August, 1977/75 cents

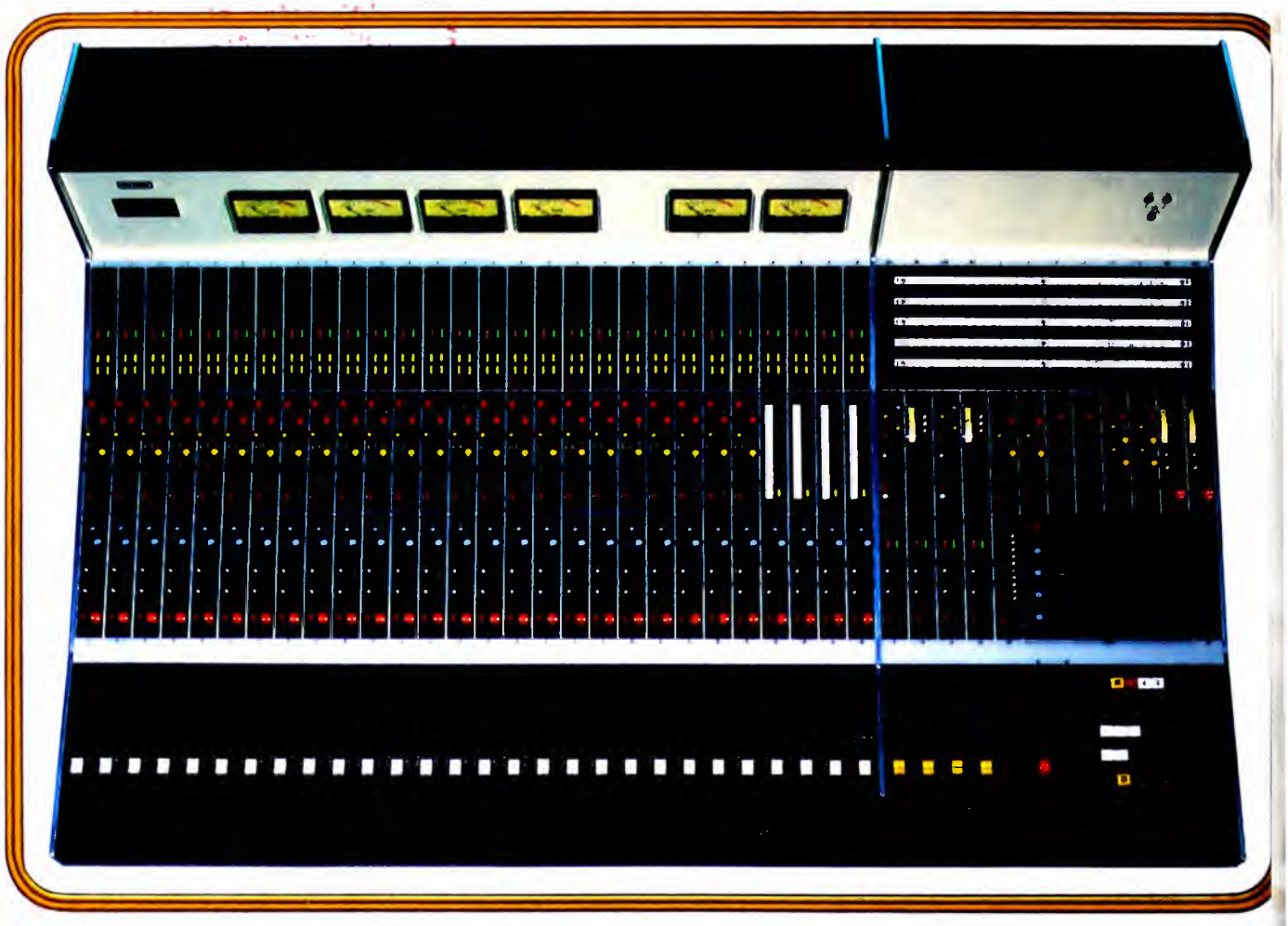
BROADCAST ENGINEERING®

IMAGE ENHANCER ROUNDUP

Page 22

Audio distortion tests
NRBA convention time
Basic STL review

The Way We Are.



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Angenieux 9.5-57mm AV30 Zoom Lens	$6250	$2075	$7100	$2325
Angenieux 12-120mm AV30 Zoom Lens	$6200	$1540	$7050	$1790

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BROADCAST ENGINEERING.

The journal of the broadcast-communications industry *August, 1977 Volume 19,*

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a monitor, showing a 13
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recorded on a single tra
It proves the viability of
digital video multi-dubs
courtesy of Ampex. *Pho*
by Donna Foster Roizen

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Regional advertising sales offices listed on ad index page.

BROADCAST ENGINEERING is publishe
ly by Intertec Publishing Corp., 922
Road, Overland Park, Ks. 66212.

BROADCAST ENGINEERING is edited
porate management, technicians/engin
other station management personnel
mercial and Educational radio and TV
Teleproduction studios, recording stud
and CCTV facilities, and government
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gineers, dealer/distributors of broadca
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SUBSCRIPTIONS: BROADCAST ENG
is mailed free to qualified persons in oc
described above.

Non-qualified subscriptions in the U.S.
one year, $10.00 two years, $13.00 th
Outside the USA add $1.00 per year
postage. Single copy rate 75 cents. Ba
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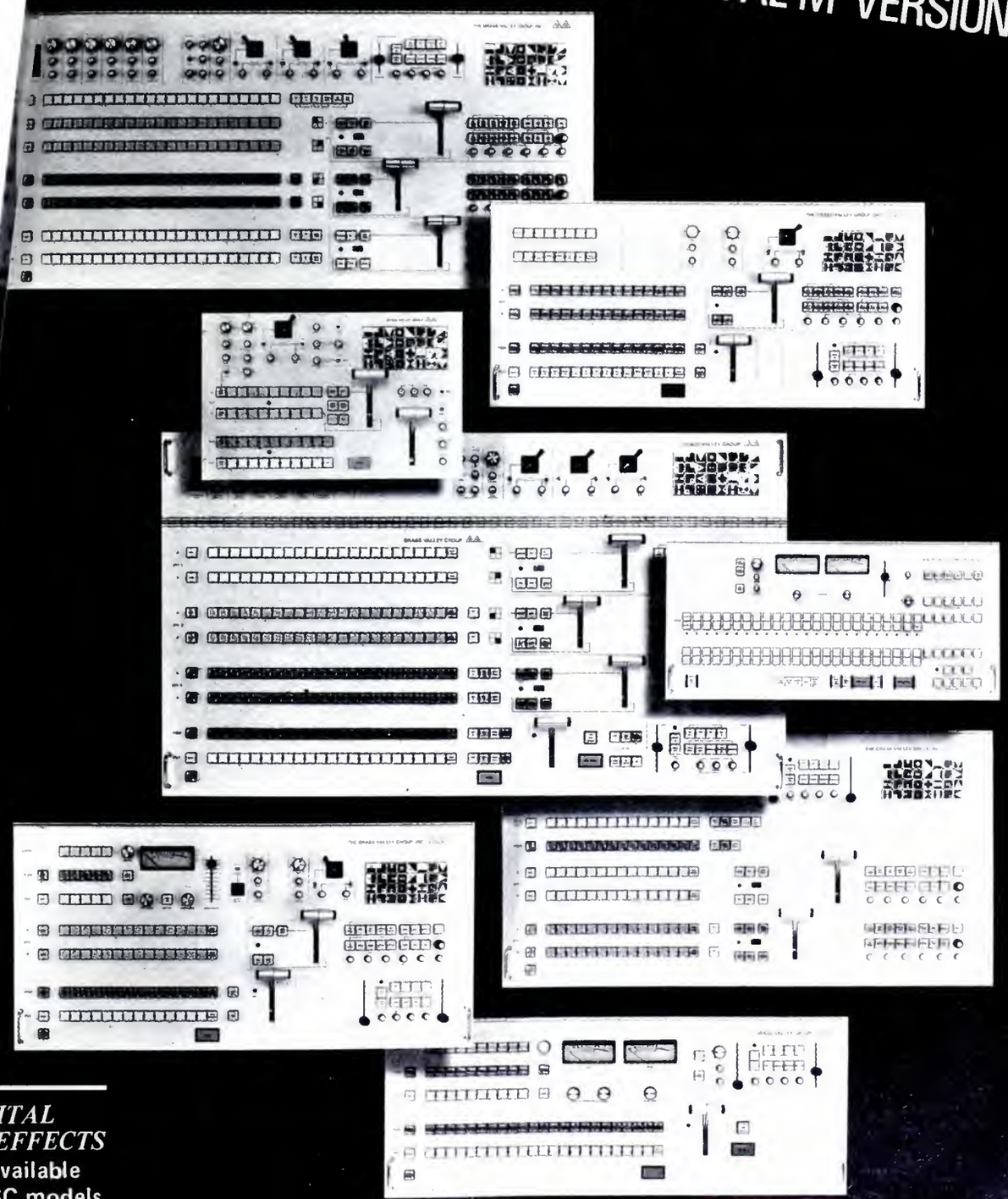

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DIRECT CURRENT FROM D.C.

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

17th Reregulation Order Adopted

The Broadcast Reregulation Task Force has issued another Order relax ing and clarifying requirements. The sections (73.40, 73.44, 73.6 and 73.62) relating to changes in existing equipment, such as fre- quency control, are revised to make it clear when and under what co ditions type-accepted equipment may be modified. Of importance al is a clarification which says that if you are modulating your AM station to 125% on positive peaks, you better have a modulation mon itor which is type-approved to read 125%. This particular change b becomes effective November 1 and fines will be levied shortly there after. 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 be tween Ampex and Sony) on a new format for non-segmented 1-inch he- cal VTRs. While there are some details to be worked out, it now appears that the major hurdles to a standard format are overcome an 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 to giving examinations in Spanish for radio-telephone third-class ope tor 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 staf to prepare the necessary paper-work to eliminate the third-class license permit entirely and to substitute the restricted permit fo broadcast operation. The Notice of Proposed Rule Making (Docket 20817) should be out by the time you read this.

