Transmitter Division of American Electronic Laboratories as national sales manager...IGM, a division of North American Technology, Inc., has appointed **Carl Peterson** as west coast regional sales coordinator.

Robert J. F. Whistler, a founding member of Ganger Associates Limited, has been elected vice president of that organization...North American Philips Corporation announced the appointment of **Raymond E. Johnson** as acting general manager of the EIA Board of Governors.

Philip Schneider, former president of RCA American Communications, Inc., has been named vice president-Advanced Westar of the Western Union Telegraph Company.

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industry news

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FCC begins inquiry on FM quad standards

The Federal Communications Commission (FCC) has begun an inquiry on whether to adopt standards for FM quadrasonic radio broadcasting. The action is a response to petitions by Pacific FM, Inc., the General Electric Company and CBS Inc.

There are three basic quadrasonic transmission systems: discrete four channels—4-4-4; four channels by combining the audio channel into three signals to be decoded later in the receiver back into four channels—4-3-4; and four channels by an encoding process into two signals transmitted as left and right stereophonic signals, which then are decoded in the receiver back into four channels—4-2-4.

The Commission said the purpose of its inquiry is to determine whether there is sufficient public and industry interest to warrant adoption of standards for quadrasonic broadcasting, and, if so, to develop a record that would assist the FCC in formulating standards.

Issues to be resolved

Some of the issues to be resolved before the FCC can propose to adopt specific standards, if any, for quadrasonic broadcasting, and on which it asked for comment, include:

1. The merits of the 4-4-4, 4-3-4 and 4-2-4 system as compared to each other, and the evaluation of several system designs proposed by various manufacturers.

2. The compatibility of proposed quadrasonic systems with current monophonic and stereophonic receivers; the impact on subsidiary communication authorizations (SCAs); changes in station coverage; studio transmitter interconnections and transmission equipment.

3. Whether the broadcast industry is interested and willing to spend the money necessary to transmit quadrasonic sound; whether there are sufficient listeners interested in quadrasonic sound willing to spend funds to purchase new equipment or adapt existing equipment; and whether sufficient software (program material) would be available for discrete quadrasonic broadcasting.

In addition to determining the ability of monophonic and stereophonic receivers to function normally in the presence of quadrasonic broadcasting, the FCC also said it was interested in determining whether these receivers could be modified or adopted, through practical means, for quadrasonic and, compared with current stereophonic receivers, how much more quadrasonic receivers for 4-4-4, 4-3-4 or 4-2-4 systems would cost.

More problems?

The FCC said the adoption of standards for each of the quadrasonic systems might create problems of produce less than optimum sound reproduction or station coverage. Therefore, it said it was important that broadcasters consider the effects on station

coverage, protection ratios, increased occupied bandwidth and multipath that are characteristics of 4-4-4, 3-3-3 and 4-2-4 systems.

The FCC urged radio equipment manufacturers, broadcasters and the listening public to make known their interests and to contribute relevant information to assist it in this proceeding.

Comments are due by September 15, replies by September 17.

WSFA tall tower going up

Construction has started on Alabama's tallest man-made structure: a 1935-foot "Tall Tower" to transmit television programs of WSFA-TV, Channel 12, Montgomery. The structure is being built on a 10-acre site about 25 miles south of Montgomery near Wetumpka, Alabama. When completed, the tower will be 10 feet taller than Chicago's Sears Tower (the tallest building in the world).

Thomas J. Josephson, vice president and general manager of WSFA-TV, said, "This tower will expand WSFA-TV's service area 58%, from 12,700 square miles to over 20,050 square miles. In addition, we are installing a new transmitter and antenna system which will improve picture and sound quality.

Coordination of the entire construction project is being handled by Richard C. Payne, WSFA-TV chief engineer. Payne also supervised the construction of the station's current tower when Channel 12 went on the air on December 25, 1954.

Service from the WSFA-TV Tall Tower is scheduled to begin in September.

Radio code board asked to review time standards

The radio board of directors of the National Association of Broadcasters (NAB) has directed the Radio Code Board (RCB) to review its time standards and specify four areas for consideration.

The board said RCB should consider (a) total coordination of time standards, (b) bringing time standards in line with current FCC policies, (c) work stations carrying uncompensated commercials, newscasts, and (d) any other action the Board may consider feasible.

Also approved by the board was the establishment of a new NAB radio committee to represent small, medium and large markets. The small market radio committee and radio information office committee will be abolished.

In addition, the board of directors endorsed the formation of a committee to assist NAB's public affairs department in its relationship with the broadcast industry and general public.

continued on page 66

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**industry
news**

continued from page 65

FCC opens AM stereo broadcasting inquiry

The Commission has opened an inquiry to determine whether there is an interest and need for AM stereophonic broadcasting and, if so, to develop a record to assist the FCC in proposing standards for such a service.

[AM stereophonic broadcasting is defined as the transmission of a stereophonic program by a single AM broadcast station utilizing complex modulation of the carrier wave within the authorized bandwidth.]

The inquiry was begun in response to rulemaking petitions by Kahn Communications, Inc., and the Association for AM Stereo, Inc. (AAMSI).

Kahn is a New York corporation engaged in research and manufacturing of electronic communications, telephone and broadcasting equipment and has developed a system for transmitting stereophonic signals for the AM broadcast service. AAMSI is a nonprofit corporation of 26 broadcast station licensees and one equipment manufacturer, was founded for the purpose of encouraging the adoption of AM stereo standards.

Kahn contended that use of its technology for compatible stereophonic transmission by AM stations would allow listeners to enjoy stereophonic reception with little or no additional investment in receiving equipment. It asserted that its system is completely compatible with existing transmitting equipment and with monophonic receivers, would cause no additional interference to other stations, would provide stereo reception using two conventional receivers and could provide high-quality stereo with receivers designed for AM stereo reception.

AAMSI, without endorsing any specific system, said AM stations were at a competitive disadvantage as compared with FM stations now transmitting stereo. It also believed the public interest would be served by AM stereo even though that service might not have the full fidelity of FM.

The FCC said it had little technical data on standards for AM stereo or the performance attainable by the available modulation techniques. It noted that the National AM Stereophonic Radio Committee (NAMSRC) was in the process of planning and conducting a series of extensive tests on several systems that have been submitted to it. The Commission said it believed that the test data NAMSRC proposed to develop would be of great assistance in the preparation of technical rules for an AM stereo service.