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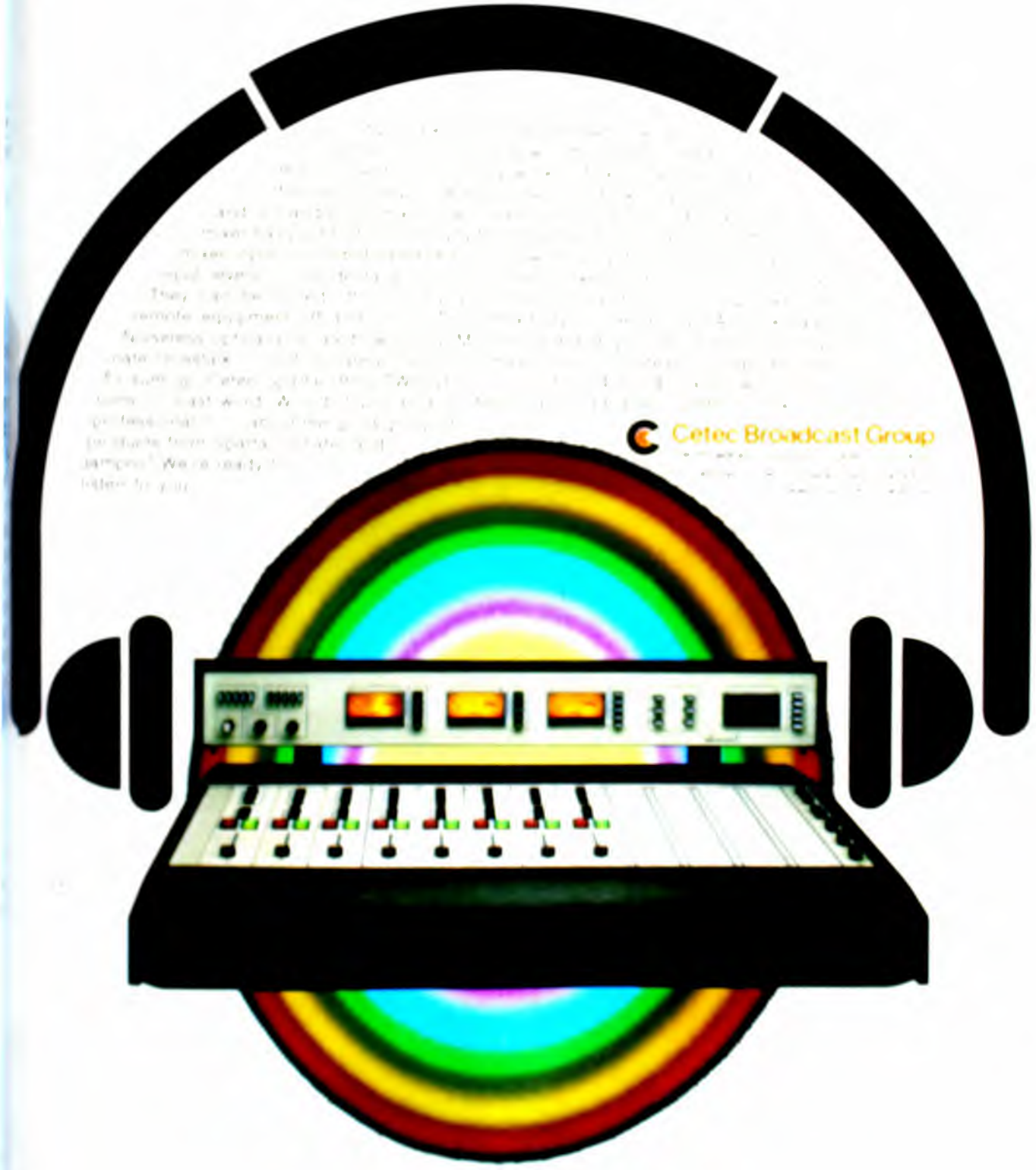
CETEC Sparta's Centurion Consoles are really worth listening to.



DIRECT CURRENT FROM D. C.

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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);
From 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... A Los Angeles man was convicted on two counts of manufacturing and selling power amplifiers which would increase the power output of CB sets to as much as 2000 Watts...The Commission no longer requires a prior coordination procedure when a radio station is built on government land.

20-1000mm.*

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nents are tougher. Production stand- ner. And schedules, shorter than ever.

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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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Let's look at the backside ...something no one else will ask you to do.

Our exclusive back treatment creates a conductive surface that all but eliminates static buildup and the resultant dropouts and scratching.

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We design our cassettes as carefully as our tape.

Only "Scotch" videocassettes are made from tough, high impact ABS plastic.

It wouldn't be such a big deal if all videocassettes were so durable. But they aren't. And if you've ever accidentally dropped and cracked a cassette, you can appreciate why we've made ours extra strong.

Give us an order and you'll also receive some extra cassettes that are a class by themselves.

With every order of $800 or more, we'll give you one program from our 10-course workshop series on video production. These informative videocassettes show you everything from lighting and propping to field production camera techniques.

Just circle our reader service card number and we'll tell you more.

Nobody, but nobody, knows tape like 3M.

We've been in the video tape business for as long as there has been video recording.

So show your Sony that you care. Buy it a case of "Scotch" videocassettes soon.

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"Scotch" Videocassettes.

For More Details Circle (6) on Reply Card

NAB TV board passes resolution on programming

The television board of directors of the Na Association of Broadcasters has passed a reso calling on NAB's Television Code Review Boar take positive, visible, affirmative steps to enco industry and public awareness of both the spiri letter of the Code."

Commenting on the resolution, NAB Pres Vincent T. Wasilewski said, "This action repre an attempt on the part of the Television Board an NAB once more to reflect, in response to the con of the segment of the viewing public it represen dedicated desire on the part of the broadca industry to serve the best interest of the total pu

The resolution states:

"Whereas the recently announced Fall 1977 vision schedules indicate a substantial reducti the number of police action/adventure programs taining depictions of violence; and

"Whereas the Television Code Review Boarc conscientiously responded to concerns expresse the NAB Television Board of Directors by (1) hd meetings with broadcast industry leaders, cons advocacy groups and members of the Holly creative community regarding depictions of violer some television programs and (2) conducting in- reviews of the Television Code's Program Stan Section including the language on violence which strengthened in 1972; and

"Whereas television programming, as an evolving art, requires ongoing close attentio broadcasters to help assure that the programs present to the American public take into accou only the in-home, family aspect of the medium bu the reasonable and sometimes conflicting expecte of the many and diverse audiences which com the viewing public;

"Now, therefore, be it resolved:

"[1] That the NAB Television Board of Directo keeping with our industry's belief in the conce freedom with responsibility, urges broadcasters encourage programs which reflect the establ values and traditions of our society, (b) to exerc high degree of critical judgment when prese programs which reflect the changing or cha attitudes of substantial segments of our society ar to continue their efforts toward assuring h depictions of violence or aspects of human sexual programs are handled responsibly;

"[2] That the NAB Television Board of Dire supports the plans of the Television Code R Board to continue and to expand its dialogues on gramming and voluntary broadcast self-regul with industry leaders, the creative community, sumer advocacy groups and the viewing publ general;

"[3] That the NAB Television Board of Dire urges continuation of the Television Code R

continued on pa

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For More Details Circle (8) on Reply Card

industry news

continued from page 12

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

"[4] That the Television Board of the Na Association of Broadcasters calls on the Tele Code Review Board to take positive, visible, af tive steps to encourage industry and public awar of both the spirit and letter of the Code and fu the Television Board resolves to alter the langu the Code regarding the following matters:

A) To reassert in more specific term broadcasters' recognition of televisi primarily a family medium and

B) Delete the current language of sectic paragraph 8 and replace it with lan which specifies that material generall ceived as obscene, profane or indec unacceptable.

The language will be drafted by a mittee appointed by the chairman Television Board and submitted to the vision Board at the September 1977 m for ratification;

"[5] The Television Board directs the Code Au ty through all means available to it to provide f widest possible dissemination of the revised lan in particular and the Code in general throughou industry, government, special interest groups, ar population at large."

Billboard restrictions

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

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

"(1) Non-Program Material Definition: Non-pr material, in both prime and all other time, inc billboards, commercials and promotional anno ments.

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

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

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

"Public service announcements and promo announcements for the same program are exc from this definition."

continued on pa

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

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This is the first of 12 amplifier sections built for three Saudi Arabia locations. They will be used as building blocks for 1 or 2 megawatt transmitters in the broadcast service. Similar approaches are planned for other locations in Saudi Arabia.

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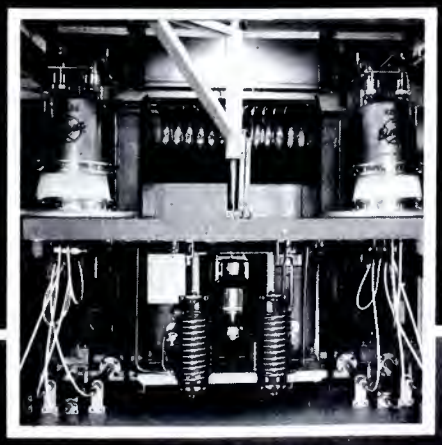

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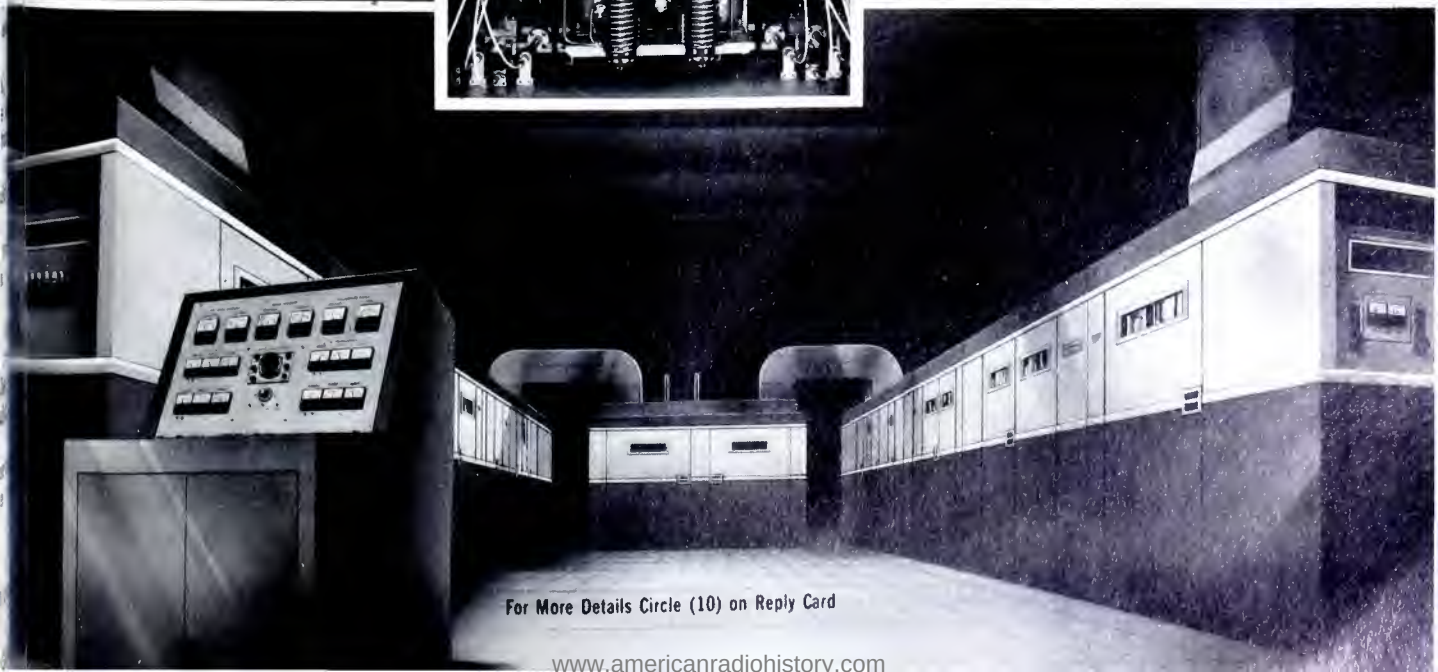

For More Details Circle (10) on Reply Card

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 Columbi the Home Box Office case overturning rules gover pay-cable television.

In its opinion, the Appeals Court set aside reg tions by the Federal Communications Commis (FCC) which prevented pay-cable from siphon popular feature film and sports programming f free TV.

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

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

Overall, NAB said that the Court of App decision prevents the FCC from fulfilling its respo bility of insuring that the public receives contin entertainment programming on free TV.

Film camera maintenance seminar set for October

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

According to Ed Clare, assistant-to-the-presid and seminar coordinator, the program will ag include a comprehensive training seminar for CP-16 reflex and non-reflex camera models a related accessories, led by Cinema Products te nicians Marty Prager and Chuck Jackson. As in p years, representatives from other equipment ma facturers will also conduct sessions on curr practices and developments in their field.

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

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

continued on page

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

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

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 Flah demonstrated the applicatio 1-inch helical machines to origi sitcom-type program production rently being shot on film.

CBS experimented with the p lar *Bob Newhart* and *Phillis* sh which are done 35mm color f For the experiment, the setup cluded parallel 35mm movie ca as, Thomson-CSF 1515 tria studio cameras and Thomson I Microcams.

Consecutive sequences of same images made by each of three camera setups were repla from Sony BVH 1000 record There was little difference betw the three different originations. I electronic cameras showed sli higher chroma saturation than film take, and high contrast exte scenes exhibited some moire (sim to what we see when Johnny Ca wears one of his pinstripe jack

To prove the editing and m generation capability of the 1 Flaherty ran a program tape brightly lit scene involving a mu number that included highly poli musical instruments. The sec generation was excellent and lo like a good quad reproduction. prisingly, the 12th generation sh right after was also accept broadcast quality, on a subje evaluation basis.

Flaherty assured the audie that these tests were rigoro made, with multiple generat produced on a machine interch basis, thus verifying the compat ty of the 1-inch format on a mul machine arrangement.

Perhaps the most significant ment by the CBS engineering president, as far as future telev production is concerned, was statement that upon ratificatio IATSE, CBS would provide 1- recorders to production houses do some of the network's ou programs. The program tapes i

continued on pa

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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 propo and ratified a standard 80 address code that is now univers accepted and used.

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

At this point there is s reluctance by manufacturers to any official reaction, much bey the announced agreement in prin ple. Doubtless, there are m questions still unanswered.

Donald Kleffman, vice presi and general manager of Aud Video Systems division for Amp told **Broadcast Engineering**, " are particularly pleased that proposed agreement represents compromise by all parties c cerned. Ampex is in the process developing plans to insure that 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 convert to the proposed format."

Perhaps the September meet will spell out some of the details. As you would imagine, task of compatibility is not as sim as the agreement might lead one believe. After all, according to SMPTE, "This potential format m provide complete interchangeabi between 1-inch non-segmen helical videotape recorders that built to the mechanical and e trical specifications chosen."

The SMPTE has said it feels " television industry should indeed pleased that the accelerated p cedure urged by CBS and ABC yielded a comprehensive re which will greatly benefit all vi tape recorder users in the futu The SMPTE Working Group continue to work toward spec standards and to clear up any maining problems.

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

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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 distributi and switching systems in TV studi are virtually transparent to vid signals, and therefore, don't a significant degradation unless the is a fault requiring maintenan Unfortunately, the same cannot b said of videotape recorders. Sin most programs today are taped f delayed airing, this is where t greatest emphasis on enhancem is usually placed.

Quad VTRs, or other segment recorders in good operating c dition, reduce video signal qual very little at the first generati But multiple dubbing will cause cumulative degradation of facto such as signal-to-noise ratio, moi differential head banding, time ba jitter, chroma/luminance displa ment, differential gain, differenti phase and others.

While the new crop of one-in helical recorders (non-segment eliminates the banding progra these recorders still have simi accumulations on multi-generat dubs which reduce picture qual by known factors. The worst

continued on page

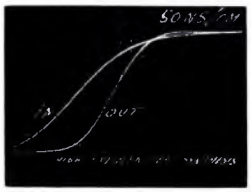

Figure 1 The input signal is the slow rise time coming from a color-under VTR, the application of high frequency synthesis produces the output signal which gives the video image improved subjective sharpness.

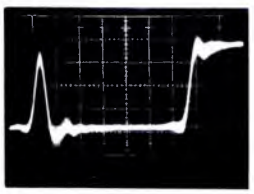

Figure 2 A sine^2 pulse and bar signal from a typical U-Matic recorder will exhibit noise, overshoots and ringing as seen in this waveform.

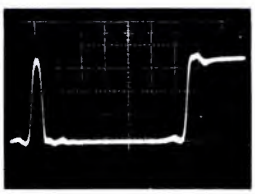

Figure 3 The same test signal applied to an enhancer clearly shows the noise reduction on the base line and improved K factor at the pulse edges.

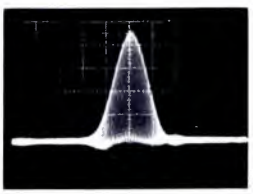

Figure 4 Chrominance/luminance delay appears in the bottom of the 20T pulse with subcarrier. Typical first generation U-Matic delay is 90 nanoseconds.

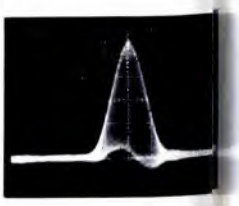

Figure 5 Corrected 20T pulse now sho near zero delay. Incremental 50-nanosecond steps c be adjusted until chroma/luma delay minimized.

If we could fill this page with the list of users of CCA transmitters, you wouldn't be able to read the 1,300 names.

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Image enhancer manufacturers

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

Image enhancers

continued from page 22

fenders 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 proble there are a variety of enhanc made by at least 12 suppliers. Th include: enhancers that work on RGB signal ahead of the encod enhancers which work downstre from the encoder on the compos full bandwidth NTSC signal, eith

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. **$1,595**

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	Total signal correction for all VTR formats. Has instantaneous correction range of 4H lines (254 *u*sec) at 58 dB signal to RMS noise. Includes Image PLUS, Velcor velocity corrector, and remote control capability. DOC and line by line correction are optionally available. Remote control panels are available with 8 or 13 remote controls. **$21,995**

Rank Cintel

3-Channel Enhancer	Both horizontal and vertical resolution. Intended for film chains, but works with cameras and other systems. Enhancement applied to all 3 color channels from matrixed signal from R-G-B inputs. To 12 dB correction. Adjustable coring for noise reduction. Full remote control provisions. (Price shown is approximate.) **$7,200**

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 erform more than one of the e functions.

Color-under limitations

ere are four primary deficiencies of a video signal coming from a color-under VTR that need correction 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 process 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 m- frequency phase. Four separate time constants. h adjustable chroma boost. ±3 dB gain. Monitor jack a 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 h zontal & vertical detail. Maintains sharpness and reso tion of encoded video without double enhancem when processing previously enhanced signal. Availa for NTSC, PAL, and PAL-M installations. $4,
Mark IV 8010-1	Same as above but with separate detail output. $$4,
Mark IV 8310	This model is designed for operation with 3-tube co cameras. $3,
Mark IV 8310-1	Same as 8310 with separate detail output. $4,
Mark IV 8410	Designed for operation with 4-tube color or monochro cameras. Available (along with model 8310) for 525 and 625/50 unencoded systems. $3,
	3M Company
6210	RGB enhancer features green-derived enhanceme 3.58 combing; adjustable noise reduction; horizont vertical enhancement balance; level-dependent apert equalizer; coring controls. $3,
6220	In-line enhancer accepts video from camera & provid vertical/horizontal enhancement. Inertially genera output for chroma-key. Gain automatically adjusts viously enhanced signal. Controls include: coring just; level-dependent aperture equalization; horizont vertical balance; detail gain; and by-pass. (This available in November.) $3,

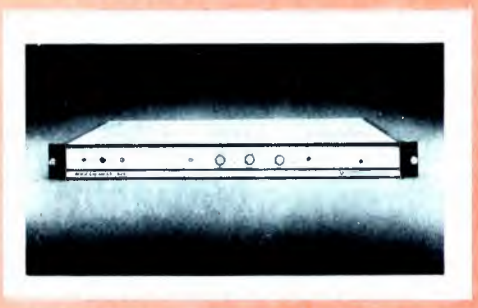

Image enhancers

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 chan with video head wear, which slo delays the chrominance, theref requiring periodic readjustment maintain the best registration.

4. Picture noise levels: Both luminance and chrominance sign

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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 visi... or annoying. Improvements of 3 ... or better are possible, thus ov... coming one or two generations ... VTR degradation when dubs ... being made.

Cancelling misregistration

Since the luminance and ch... minance signals travel along diff... ent paths, it is possible to route ... of the signals through a step-de... circuit which provides increme... steps of approximately 50 na... seconds on either side of a nomi... delay value. By observing the im... or test signal, the operator ... cancel the inherent VTR delay er... and bring the monochrome ... color signal components back i... near perfect superposition.

Even in the case of a cumulat... multi-generation dub error, the ... placement can be compensated ... by selecting the appropriate inc... ment of corrective delay. The ... hancer's adjustable delay circuit... usually ±250 nanoseconds, a... quate for almost any practi... situation encountered with co... under VTRs.

There are more specialized ... hancers which perform hig... sophisticated signal manipulation... achieve their goals. Converting ... video signal into digital form, t... storing it in a frame memory, p... vides an opportunity to apply fr... interpolation techniques to suppr... random noise while retaining or ... hancing the predictable signal c... rying components. This system ... achieve phenomenal noise reduct... figures of 12-16 dB.

Summary

The largest number of im... enhancers in use today are still ... type that are integrated into co... cameras. These are familiar devi... in use for several years.

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

Much of the ENG work curre... being achieved by lightwei... cameras and portable color-un... VTRs is being subjected to ... hancement before editing or air... The recent program, "A Day in ... Life of Jimmy Carter," used porte... equipment and post-production ... hancement to make the produc... material adequate for network ... lease. This is a relatively new f... in which improved versions of b... analog and digital enhancers ... undoubtedly continue to appear.