The Commission said its first concern was whether there was a public interest or need for AM stereo that was not or could not be met by FM. It also said it was concerned whether the AM service, with its technical limitations, susceptibility to interference and other factors that would limit its stereo quality, would make the differences the listener might experience between AM and FM stereo.

Before proceeding with a rulemaking to establish technical standards for AM stereo, the Commission



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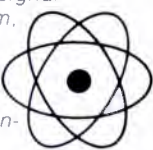
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BROADCAST ENGINEER

the following basic public interest issues must be considered:

the actual public interest and need for an AM stereophonic broadcast service;
the extent the broadcasting industry and the manufacturers of home and automobile receivers are interested in meeting the public's interest;
the impact AM stereo would have on the continued development of FM;
the cost impact on broadcasters for equipment programming and on the public for receivers;
the compatibility of AM stereo with all existing international radio regulations, terms of the North American Radio Broadcast Agreement and any other international agreements to which the United States is party;

the extent to which the FCC should regulate stereo performance from studio through radiated signal to ensure that the public is provided with a quality program service;

the possibility of a "standard" response characteristic for AM stereo receivers to avoid the current problem in AM broadcasting where stations use special processing of their audio signals to overcome limitations in many receivers.

The Commission requested the public, broadcasters and manufacturers of both broadcasting and receiving equipment to comment on Kahn's recommendations, to respond to specific questions concerning the economic, operational and technical aspects of establishing AM stereo and to submit any additional information they believe should be considered.

The FCC said it must be recognized that AM stereo must have both an operational and technical impact on existing AM in such areas as signal coverage and stereophonic signal quality. Therefore, it stressed that the information requested would be needed in attempting to balance this potential impact on AM radio and the public interest and need for AM stereo.

Comments may be filed by October 15, and replies by November 15.

Free photo tip radio program available from Kodak

A new radio program service on picture-taking, "Photo Tip of the Week," now is available without charge from Eastman Kodak Company.

Available for a variety of programming uses, the service will be distributed in 13-week packages. The package scripts can be scheduled regularly, used as insert material on music and talk shows, or used in connection with commercials for photographic equipment, supplies and services.

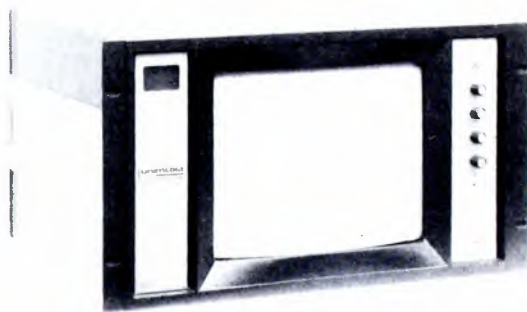
An introductory-offer package covering August and September is being mailed to program directors this month. Stations interested in this service also can join the introductory package by writing "Photo Tip of the Week," Corporate Information Department, Eastman Kodak Company, Rochester, NY 14650. ☐

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MINNEAPOLIS, MINN. 55420 U.S.A.

Europe: 22, rue de la Legion—d'Honneur,
93200 St. Denis, France

Canada: Telak Electronics, Ltd., Scarborough, Ontario

For More Details Circle (54) on Reply Card

new products

Microwave radio products booklet

GTE Lenkurt Incorporated has issued a new Microwave Radio Products booklet, which describes the company's line of microwave radio systems for the transmission of video, voice and data.

The illustrated booklet provides a description of the type 70F1 775 and 778 transmitter-receivers and the 700F1 RF Repeater System. It also provides basic information on FCC and CCIR frequency bands, as well as fundamentals of heterodyne, baseband and RF repeater operation.

The 20-page document is divided into sections covering each radio product, including FCC data and complete technical summaries. Descriptions of such auxiliary microwave radio subsystems as alarm, order wire and multiline switching assemblies are also included.

For More Details Circle (76) on Reply Card

Modular broadcast consoles

A new series of high quality Integrated Modular Professional Audio Consoles, marketed under the tradename MAP "IMPAC" Series, are designed and engineered for versatile applications in AM/FM radio or television broadcast/production, and are available from Modular Audio Products, a unit of Modular Devices, Inc.

Three standard mainframes, with shielded metal cabinet construction, accept the desired complement of associated plug-in mic and line input modules, featuring full-size controls and the most-wanted broadcast switching/control capabilities. Performance specifications exceed typical broadcast/FCC requirements. The consoles feature 15-watt monitor amplifiers, cue, talkback, muting/on-the-air light control relays, and machine remote control.

The "Dayton"—model 6012, 12 channel AM/FM stereo/mono control center features dual stereo, plus monaural mix outputs.

The "Springfield"—model 6022, and the "Burbank"—model 6032 are 16 channel monaural TV audio control centers, featuring illuminated push-button switching throughout. Model 6022 offers two program outputs, plus foldback. The more elaborate model 6032, has four

outputs, including two assignable submasters and two program outputs, plus foldback & echo send with equalizers available on every channel.

MAP "IMPAC" Series consoles come made to order, either wired in "kit" form. Modules are available separately for custom application and expansion purposes. Delivery from 90 to 120 days ARO for complete package.

For More Details Circle (77) on Reply Card

Audio-video tape synchronizer

EECO's new microprocessor-based MQS-100 series synchronizing system can cue and synchronize a three mag tape transports including video, audio and mag film simultaneously. The SMPTE/EBU Ecode, used for indexing of the tapes, need not be identical as tapes with drop-frame and no drop-frame formats can be intermixed.

System modes include high-speed search and cue, follow the leader "Chase Mode," synchronized playback, fast and slow re-synchronization and roll-back with automatic re-synchronization. Operational efficiency is demonstrated by controlling simplicity. One button actuates transports to roll back, start forward and synchronize automatically.

Time code readings for all tapes can be "captured on the fly" individually or simultaneously, plus or minus offset of any selected time increment can be preset for each slave transport.