Image enhancer mailing list

Cohu, Inc.
Electronic Division
5725 Kearny Villa Road
P.O. Box 623
San Diego, CA 92112

Corning Electronics
Corning Glass Works
3900 Electronics Drive
Raleigh, NC 27604

Dynasciences
Township Line Road
Blue Bell, PA 19422

Hitachi Denshi America, Ltd.
58-25 Brooklyn-Queens Expressway
Woodside, NY 11377

Microtime, Inc.
1280 Blue Hills Avenue
Bloomfield, CT 06002

Rank Precision Industries, Inc.
411 East Jarvis Avenue
Des Plaines, IL 60018

Telemet
185 Dixon Avenue
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3-M Public Relations
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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, like 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. This mathematically is:

$$SR = 2\pi Eopf$$

For example, suppose we had a 10v peak signal at 20 kHz. The SR of this signal would be 1,260,000v/S, or in terms which are usually seen, 1.26v/μS.

This is a deceptively simple

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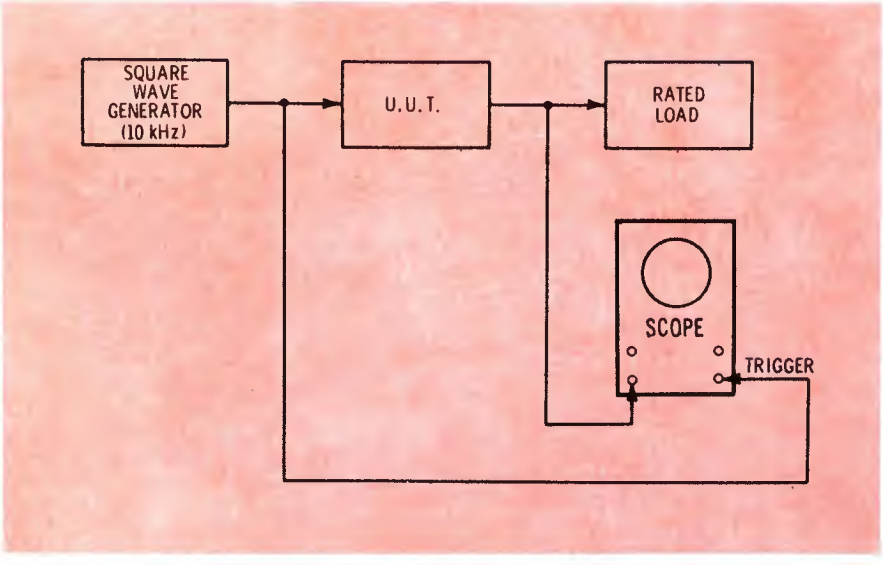

Figure 1. Test setup for slew rate check.

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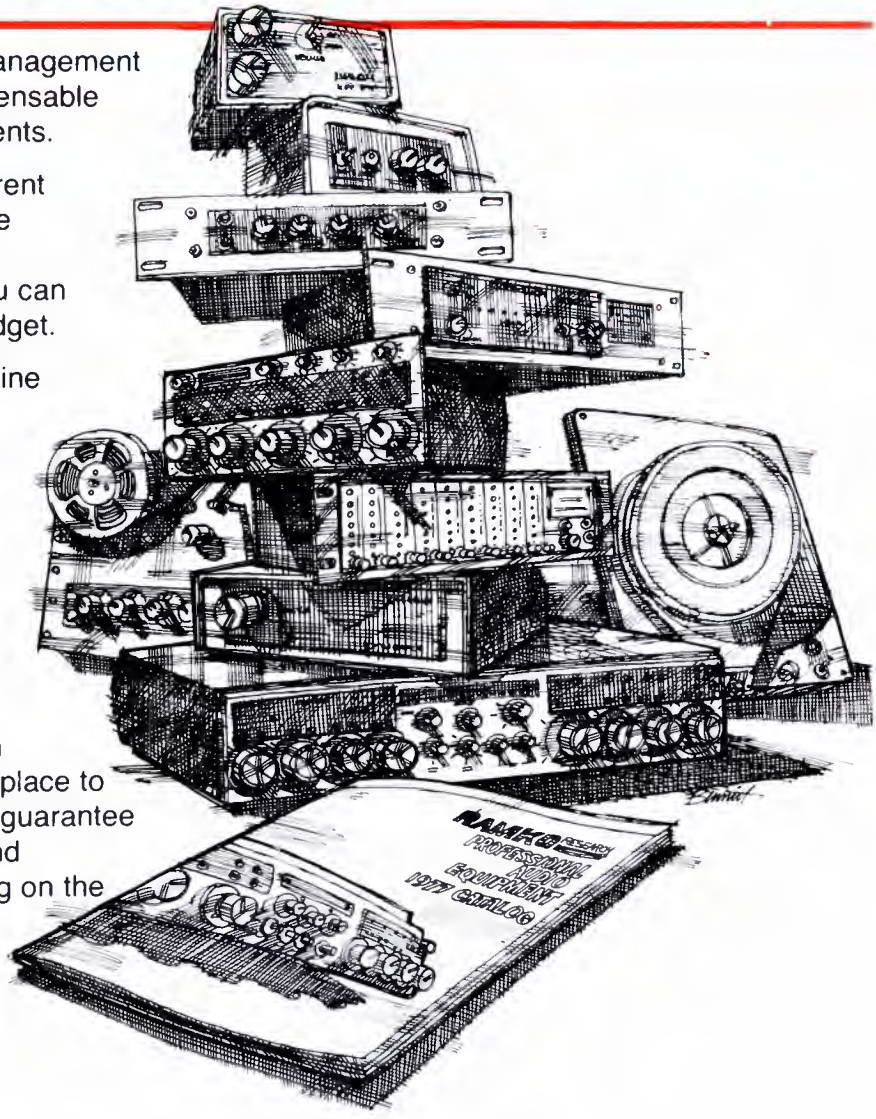

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Slew rate tests

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

With the output square wa... displayed on the scope, measure ... time interval for the (+) and (-) ... slewing intervals, as illustrated ... Figure 2. Slew rate is then c... culated just by dividing the volta... swing by the time interval m... sured, which will give so many vo... per microsecond—for example ... 20v rise and fall in a time inter... 4μS is a 5v/μS slew rate. T... sample photo demonstrates a 2... μS SR.

Ideally, slew rate should b... symmetric, if not the distorti... which will be generated will not b... at its minimum which occurs wh... slewing is equal (+) and (-). T... check does, of course, require ... well-calibrated scope (and prob... for the time measurement, oth... wise it is meaningless.

The square wave source shou... also be high in terms of qual... with rise and fall times 100 na... seconds or less. If a square wave ... function) generator is not availa... in the shop, one can be built sim... and inexpensively around a 5... timer[3] as shown in Figure 3. T... circuit can use any available po... tive supply voltage from 5 to 1... and produces a max p-p outp... equal to the supply voltage. It ru...

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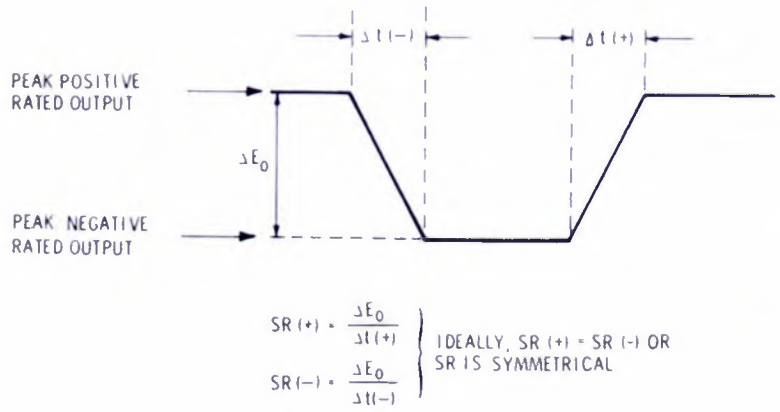
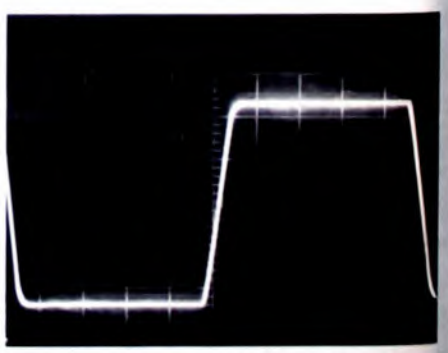


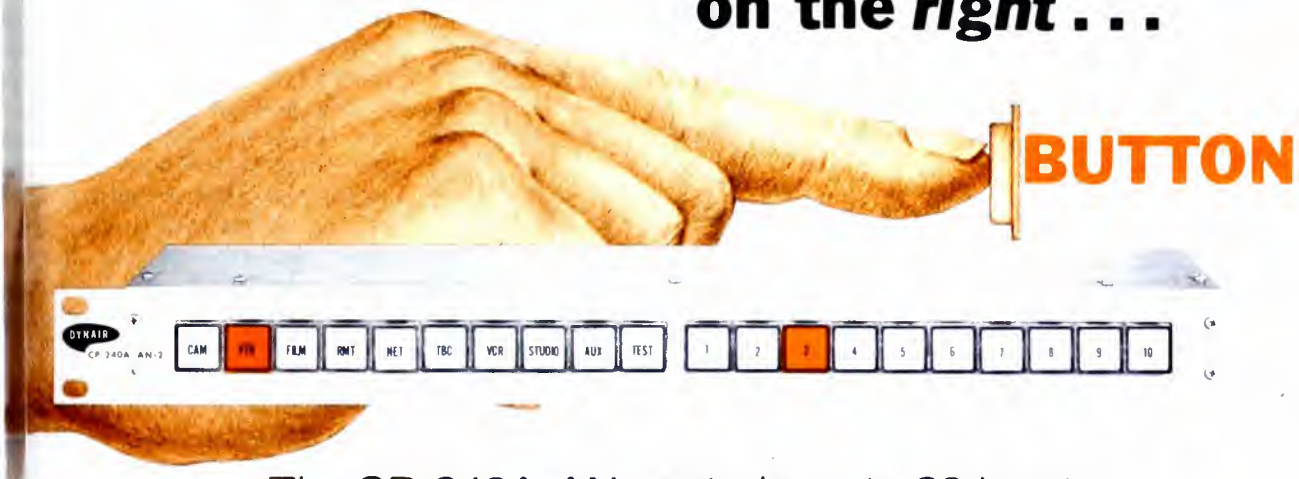
A. Method of calculation.



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

Figure 2.

DYNAIR puts *your* finger on the *right* . . .



The CP-240A-AN controls up to 80 inputs on a standard 1¾" rack increment!