For More Details Circle (78) on Reply Card

Digital control system

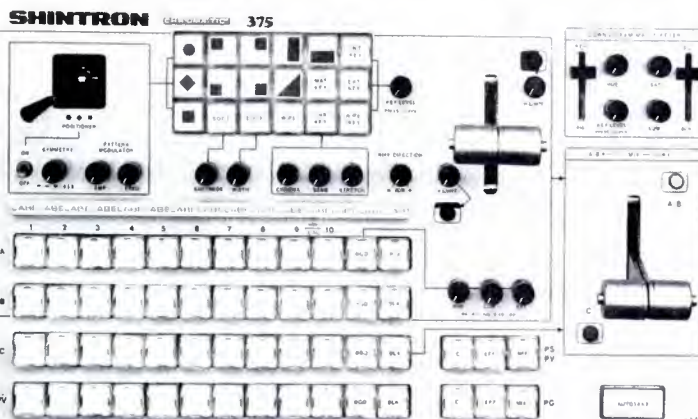
Totally automatic operation of remotely-located broadcast transmitter is possible with the modular DCS-2A digital control system offered by Moseley Associates, Inc. The system employs fully digital techniques and provides command telemetry, status and automatic logging functions. Two basic segments constitute the DCS-2A and a companion computer option.

All basic functions desired for command and observation of a remotely-located transmitter plant are provided by the DCS-2A. They include direct commands and

A Classic is Born

12 Input, A, B, C, Independent Preview and Program Bus
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For More Details Circle (55) on Reply Card

Digital noise reducer

Richmond-Hill Laboratories has introduced a digital noise reducer making it possible to process incoming TV signals with mathematical precision. Incoming video is seized in a picture element by picture element basis, in real time, not as a function of the overall picture.

Picture improvement is dramatic as the noise reducer achieves a 12 dB signal-to-noise ratio improvement. Thus a marginal 40 dB input TV signal becomes a high quality 52 dB output signal. Achieving improvement with the new digital noise reducer may even be as high as 15 dB. The noise reducer is effective at low frequencies so that streaky chroma noise often present in 1/4-inch tape recorders is removed.

For More Details Circle (80) on Reply Card

Auxiliary Transition Unit

Richmond Hill Laboratories has introduced their Auxiliary Transition Unit (ATU), designed to expand the capability of any existing production switcher. It can be incorporated as an option in the RGL 3000 series of switchers. The ATU is a complete mix-key system with sync-non-sync fade and black capability. When used on

continued on page 70

FIDELIPAC® Accessories and Cartridges

CART-A-ROUND CARTRIDGE STORAGE RACKS

Each WR-25 Modular Rack holds 25 Type A cartridges...eight can be mounted on our Mobile Carousel Base to make up the MR-200



WR-25 \$ 15.10
MR-200 \$156.55

TABLE TOP CARTRIDGE RACK (not shown) Model

TR-96 holds 96
Type A
cartridges.
Model TR-48
holds 48.
TR-96 \$73.85
TR-48 \$42.55



ALIGNMENT PROBLEM?

Keep your cart equipment in perfect working order with:

- 350STA Alignment Cartridge \$38.50 • 350STF Wow and Flutter Cartridge \$23.40
- 350STQ Cue Test Cartridge \$35.00 • Head Insertion Gage \$3.35
- Height Gage \$17.85
- Right Angle Zenith Gage \$21.75



CART-E-RASE DEMAGNETIZER

Can be used for erasing cartridges, reel-to-reel tape, film sound striping, etc. \$39.95



STUDIO ON AIR LIGHT

Brilliant red lettering on jet black background can be seen in the brightest ambient light conditions. \$29.95



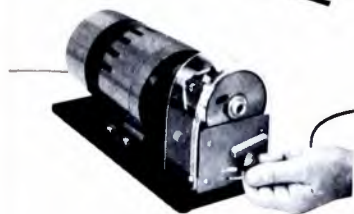
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For More Details Circle (58) on Reply Card

new products

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the output of a mixer, the program bus feeds input "A." Input "B" could be the preview output or any other timed source. Three external key inputs are provided.

Transitions are split key, mix key, key, mix split. Linear keying circuitry is employed.

For More Details Circle (81) on Reply Card

Audio Limiter

The Moseley Associates, Inc., new model TFL-280 Audio Limiter affords precise modulation level control of FM type transmission systems. Optimum modulation with clarity allows FM monaural, stereo and quadraphonic as well as FM SCA or TV audio to be expertly processed.

As an agile frequency conscious limiter, the model TFL-280 solves the problems associated with the transmission of pre-emphasized audio. Existing stereo generating equipment can be retained and operated with optimum modulation. A field removable audio low-pass filter located prior to pre-emphasis and high frequency limiting provides complete protection to the stereo and SCA spectrum. The precise audio limiting capability of the model TFL-280 enables the unit to remain in the audio chain for EBS two-tone transmission and proof of performance measurements. Multi-channel AGC interconnection terminals are provided for two or more channel operation.

For More Details Circle (82) on Reply Card

RF amplifier

QEI Corporation announced the in-stock availability of its newest broadcast station component, the model 572 RF amplifier. An all solid-state unit, the model 572 is designed to be used exclusively with QEI model 571 AM modulation monitor, and can be mounted either directly above or below it. Operator controls on the model 572 include an AGC switch which can be used to disable the AGC circuit if desired. A level control is used to set the output level to 100 percent on the AM modulation monitor carrier level meter. The 572 can be operated with the AGC switch in either its on or off position.

The QEI 572 is a crystal-con-

trolled double conversion amplifier with an intermediate frequency of 10.7 MHz. With the AGC switch turned off the amplifier has a gain of approximately 76 dB, with the level potentiometer set at minimum. The linear signal to the modulation monitor is taken of the center tap of bifilar transformer. Power supply voltage and signal level information are obtained from the 571 AM modulation monitor.

The model 572 is supplied with a shielded resonant loop antenna together with 50 feet of RF-58 coaxial cable. Sensitivity is 500 microvolts for 45 dB S/N at 100 percent modulation. Residual hum and noise are greater than 50 dB below 100 percent. Distortion is less than 1 percent. Bandwidth is -6 dB plus-minus 16 kHz; -60 dB plus-minus 16 kHz.

Dimensions are 3 1/2 inches high x 19 inches wide x 9 1/4 inches deep. The maximum operating temperature is 131°F (55°C) ambient.

For More Details Circle (83) on Reply Card

Recording console

Quantum Audio Labs, Inc. has introduced the QM-168 recording console, an eight-buss console with 16 inputs.

Each input module has solo, mute, two independent echo sends, two independent cue sends, six frequencies for EQ on three knobs, an equalizer in/out switch, include a mic/line switch with 15 dB padding on the mic. Also included are conductive plastic faders for panning to the eight busses.

The stereo monitor has push button selection of buss, line, and playback; separate control for additional cue masters and solo controls; and talkback slates to all eight busses, two cue busses and the studio monitor feed.

For More Details Circle (84) on Reply Card

Microphone

A new microphone, featuring a smooth, flat frequency response for speech, vocal and instrument pickup, has been announced by Shure Brothers, Inc.

The SM59 microphone is a dynamic type with a wide 50 to 15,000 Hz frequency response that provides clean reproduction without a presence peak in the high frequency range. This feature, coupled with its anti-feedback cardioid pickup pattern, makes the SM59 ideal for use in studios, performances, churches and meeting rooms.

Another feature of the SM59 is

tented mechanopneumatic shock hunt system which reduces mechanical noise and pickup of floor and desk-stand vibrations. A special "pop" filter protects against excessive breath sounds.

For More Details Circle (85) on Reply Card

3/4-inch videocassette cleaner/evaluator

Television Equipment Associates' Get, model U 1, is a table- or rack-mounted machine for automatic cleaning and evaluation of automatic 3/4-inch videotape cassettes at high speeds. Cassettes are positioned in the transport and operating controls are initiated which cause the machine to draw a tape which is presented to cleaning evaluation stations. The machine transport shuttles the tape to its end, automatically reverses, re-erases tape to the front end, and retracts the tape loop. Tape cleaning is accomplished on both the forward and reverse pass and evaluation of physical damage on reverse pass only. An erase head in the tape path—when actuated—will function on both forward and reverse cycles to erase tape to approximately 50 dB.

An opto-electronic evaluation designed to identify tape edge damage, folded or wrinkled tape (within pre-determined limits) will, on recognizing such damage, stop the transport and a front panel indicator will light. The operator—having observed the indicator light—would raise the machine lid to visibly inspect the tape loop and take corrective action; i.e. repair the tape in the transport, over-ride the evaluator to complete the cycle, or retract the tape loop at the damage point to remove the cassette from cleaner.

For More Details Circle (86) on Reply Card

Solid-state mixer

Spectra Sonics has introduced a new, solid-state audio mixer which may be installed in a standard electronic equipment rack.

The model 1100 line/microphone audio mixer will accept six line or six microphone inputs and has a monaural output. It also features a monitor capability, high and low frequency equalization and a Vu meter. The inputs and the program output are transformer isolated.

Some performance specifications are: signal-to-noise ratio—micro-

phone input 78 dB $\pm$ 1 dB, line input 80 dB minimum; maximum continuous sine wave power, +24 dBm $\pm$ 5 dB; total harmonic distortion and noise, .02% maximum, .01% typical.

For More Details Circle (87) on Reply Card

Zoom lens for RCA TK76

Angenieux Corporation of America has announced the immediate availability of the new 15x9.5 Total Zoom Lens System for the RCA TK76 camera. The production of this lens is now such that deliveries are being made throughout the U.S.

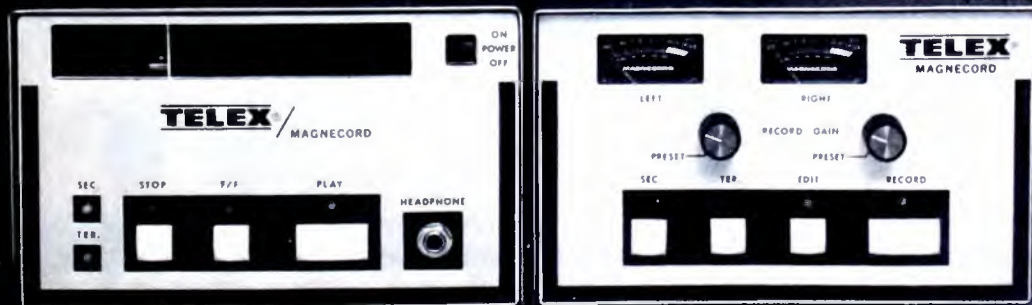
The 15x9.5 Total Zoom Lens System consists of the basic 9.5-142mm, f/1.8 zoom lens with a series of both front and rear mounted accessories. All angles can be obtained from 1° to 70° without removing the lens mount from the camera.

This capability is enhanced by the fact that the basic lens is packaged very compactly (approximately 7 inches long and only two pounds).

For More Details Circle (88) on Reply Card

continued on page 72

At Last, a Cart Machine that Keeps its Cool



Telex/Magnecord broadcast cart machines run cool and steady. So cool no ventilation is required, so steady not even voltage or frequency fluctuations will alter their speed. Thanks to our dc servo flutter-filter drive.

The MC series offers broadcasters a host of options, including field convertability from mono to stereo or play to record and, of course, end of message, secondary/tertiary cue tones.

Designed for type A or B carts, the MC series meets all NAB specifications, offers full immunity to EMI and RFI, is remote controllable and automation compatible with CMOS digital logic. Audio muting, air damped low voltage

dc solenoid and fast forward are standard features on every MC unit.

Four broadcast cart machines to choose from in the Telex/Magnecord MC series. Running cool and steady. With a pleasant surprise—they're affordable.

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For More Details Circle (61) on Reply Card

new products

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Multi-deck cart system

Broadcast Electronics has announced the availability of a new plug-in multi-deck record/playback tape cartridge system. The system consists of the updated Spotmaster model 5300A three deck playback unit and the companion model 5309 Record Amplifier.

The new 5300A has plug-in removable decks and an improved internal mechanical design which insures extremely stable deck and capstan positioning independent of front panel reference.

The system features low voltage, solid-state solenoid switching, the Phase Lok III head bracket, and wide dynamic operating ranges. Systems are available for both mono and stereo application.

For More Details Circle (89) on Reply Card

Freeze picture system

NEC America Inc., Broadcast

Equipment Division, has announced the new monochrome DFP-754 Freeze Picture System.

The DFP-754 Series of freeze picture transmission systems are designed for use with black and white (monochrome) television systems. The monochrome signal is considerably less complicated than the color television signal and therefore requires less transmission time to convey the same visual information. A complete frame of television information may be transmitted via telephone in just under 30 seconds.

The use of a digital frame memory at both ends of the system allows for the picture to be captioned in 1/30th of a second at which time the operator may reposition the camera on other material rather than hold the "shot" while the transmission occurs.

The NEC DFP-Series of freeze picture transmission systems have been developed for the purpose of allowing television communications via conventional telephone circuits. Television signals contain vast amounts of information which must somehow be reduced to logical, high-speed signals for transmission over narrow telephone channels

designed only for voice communication.