Here's how it works with DYNAIR's 1400 and/or 8100 Series switching equipment: select your source group from the left bank; FILM, VTR, NET . . . whatever. The group button flashes until you select one of ten specific sources in the group on the right bank. Both buttons take on a steady glow. You have just switched the system (audio, video, audio and video, or data) to the selected source.

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at 10 kHz, but you can vary the frequency by changing Rt. 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 measurements and audible defects, the SR of an amplifier should be as a minimum, **0.5v/μS per peak output volt.** For high quality circuits, the figure should be **1v/μS per peak output volt.** Thus, for the 20v p-p level mentioned above (which is 10v peak) the U.U.T. should possess a 5v/μS slew rate as a minimum; preferably it will be 10v/μS. 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 50v/μS, for high output levels and high load impedances.

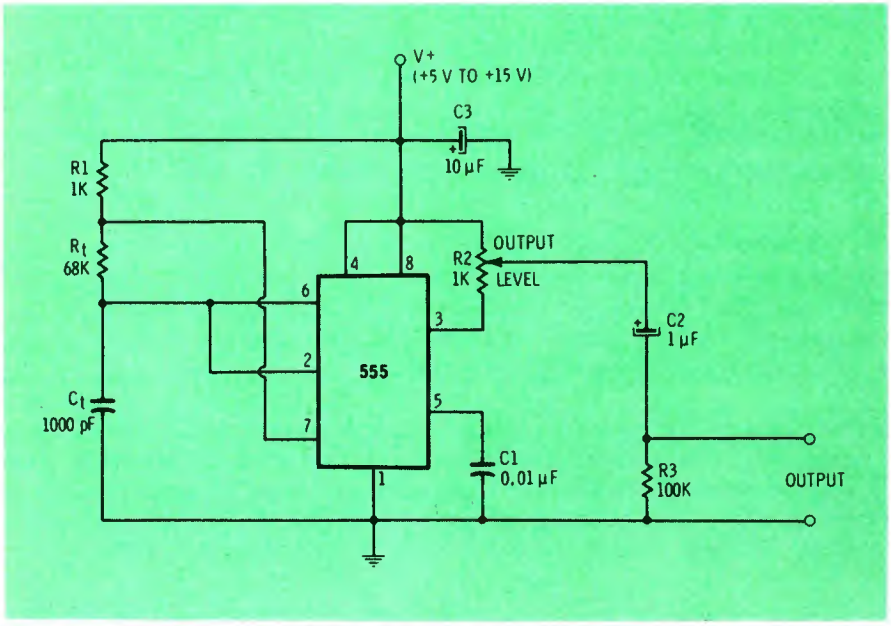

Figure 3. 10 kHz square wave generator.

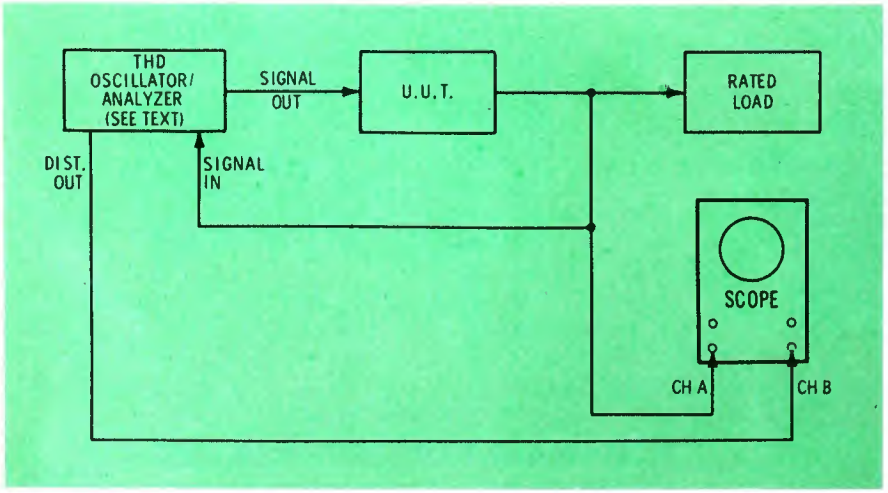

Figure 4. Test setup for THD check for SID.

THD Tests for SID

A more complete and thorou check for SID can be performed sweeping the U.U.T. for THD, full rated output voltage, beginn at 100 Hz, and to as high frequency as is practical. The up limit will be determined by eit the gear under test, or your t equipment, but 100 kHz as a li will yield all the information nec sary (if you can make it). If gear is line level and does not h transformers in the path you usually make the sweep to 100 k without major difficulties. Po amps generally do not like quencies above 20 kHz, and s tests are not recommended them.

The general setup for a TD measurement is shown in Figur and is similar to the square w test setup, with the exception of signal source. This signal genera is a high purity sine wave sou with a residual distortion on order of 0.002 percent. The a lyzer portion must be capable measuring to this degree of reso tion in the 100 Hz to 100 k range. The Sound Technology ty 1700 and 1710 are suitable.

While it is not absolutely ess tial to have this degree of resolu and range to measure THD, it fact that high quality audio circ can easily have distortions be 0.01 percent up to 20 kHz. Th fore an instrument must be capa of better performance to t assess its relative quality. This be more apparent as some typ performance is shown.

Figure 5 shows actual measu THD on a solid state line dr circuit, one which uses an IC amp as its gain element. Data taken at an output power leve +19 dBm, or a ±10v swing ac 600 ohms.

There are three different cu shown, representing three test ditions. The first of these represents performance as m sured through a 600/600 ohm transformer into the load. Ther a rise in THD below 1 kHz (du the transformer), but our are interest lies in the 2-10 kHz r where THD rises rapidly to a

percent. This very sharp rise is ative of SID, and its character- shape should be noted for e reference.

st to the right of this curve is a id, also labeled 0.6v/μS. How- e in this case the data reflects rmance of the circuit as mea- **before** the transformer. The THD is gone, but the sharp rn in HF THD is essentially ame. The very slight upward in frequency is due to the ler output swing required, out the transformer's 1 dB loss. u can see that the basic it is virtually distortionless up few kHz, then it rises to over percent in about two octaves. one percent point is reached at Hz, which corresponds to the μS slew rate of the circuit.

e very same circuit was also ured, but with conditions ad- for a 4v/μS slew rate. From it can easily be seen that rmance is greatly improved, as is only 0.012 percent at 20 and one percent is reached at Hz. The ratio of one percent intercepts is the ratio of slew —or 6.7/1 (or 62 kHz to 10 H.

hough this is only one specific ple, there are many other ts which will show similar ior. In almost all cases per- ance can be predicted from SR In the case here, the SR for v/μS case is just shy of the S per peak volt criteria, and is reasonably low up to 20 Other forms of measurement as two-tone 1:1 HF IM and will show results of corres- ing quality, if the above men- slew rate criteria is met.

summary, slew rate (or its tion products of SID) can ce very poor quality in audio ts, if certain minimum stan- are not met. This poor y shows up as THD and IM rtion, and is audibly very ing. It is relatively easy to SR however, and it can be using only a square wave ator and an oscilloscope. This (as a minimum) should be yed in maintenance or the tion of equipment for poten- tial 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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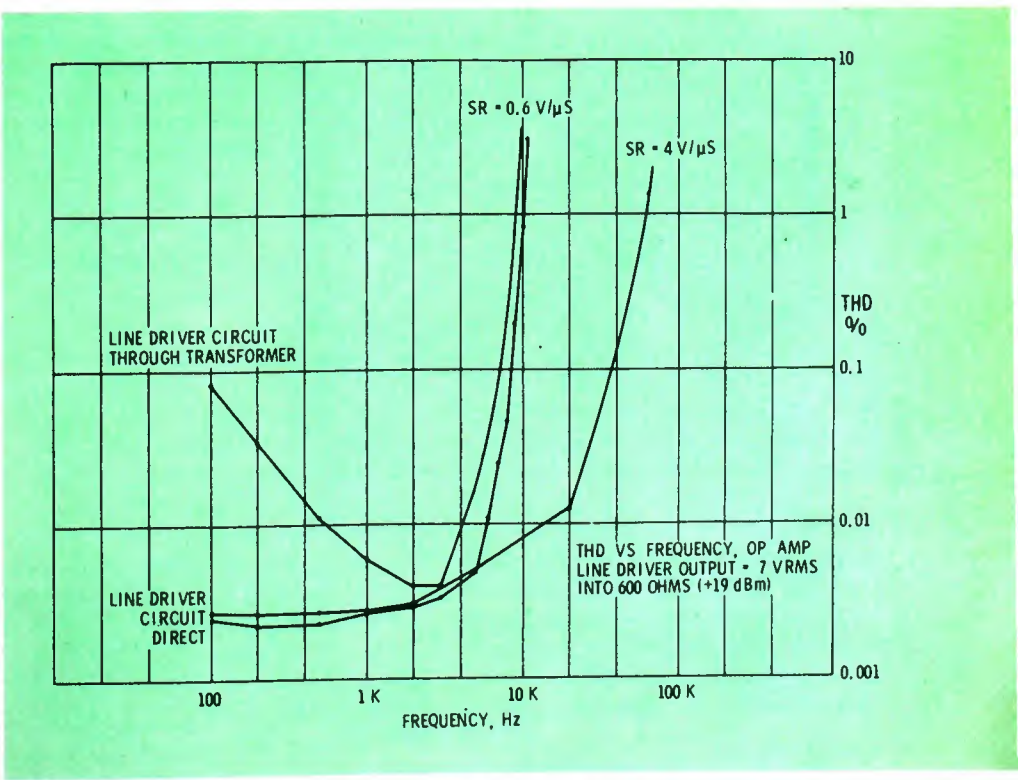


Figure 5. Percentage of THD vs. Frequency. (Normally you would see this on a log graph.)

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 947 MHz to 952 MHz spectrum. The National Association of Broadcasters (NAB) has filed a petition with the FCC requesting the reassignment of 942-947 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.