For More Details Circle (90) on Reply Card

Remote junction module

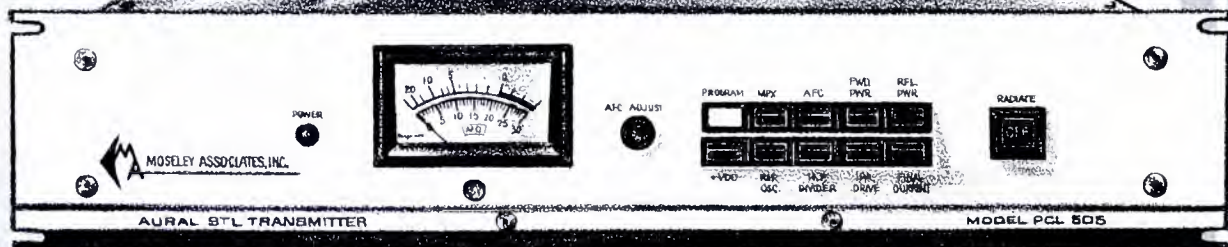
A new remote junction module (model U3204) with both a visual and audible signaling capability has been introduced by David Clark Company.

Usually used as part of a system in conjunction with main station (main power supply/amplifier, noise attenuating headsets and base stations), the U3204 also features three additional outputs for system expansion.

The Clark series 3200 communication system, (of which the U3204 remote junction module is an optional component), was designed for theatrical and sporting events, radio concerts and traveling shows, movie and television productions.

The entire system can be used in a portable, fixed and semi-fixed configuration, and is ideal for coordinating sound, lighting and camera crews in noisy environments. Depending upon particular communications requirements, users can match and interface standard

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omponents to build their own custom-tailored system.

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Satellite earth station receiving system

Farinon's new FV4ESR Earth Station Receiver System for 3.7-4.2 GHz video satellite reception features a dual-conversion IF heterodyne receiver and a transmission self providing a variety of baseband treatment options.

Output options include combined video and aural subcarrier for RF channel modulation or baseband microwave, 70-MHz output for IF heterodyne microwave, or video and audio outputs for baseband microwave and cable distribution systems.

Optional plug-in equipment includes: AM and FM program transmission channels; orderwire channels; clammers; remote control and monitoring equipment; FM cueing; and 4.5/5.5-MHz aural carrier generators. The system is fully compatible with 525/625-line NTSC, PAL, PAL-M and SECAM system requirements.

Also available from Farinon are

4-GHz low-noise amplifiers for a complete earth station package.

For More Details Circle (92) on Reply Card

ENG color TV camera

A new three-tube color TV camera weighing only 17.4 pounds, including built-in camera control unit, has been introduced by JVC Industries, Inc.

Designated the CY-8800U, the professional-quality portable camera serves as a highly mobile companion unit to JVC's CR-4400LU portable 3/4-inch cassette recorder-player.

The new camera is equipped with three 2/3-inch magnetic-focus, magnetic-deflection Plumbicon® tubes. Saticon tubes will also be available.

The CY-8800U is a highly self-contained unit which can be activated by 12-volt DC power.

The camera is priced under \$20,000 and features an easy-to-use 1.5-inch CRT viewfinder that can be moved forward and back, up and down and laterally.

The new camera has external synchronization capability (SC plus SYNC or composite video) and can be operated remote through an optional unit. It also features a built-in color bar generator and can

be used as an encoder or color monitor for line checking.

For More Details Circle (93) on Reply Card

Video source identifier

QSI SYSTEM'S video source identifier (VSID) is a type of electronic tagger, designed to provide electronic identification to video sources all within a small p.c. card. The VSID is used to tag electronic video signals in the same technique that electronic cabling and equipment are tagged and identified with reference designations. Within all video systems, patch panels, switchers, monitors, VTRs, etc., are physically labeled for signal source identification. These identification tags seldom change, but the signals are often routed through these video devices change. To be absolutely accurate as to video signal routing, recording and airing during fast reacting and emergency operating situations, VSIDs are used to eliminate most technical operating errors.

Page of frame identification of information storage in video format is necessary application for VSID.

For More Details Circle (94) on Reply Card

continued on page 74

Meet the MILLION DOLLAR Success Story: the SMC DP-2 Digital Programmer



We've sold over one million dollars of DP-2 automation so far in 1977. And that's a success story we want you to investigate. Because the DP-2 is the finest microprocessor automation system available today — out-performing the human functions of action and decision-making. To discover how the DP-2 can work for your station, call:

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The Tentel tape tension gage is designed to diagnose problems in your magnetic tape equipment. Throw away your fish scales (or put them in your tackle box where they belong). The TENTELOMETER will measure tape tension while your transport is in operation, so you can "see" how your transport is handling your tape...smooth, proper tension for quality recording? or oscillating high or low tensions causing pitch problems, wow and flutter? "See" what your heads "See" and HEAR the difference.

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Continental Electronics

For More Details Circle (65) on Reply Card

new products

continued from page 73

Videocassette eraser

Garner Industries' expanding line of audio and video production equipment now includes the new Video'Raser, designed exclusively for providing professional videotape cassette erasures in less than five seconds.

The compact Video'Raser unit completely automates studio or station videocassette erasing jobs by eliminating the multiple pass operation found in many video erasing units. According to Garner Industries, tapes are erased fast and clean in one pass on a continuous belt over four high flux coils.

The operator inserts the videocassette into the Video'Raser opening and a cleanly erased tape is automatically ejected at the end of the machine. The Video'Raser unit will handle up to 7-inch video reels, cassettes and cartridges.

For added safety and reliability, the Video'Raser unit features an automatic cutoff switch to prevent overheating.

For More Details Circle (95) on Reply Card

Color TV monitor

A 19-volt broadcast and teleproduction monitor which provides preset controls for contrast, brightness, chroma, phase and aperture has been developed by Conrac.

The 5300 Series has been specially designed for operator convenience in budget-limited broadcast, industrial and educational applications. The unit features a Color-match 19-volt shadow mask black matrix CRT, horizontal and vertical delay switches, a horizontal AFC time-constant switch, phase linear aperture correction, and a switchable NTSC corrective matrix.

Brightness and resolution consists of: minimum 450 TV lines center, 360 corners, at 20fL. No point in the raster deviates from its proper position by more than 2% of raster height. Convergence does not deviate more than 0.030 inches (0.75mm) in a centrally located area bounded by a circle, the diameter of which is equal to picture height.

The 5300 Series incorporates a rigid extruded aluminum frame with all set-up and convergence controls accessible in a lockable pull-out

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A keyed back-porch clamp
contains true black level when
operating with either composite or
composite video.