*Moseley Associates Inc., Goleta, California

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

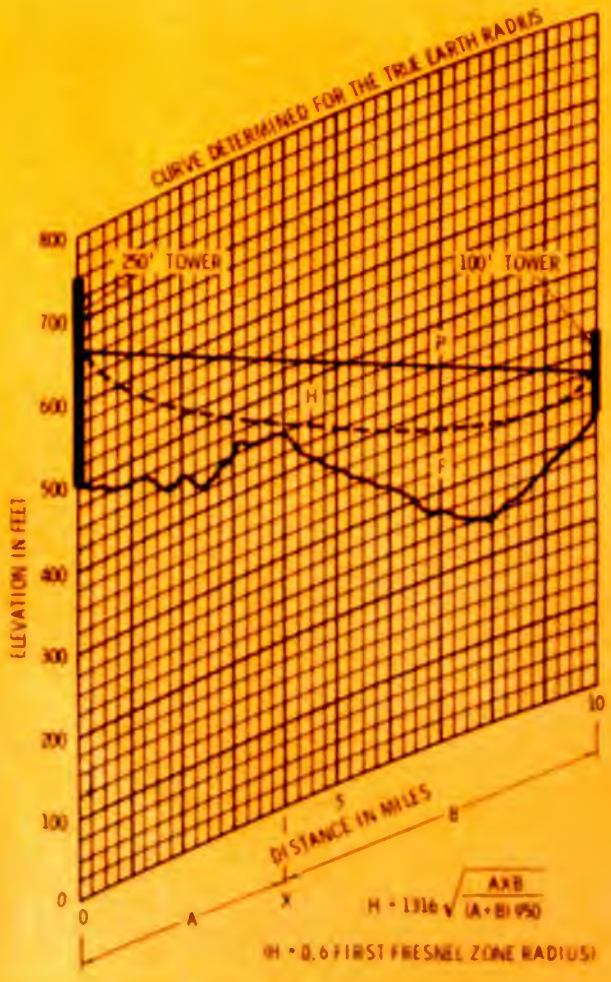
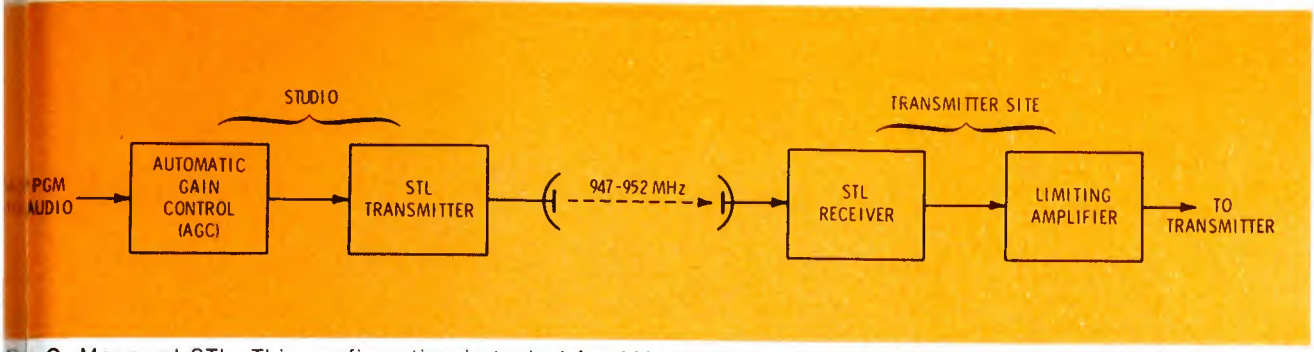
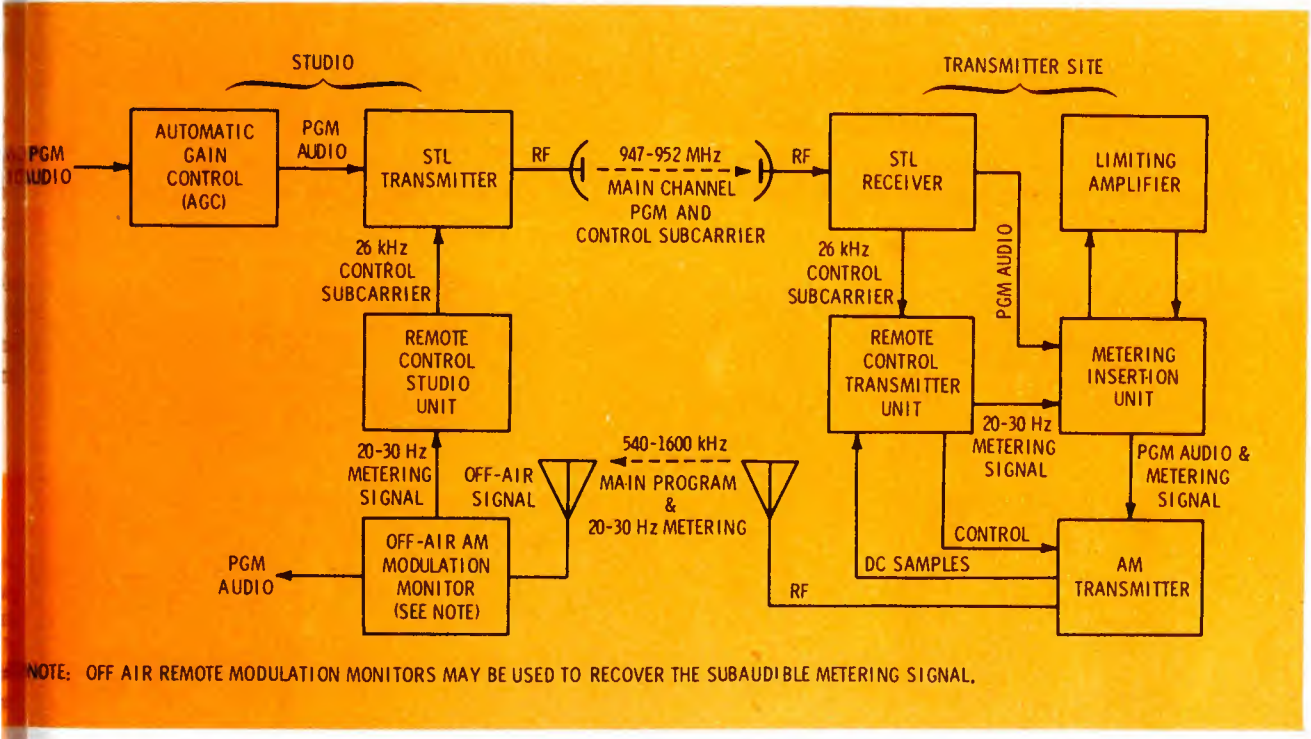


Figure A. Typical Aural STL Path Profile drawn on true earth radius graph paper. Line "P" between the studio and transmitter site represents the center of radiation between STL transmitting and receiving antennas. The dashed line ("F") represents 0.6 First Fresnel radius from the center of radiation, 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.



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



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

l Dorman, Operations Man- learned that telephone circuits d thought would be available nterconnection of the studio ransmitter sites could not be ded by the local telephone any. This left only the STL as ans of getting WRSQ on the y diligent effort, he was able tain an STL and was on the the end of November.

all stations are faced with ame situation as WRSQ. A er of other reasons usually in the selection of an aural These are: (1) Better Quality; gher Reliability; (3) All Oper- Under Station Control; (4) bility/Versatility; and (5) Saving 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 dedicated 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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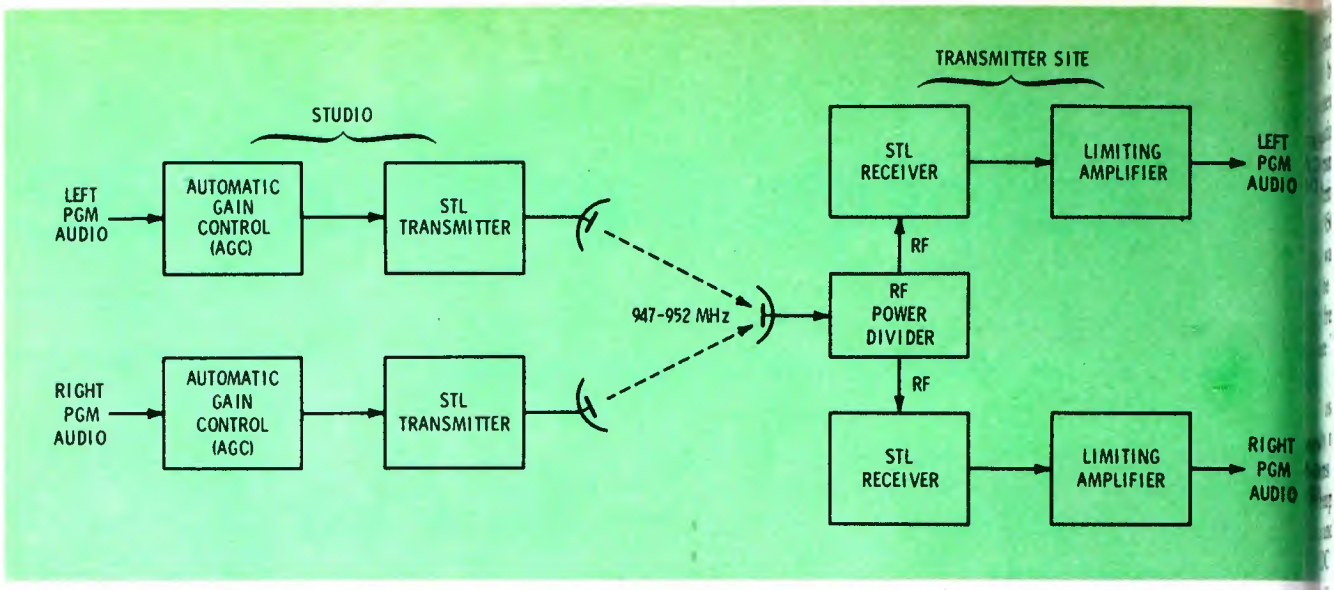

Figure E. Dual STL for FM Stereo. This configuration utilizes separate monaural STLs to relay left and right progr audio. Separate STL transmitting antennas are normally used. An RF power divider can be used to operate the two receivers from one antenna.