For More Details Circle (96) on Reply Card

Wow and flutter meter

A new wow and flutter meter for
checking and alignment of audio-
videocassette recorders and
turntables has been introduced by
Chips Test and Measuring Instru-
ments, Inc.

The meter, PM6307, consists of a
crystal-controlled oscillator at 3 kHz
or 15 kHz, a measurement section
with two analog meters indicating
wow and flutter to 3%, each in
the ranges. Measurements can be
made using a weighted frequency
response, a linear frequency re-
sponse and via an external filter for
lab work in the laboratory.

The PM6307 can differentiate
between electrical and mechanical
problems. Generally excessive wow
and flutter readings are indicative of
mechanical wear or failure and
wow is often associated with faulty
electronic circuitry. A standard DIN
input/output socket located on the
front panel of the meter easily
connects the instrument to be

tested. There are also BNC connec-
tions on the rear of the instrument
for input and output signals.

The 3.3-pound unit will measure
input signals from 2 mV to 10 V,
indicating use with turntables using
electromagnetic cartridges directly.

For More Details Circle (97) on Reply Card

Fluid head and tripod

Cinema Products Corporation has
announced the availability of the
new Universal 808 fluid head and
tripod.

The ultra-lightweight Universal
808 fluid head (2.8 pounds) is
designed for use with all Super-8
cameras, and lightweight 16mm and
video cameras (with low C.G.)
weighing up to 12 pounds.

Special features of the Universal
808 fluid head and tripod include a
quick-leveling claw-ball & cavity
system; AUTOSLIP self-adjusting
breakaway free pan; and HYDRA-
LOK—a lock/tension device which
assures safe locking in any tilt
position. The Universal 808 fluid
head and tripod permits smooth
pan-and-tilt movements, and is fully
operative in a temperature range
from -4°F to +167°F without
changing fluids.

The Universal 808 fluid head and
tripod is priced at \$300.00.

For More Details Circle (98) on Reply Card

Color camera with diagnostic interface

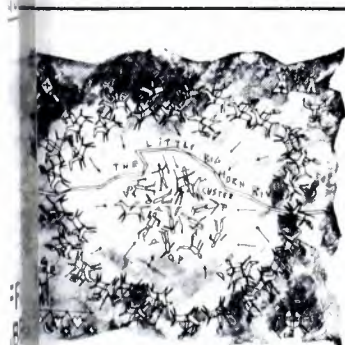
A new broadcast color camera
with state-of-the-art features that
raise camera technology to a new
level of sophistication has been
placed on the market by Ampex
Corporation.

The BBC-10 color camera was
shown for the first time at the 10th
International Television Symposium
and Technical Exhibition, June 3-10
at Montreux, Switzerland.

The new camera features auto-
matics with digital memory and
intelligent, digital controls that
streamline operations while mini-
mizing operator errors, according to
Donald V. Kleffman, Ampex vice
president—general manager of the
audio-video systems division.

This digital technology goes one
step further. Through a full diag-
nostic interface with the camera
automatics, the operator is informed
when a command cannot be com-
plete and why. The BBC-10's multi-

continued on page 76



On June 25, 1876,
George Armstrong
Custer ignored his
scouts' warnings
of many Indians
gathered at Little
Big Horn. So he rode
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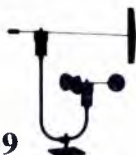


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new products

continued from page 75

plex system also permits the use of a 1/2-inch (12.7 mm) ultra-small cable.

BBC-10 offers "on demand" ACT for extended tube life. With the ACT system off, BBC-10 tubes perform like non-ACTs. With ACT on, special circuitry activates the ACT system only when excess scene highlights are present, thereby increasing the life of an ACT tube substantially under typical operating conditions.

If ACT tubes are not desired, the BBC-10 accepts standard tubes; no modifications are necessary. (The system also accepts over 25 different lenses from all manufacturers.)

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TBC and standards converter

Consolidated Video Systems has introduced a new PAL-M digital video signal processor that incorporates both time-base correction and standards conversion in a single, 3 1/2-inch (8.9 cm) high package. Called the CVS-515, the new TBC accepts monochrome or color NTSC or PAL-M signals from any heterodyne VTR, and produces a stable, time base corrected PAL-M signal. Since the CVS-515 also includes a standards converter, NTSC equipment can be used in PAL-M systems, and programs can be easily interchanged between NTSC and PAL-M countries.

The CVS-515 is a complete video signal processor and includes these built-in features: sync generator with gen lock, correct color drop out compensator, line-by-line velocity compensator and a processing amplifier. A two-line window of correction allows correction of tapes with large timing disturbances or unframed edits.

For More Details Circle (100) on Reply Card

ATS unit available

The automatic transmitter operator, introduced by Widget Works, Inc., is a complete ATS controller for the broadcaster. Guaranteed to meet FCC specifications for ATS control for one year from the date of delivery, the micro-processor-based unit monitors and controls power, modulation and hours of operation.

ATS operation eliminates the requirements for 3rd-class licensed operators and transmitter readings.

A single automatic transmitter operator handles up to four transmitters for an AM-FM combination with proper options. Remote control with wire line, STL, or subaudible links is a build-in option.

All hours of operation for entire year are programmed into unit at the time of manufacture, eliminating the necessity to reset timeclock on the last day of each month. Calibration is performed with a calculator keyboard, so that no manual adjustments need be made.

For More Details Circle (101) on Reply Card

Telecontrol system

Moseley Associates has introduced their TCS-1 Telecontrol system. The TCS-1 is designed to operate over a two-wire 3 voice-grade-type data circuit, equivalent radio circuit.

Applications for the TCS-1 include command and status (tally-back) from broadcast transmitters, electronic news gathering or similar antenna systems, microwave transmitters and receivers, remote located TV cameras, or industrial applications.

Consisting of a command terminal and remote terminal, the TCS-1 provides eight command and eight status functions. It is designed so that two systems may be combined on a single interconnecting path to provide a total of 16 command and 16 status functions.

For More Details Circle (102) on Reply Card

Image repositioner

A new digital TV compressor for use in TV special effects has been introduced by the Professional Video Group.

The model 1080 Video Image Repositioner can be used to move a window insert of the most important element of a TV scene to the desired location on the screen.

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tion of the cost of the more complex equipment. Prerecorded tape, film and slides as well as video images can be repositioned anywhere on the TV screen. James B. Tharpe, manager of the Video Group, indicated that in instances the selection and location of the key element of interest in a scene for repositioning has proven more effective than the insertion of a compressed full frame picture.

For More Details Circle (103) on Reply Card

Darlington transistor series
A series of monolithic Darlington resistors that switch up to 500 amps in 400 nsec is available from TV Power Semiconductors. The NPN devices, suitable for use in high speed power circuits, have a collector-emitter voltage range of 0 to 500 VDC. The series, designated SVT6000, can withstand a continuous collector current of 15 amps and peak currents of 20 amps. Power dissipation for the devices is 50 watts while the junction temperature range is -50°C to +150°C. The sustaining voltage rating for SVT6000, 6001 and 6002 are 350 and 400 volts, respectively.

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SALESMAN with ability to do production. Requires serving out of town accounts. Send resume to P.O. Box 432, Kemmerer, Wyoming 83101. 7-77-21

THE REX HUMBARD MINISTRY has immediate openings for experienced video operator/engineer, technical supervisor, unit manager, and maintenance engineer. Some national and international travel required. Send resume to D. Ginaven, 2690 State Road, Cuyahoga Falls, Ohio 44223. 8-77-11

HELP WANTED (Cont.)

NETWORK-AFFILIATED TV STATION in beautiful East Tennessee seeks experienced studio engineer. Must be well-qualified in maintenance and repair of quad and helical videotape, studio cameras, and microwave. Good pay for the right person to move to this scenic area of lakes and mountains. Company paid medical insurance and retirement. Contact BROADCAST ENGINEERING, Dept. 387, Box 12901, Overland Park, KS 66212. 8-77-11

CHIEF ENGINEER—TELEVISION SERVICES: DUTIES: Responsible for the technical operation and maintenance of all the equipment contained in the television facility. Assists other Library Communications Center departments with equipment operation and maintenance. QUALIFICATIONS: A thorough knowledge of TV receiving/transmitting, circuitry, solid-state electronics, and videotape servo systems is required. Must hold a minimum of a current first class FCC license. STARTING DATE: September 1, 1977, or as soon as possible thereafter. SALARY: Negotiable based upon experience and qualifications. APPLICATION DEADLINE: August 31, 1977. SEND RESUME TO: Mr. Robert C. Archer, Director of Television Services, Southeastern Massachusetts University, No. Dartmouth, Mass. 02747. SMU is an Affirmative Action/Equal Opportunity Employer. Applications from women and members of minority groups are particularly encouraged. 8-77-11

EXPERIENCED ENGINEERS. Technical schooling and first phone license required. EOE. Send resume and salary requirement to KBMA-TV, 3017 Bellevue, Kansas City, MO 64108. 8-77-21

CCA FM10DS EXCITER tuned to 98.7 MHz and associated SG-1D stereo generator, used manuals both for \$2,000. Moseley SGC-4T subcarrier generator at 67 KHz. used manual, \$300. McMartin TBM-3000 Freq. Monitor, used, 98.7 MHz, \$40. Gates GTA-88F Freq. Comparator, used, \$50. Miratel AA-1 EBS Rev. \$25 or best offer. Contact C E or G M, 218-236-7900. 7-77-41

MAINTENANCE ENGINEERS—KCRG TV is in process of expanding its maintenance staff and is seeking strong candidates with 1st license, solid backgrounds in general TV broadcast electronics and minimum experience of three years involving the following: Cameras, Character Generators, Design and Fabrication, High Powered C Band Radar, Microwave, Quad and Helical VTRs, RF Remote Control Switchers, Video For information, write: Chief Engineer, KCRG STATIONS, 2nd Avenue at 5th Street, SE, Cedar Rapids, Iowa 52401, 319-398-8407. EQUAL OPPORTUNITY EMPLOYER. 7-77-21

EXPERIENCED TELEVISION OPERATORS are needed at an all new 3 Studio Teleproduction facility in Columbus, Ohio. All phases of television, including live production, remotes and ENG. All New Equipment, corporate benefits and all new program ideas. If you qualify, write: Warner Communications, 1201 Olentangy River Road, Columbus, Ohio, or call (614) 299-1128. Previous Technical or computer background helpful. We are an Equal Opportunity Employer. 8-77-11

TELEVISION TEST EQUIPMENT PRODUCT MANAGER: Large international manufacturer of TV test equipment seeking Product Manager with technical sales background in broadcast industry. Expansion program requires marketing and product direction for growing line of high quality instrumentation. Will require several weeks training at European supply centers and responsibility for complete sales and marketing program in U.S. Send resume to: S. Rauch, Philips Test & Measuring Instruments Inc., 85 McKee Dr., Mahwah, N.J. 07430. Equal Opportunity Employer M/F. 8-77-11

CHIEF ENGINEER wanted for Midwestern Directional AM and Stereo FM Broadcast experience necessary. Excellent salary and benefits. Need take charge person who takes pride in his work. Dept. 383 Broadcast Engineering, Box 12901, Overland Park, KS 66212. 8-77-11

DIRECTOR OF ENGINEERING—Midwest Public Television and Radio. Full charge of technical operation and planning. Maintenance experience required. Send letter, resume and salary requirement to Dept. 384, Broadcast Engineering, Box 12901, Overland Park, KS 66212. 8-77-11

STUDIO OPERATIONS/MAINTENANCE ENGINEER needed. Must have solid technical training and willing to learn. Experience desirable. Equal opportunity employer. Send resume to: Lewis Brown, KTUL-TV, P.O. Box 8, Tulsa, Oklahoma 74101. 8-77-11

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Advantages include salary fully consistent with your qualifications, plus overseas incentives and compensations for international field expense assistance. Please send resume with salary data in confidence to: Mr. Lawrence R. Carlstone, Professional Employment Supervisor. **HARRIS CORPORATION, BROADCAST PRODUCTS DIVISION**, Quincy, Illinois 62301.



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TELEVISION—CCTV Video Maintenance Technicians. Full Benefits. Greater New York, New York or New Jersey Area. Send resume to VPC, P.O. Box 268, New Hyde Park, N.Y.

TRANSMITTER TECHNICIANS—Voice of America has opportunities for qualified technicians at VOA stations in California, North Carolina, Ohio. Duties include operations/maintenance of high power shortwave transmitters and facilities on shift basis. Minimum qualifications: 3-years broadcast chief engineer 5 to 50 KW, 3-years supervisor of operations/maintenance high power military transmitting plant, or equivalent. U.S. citizenship required. Salary \$15-112. Submit standard government application on SF-171 to: VOA Personnel Office, Code 30330 Independence Avenue, S.W., Washington, D.C. 20547. AN EQUAL OPPORTUNITY EMPLOYER.