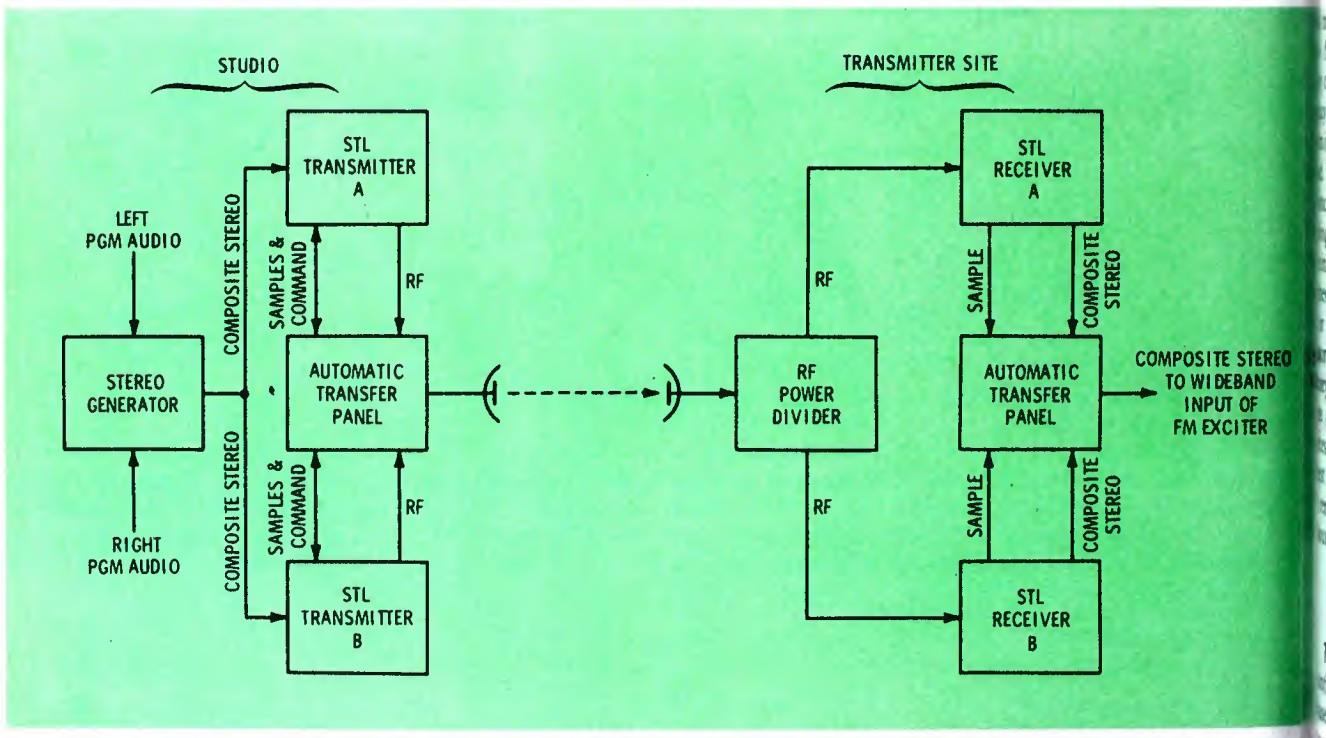

Figure F. Composite STL for FM Stereo with Automatic Changeover to a Backup System. The composite STL prov single-link service for FM Stereo. For this STL configuration, the stereo generator is located at the studio with the relaying the composite stereo waveform. The automatic changeover system shown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

STL Techniques

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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 sh also be available in the event failure. Here again, the STL eq ment selected will determine exact requirements, but some b instruments are worth noting. volt-ohm meter is normally used basic measurements of DC o ating parameters not metered

equipment itself. Should the transmitter not have a true SWR bridge built in, an in-line wattmeter can be extremely useful locating faults with RF connection transmission line and antenna. Remember, the STL operates the 950 MHz region and any external wattmeter or VSWR bridge must 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 proper response characteristics need to go to 1 GHz. While 100 MHz capability can be extremely useful, a 10 MHz 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 only function at the actual output operating frequency. The frequency-determining oscillator in current equipment typically operates at 100 kHz 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 easily rented or borrowed from a local source.

Other Services Through An STL

So until now, all comments have been based upon the STL relaying programming. Other services can also be combined on an STL, providing flexibility and versatility. As you will see 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 now enables a number of methods of obtaining the desired service. This is particularly true of the FM broadcaster. Both AM and FM equipment configurations will be discussed 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

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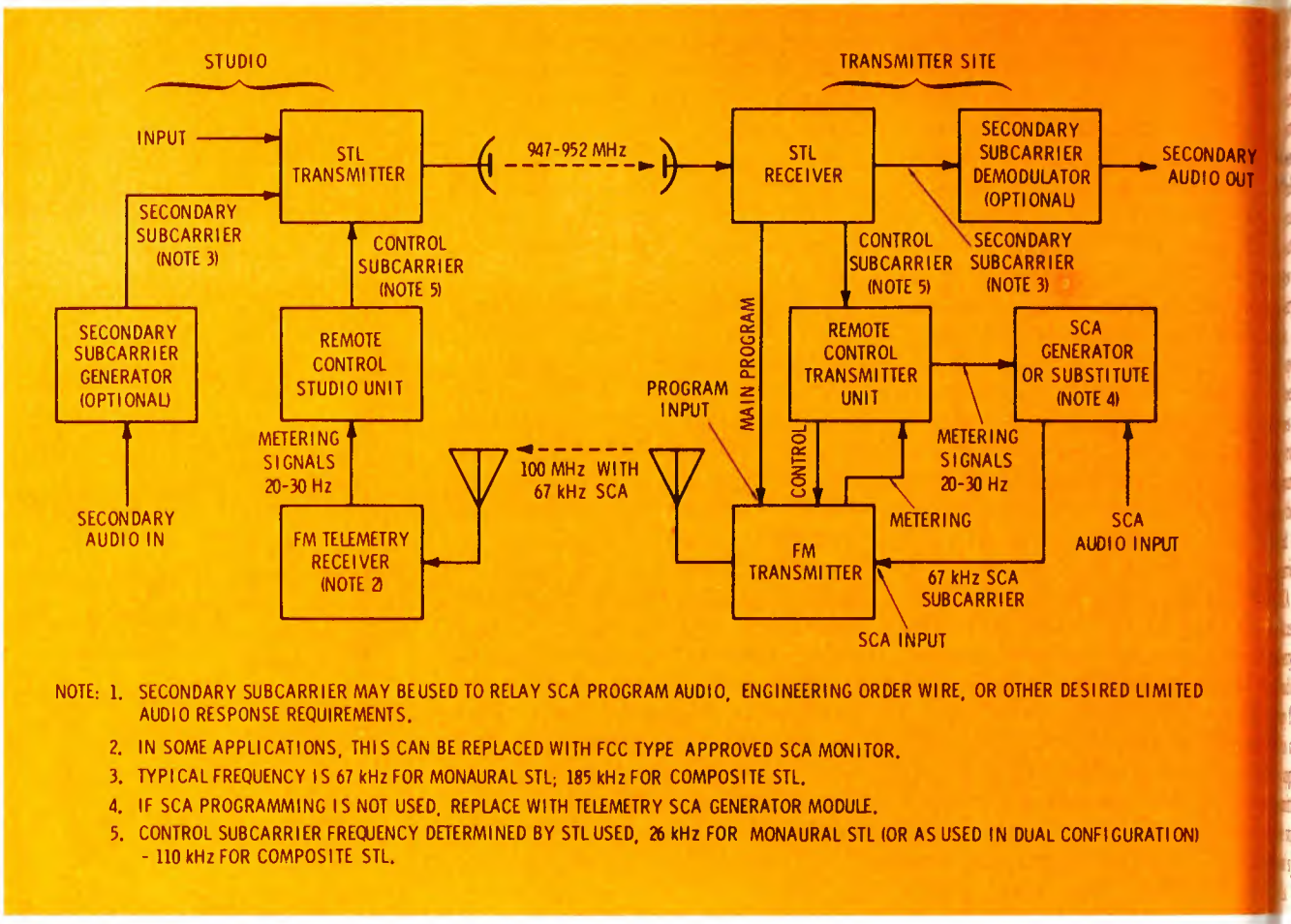

NOTE: 1. SECONDARY SUBCARRIER MAY BE USED TO RELAY SCA PROGRAM AUDIO, ENGINEERING ORDER WIRE, OR OTHER DESIRED LIMITED AUDIO RESPONSE REQUIREMENTS.

2. IN SOME APPLICATIONS, THIS CAN BE REPLACED WITH FCC TYPE APPROVED SCA MONITOR.
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.
5. CONTROL SUBCARRIER FREQUENCY DETERMINED BY STL USED, 26 kHz FOR MONAURAL STL (OR AS USED IN DUAL CONFIGURATION) - 110 kHz FOR COMPOSITE STL.

Figure G. FM STL with wireless transmitter remote control system.

STL Techniques

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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 useability.

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 selected 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 accommodating this service. Fig C is a block diagram of the b STL for monaural service. S gested positioning of audio p cessing equipment is shown.

In the use of an aural STL must always be remembered the STL transmitter is an transmitter. Varying amounts audio pre-emphasis are used STL transmitters. As with broadcast transmitters, 75 μsec pre-emphasis was common at time. Although 400 Hz or 1000 test tones are used at a level of dBm for testing purposes, progr ming should be applied at -5 d to prevent overmodulation of STL transmitter. More recen STL equipment has been desig specifically for AM applicati This equipment has a flat a response and does not employ emphasis in the transmitter and emphasis in the receiver. System

type are easier to set up and rate in AM service as the pre-hasis curve does not have to be sidered in establishing actual gram levels.

emote control is easily added totally wireless operation of the transmitter. In 1962, Moseley sociates, Inc., petitioned the FCC llow the return of a subaudible letry signal directly on the AM ier. A configuration depicting operation is shown in Figure Operation of such a system uires communications paths to from the transmitter site. mand or control information the remote control system is yed over the STL by an FM arrier in the same manner that SCA channel is used on an FM dcast transmitter. Metering or lemetry is returned as a single subaudible tone varying in frequency from 20 Hz to 30 Hz. This is mixed with program audio applied directly to the AM transmitter. The tone is recovered the studio and fed to the remote trol system.

TLs 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. □

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 quadraphonic 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 count The NRBA committee then pla to meet with Arbitron Radio ma agement to evaluate those co plaints which the NRBA belie merit attention by Arbitron. meeting together, the two orga zations will be able to pla certain of the complaints in pro perspective for the complainan and where complaints me action, the NRBA will work w Arbitron in an effort to devel corrective procedures to impro the overall service which Arbitr provides the broadcasting indus and thus the public, D stated that "in this manner, t NRBA will ensure that the voice its over 1000 radio station me bers will be represented in tho matters directly related to au ence measurement."

The NRBA has also offered assist Arbitron on such importa matters as audience diary securi unauthorized use of Arbitr Radio market reports and educa ing stations owners about t detrimental effects upon the ent broadcasting industry of dia hypes during radio sweeps.

The convention routine

The convention will open registration at 9 am October Registration will remain open un

m. The first sessions will run
n 10 am until noon.. Then at
0, the exhibit area, with the
est number of manufacturers
to show at NRBA, will be open
business until 5:30.
n Monday the general sessions
begin at 9 am. The sessions
edule will include special pro-
m emphasis on management,
s programming, research, and
ineering. From the looks of the
eduled sessions, this is one
vention where the entire staff
ld attend meaningful sessions.
course there will be some
ge benefits as well. There are
less than 55 hospitality suites
ady set up. Cocktail receptions
be held daily at 5:30. And
ediately following the recep-
on Tuesday, you'll have to
ose between a riverboat cruise,
suites, or the night life of New
eans.

The convention agenda

DAY, OCTOBER 9
M TO NOON

agement
Your Cash"
erator:
Geismeyer,
n. Covenant–C

Pam Strauss–C
KIKI-Honolulu, Hawaii

Jimi Fox–C
KTNQ-Los Angeles, Calif.