TELEVISION CHIEF ENGINEER, management oriented, for leading network affiliate in the Coast area. All new equipment and existing facilities. Equal Opportunity Employer. Dept. Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212.

HATE YOUR WIFE? Want to spend a lot of time away from home? Have intimate knowledge of RCA-45 cameras? Ampex AVR-2's? Audio mixer & switchers? Have we got a deal for you! Young, growing, West Coast Production Company who needs an operating maintenance engineer. We do most commercials, but also venture into sports & programs both live & tape. If you have these qualifications (or at least most of them) we'd like to discuss the whole situation with you. Send resume and salary requirements to Dept. 382, Broadcast Engineering, Box 125, Overland Park, KS. 66212.

STUDIO ENGINEERING SUPERVISOR—Must be able to perform specialized technical duties necessary to the operation, installation, maintenance, and maintenance of television production equipment. Ability to guide, motivate and advise people. A first class license is a requirement. An equal opportunity employer. Send resumes to: A. R. Garrett, KTUL-TV, P.O. Box 74101, Tulsa, Oklahoma 74101.

CHIEF ENGINEER—Experienced Chief needed for 5 Kw AM, DA, and Class A automated FM station. Salary, equipment, and working conditions. Midwest small market has good school system and climate. Send resume, references, and requirements to John David, KMPL Radio, Box 907, Sikeston, Mo. 63801.

ASSISTANT CHIEF ENGINEER for TV station. Requires first phone, good maintenance background and supervisory experience. An equal opportunity employer. Send resume including salary history to: General Manager, KOLN, P.O. Box 2610, Reno, Nevada 89505.

FULL-TIME CHIEF ENGINEER: requirements include First Class Radiotelephone License and experience in the areas of directional antenna operation, solid state devices, remote control systems, VHF, microwave and radar equipment. Full company benefits and top money for your people. Equal Opportunity Employer. Send resume to: Chester Grubbs, Director of Engineering, KTOK Radio, Box 1000, Oklahoma City 73101.

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New York, New York—Stan Osborn, 60 E. St., Room 1227, New York, N.Y. 10017, (212) 687-7240.

Mountain View, California—Dennis Triola, Bayshore Frontage Rd., Room 102, Mountain View, Ca. 94043, (415) 961-0378.

London W.C. 2, England—John Ashcraft, 12 Bear St., Leicester Square, 930-0525.

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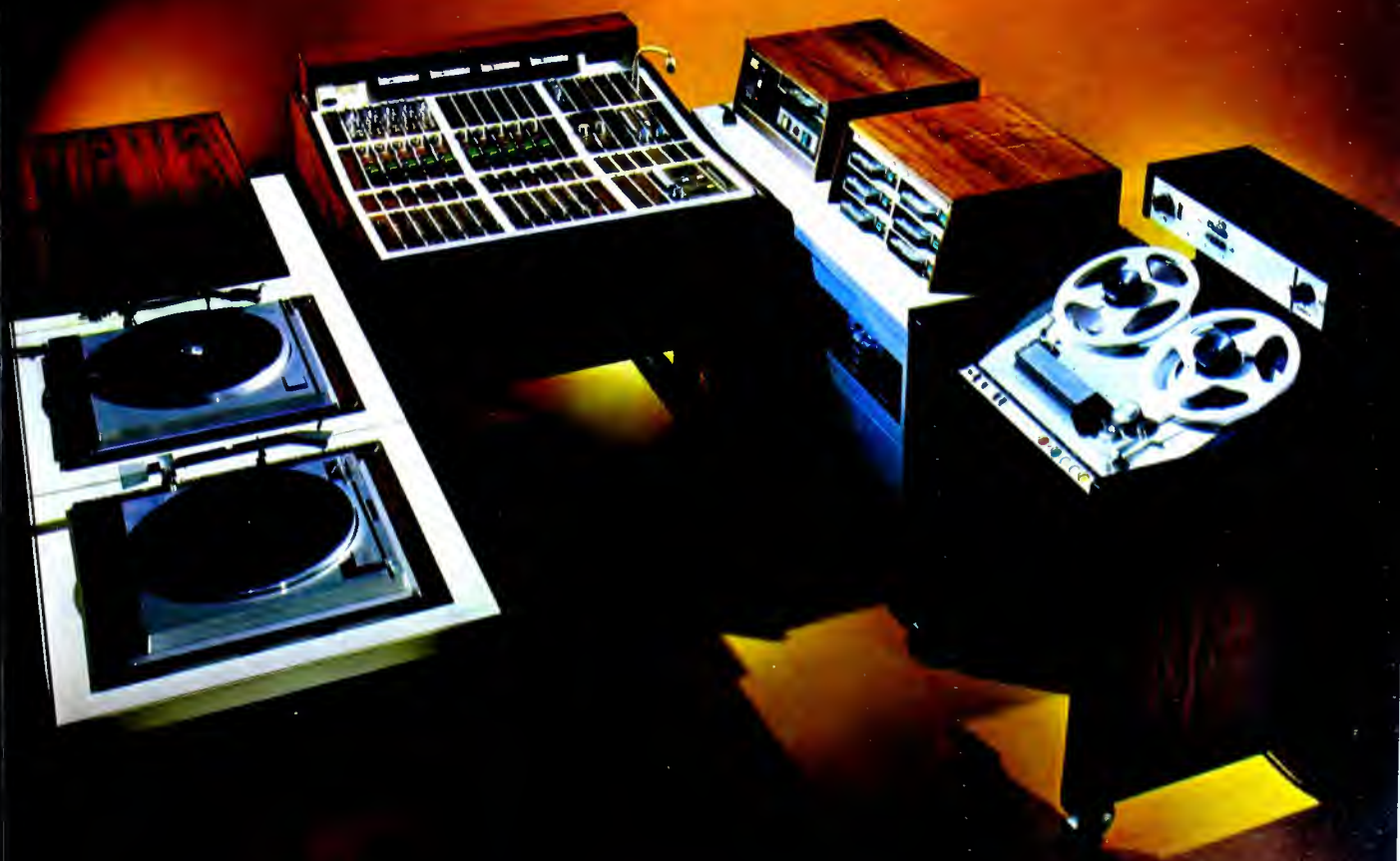
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