Bob Pittman–C
WNBL-New York

Bob Hanneberry–C
Consultant

all Market
Panel"
erator:
ter Colman,
-Ventura, Calif.

urban Radio"
k Fillippi,
D-Aurora,
ado

Dunn–C
-Utica, N.Y.

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

Paul Newhoff
WERE/WGCL
Cleveland, Ohio

ramming
ing a Market
torm"
erator:
Herpe–C

Lee Abrams–C
Burkhart/Abrams, Inc.

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NRBA

continued from page 43

Phil Roberts–C
NTC Sales Mngr.
Greater Media

Engineering
"The Ins and Outs of An FCC Inspection"
Moderator and Panelists
TBA

MONDAY, OCTOBER 10
3 PM TO 5 PM

Management
"The Broker Panel"
Moderator:
Steve Heatter–C

"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

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

"Old Line–Your Audience is Too Old"

"Rock–I Can't Stand Your Music"

"Country–Your Listeners Have no Money"
Karl Hirsh

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

"Soft Rock"
Dick Drury–C

TBA–"Magic Music"

TBA–"TM Rock"

Research
"New Applications"
Moderator:
Jim Duncan–C
American Radio

"Rad Shed"
Ellen Hulleburg–
McGavern/Guild

"Katz/Prob"
Bill Shrank–C

"Brain Plan"
Bob Galen,
Blair Radio

Engineering
2 Concurrent Sessions
"How to Compet With FM Sound"
Moderator: TBA;
Allen Roycroff, Pres. Broadcast Services;
Augie Prestal, A. D. Ring

"Improving FM Coverage for Bet Ratings"
Moderator:
Gunther Meisse, WVNO-Mansfield, Ohio; Eric Small, Eric Small Assoc
Peter Onagan, Jampro; Bob Bemish, Starr Broadcasting

TUESDAY, OCTOBER 11
9:30 AM TO NOON

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

"EOE" "Labor Relations"

"Sales Matters"

"Double Billing Lotteries"

"Payola"

"Promise vs. Performance"

"Minorities in Broadcasting"

Sales
"The National Re Panel" Moderato
Jack Masla–C

"Is There a Plac in the Sun for a New Rep Firm?"
Lew Faust–C

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

"Small Market Reps"
Bob Walton–C

"Group Owned Reps" Bob Duffy-
Cristal & Co.

ecialized Reps"
Frischling, H.R.
e

ramming
king Money
News and
ts" Moderator:
Worth, MBS–C
Kemp–C
H-Houston
Newhoff–C
E/WECL,
eland
Adamson–C
), Seattle
Viands–C
ni

motion
tion Promotion"
erator:
Latto–C

e it Away"
McDaniel–C
Z, Huntington

"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

SDAY, OCTOBER 11
PM TO 5:00 PM

Legal Panel
erator:
Schattenfield

Panelists To Be Announced

NESDAY, OCTOBER 12

agement
cess is Where
Find It"

erator:
Mellgren–C

ssical Music"
Richer, WNCN,

autiful Music in
nall Market"

Bonin–C
A, New Iberia,

ntry in the
City"

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 Doelitzch
WDDD, Marion, Ill.

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NRBA

1977 CONVENTION EXHIBITORS

AKG Acoustics
Ampro Broadcasting
Audio Sellers, Inc.
Automated Processes
Automation Electronics
Belar Electronics
Bloomington Broadcasting
BPI
Broadcast Electronics
Broadcast Programming
CBS Technology Center
Cable Wave
Collins
Capitol Magnetics
Consolidated Electronics
CCA
Cetec
CSI
Broadcast Control Data
Delta Electronics
Dolby Labs
Fred Nudd Corp.
Fidelipac
Harris
IGM
Ivonics
International Tapetronics
Jefferson Data Systems
Johnson Electronics
Kaman Sciences
Kay Industries
Lansing Sound
LPB
Marti Electronics
Marathon Products
McCuroy
McMartin
Micro Controls
Microtrak
Minneapolis Magnetics
Moseley Assoc.
Orange County Electronics
Orban Assoc.
Otari
Pacific Recorders
Paperwork Systems
Phelps Dodge
QEI
Ramco
RCA
Rapid Q
Revox
Robins Broadcast
Scully
Eric Small
Sono-Mag Corp.
Telex
Tapecaster
TFT
UMC
Wilkinson Electronics
Windchime Communications
Ward Beck Systems
Thomas Valentino
Pickering

NRBA

HOSPITALITY SUITES

Compu/Net
CaVox
Burchill
Automation Electronics
Concept Productions
Orban Assoc.
PSI
Scully
Capitol Magnetics
Arbitron
McGavern Guild
DiscLocation
RCA
Kaman Sciences
McMartin
Masters Broadcasters
Bloomington
Lansing Sound
Churchill Productions
Buckley
Kalamusic
Masla
TM
Windchime
AP
Tanner
Drake-Chenault
Continental Recordings
Radio Arts
Broadcast Electronics
Broadcast Productions
Chicago Radio
Cox Data
CCA
Harris
Filmways Radio
Audio Sellers
Selcom
Buckley
Peter Productions
Katz
Blackman
Mutual Broadcasting
IGM
Cetec
McCurdy
Dolby Labs
Johnson
CBS Technology Center
Collins Radio
Jefferson Data Systems
Tapecaster
Studio B
UPI

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 ouptut 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 le condition.

Other internal problems of gat could cause the output to be st high or low. The important ch acteristic is that the output is *changing* when input signals a normal.

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

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

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

Short circuits

A short between any node (a cessible operating point) and V_{CC} ground external to the IC is distinguishable from a short inter to the IC. Either will cause t signal lines connected to the no either to be stuck high (for shorts V_{CC}) or low (for shorts to groun When this type of failure is e countered, a rigorous physical e amination of the printed wiri

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 fine one, run the sharp point of a scriber gently

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Figure 1

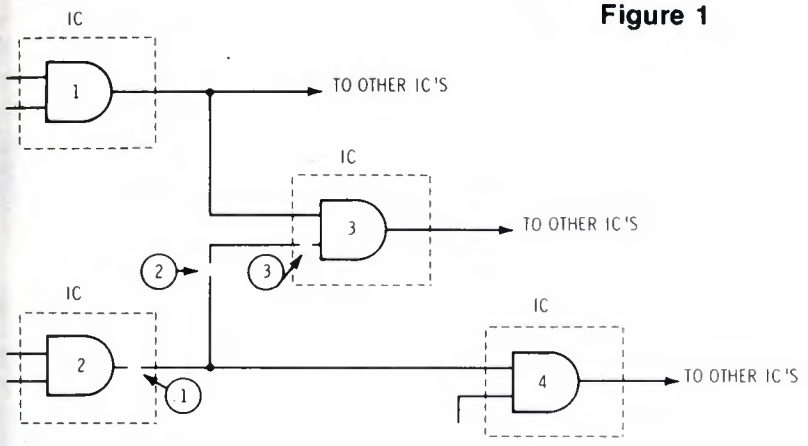
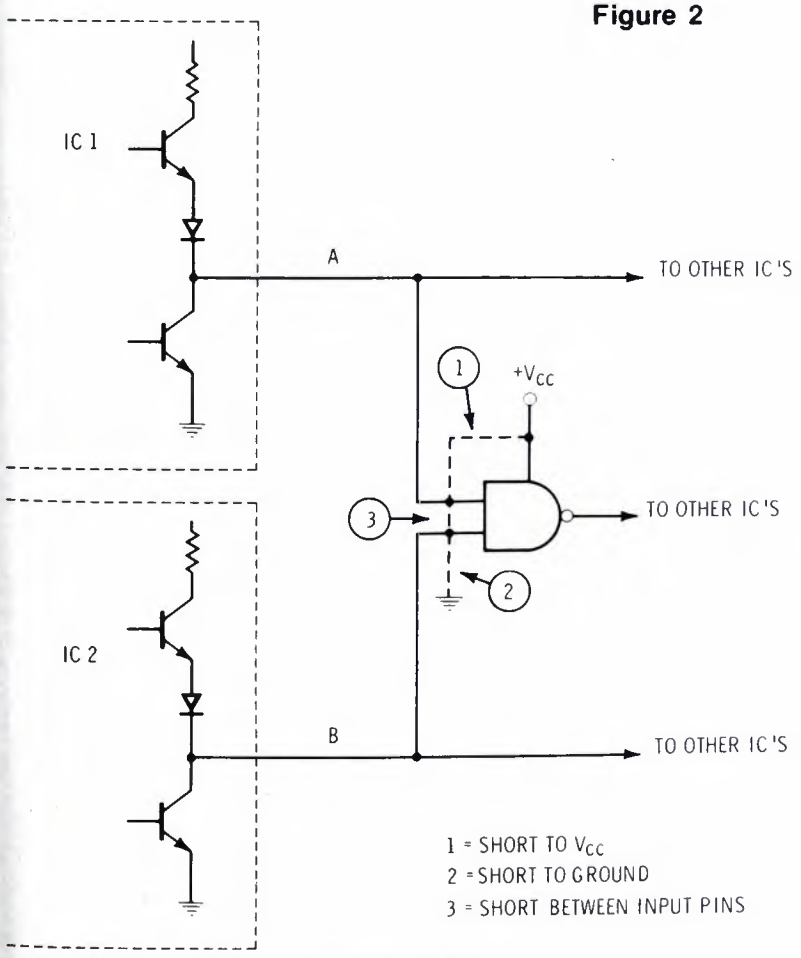


Figure 2



continued from page 49

between the runs to remove t short.

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

A short between input pins (poi 3) is not as easy to analyze. No the typical output circuitry of log ICs in Figure 2 for the purpose analysis.

Whenever the outputs of IC1 a IC2 go high simultaneously or lo simultaneously, the shorted pins w have no effect on operation. Ho ever, if one output tends to go hi while the other output tries to low, the circuit operation will fa The output attempting to go hi will supply current through t upper saturated transistor of totem-pole output stage while t output attempting to go low will si this current through the saturat lower transistor of its totem-po output stage. The saturated trans tor to ground pulls the shorted pi to a low state. Note that the outp of the NAND gate shown in Figure would be stuck in the high mo (low only when both inputs a high). If the gate was an AN circuit, the output would be stu low.

Probing opens

In tracing high-impedance pat (opens), the straight logic probe scope is most efficient. This is al highly efficient in locating the fa from shorts. However, for traci the low-impedance path caused by short, the current tracer such the Hewlett-Packard model 547 most efficient.

In lieu of a current tracer, sensitive ohmmeter with millio resolution can be used. Remove t circuit board, if possible. Using t lowest scale on the ohmmeter, p one probe on the input or output p and other on ground or V_C depending on the nature of t short. Hold the probe lead ve steady on the ground or V_{CC} poi and move the other probe from t IC pin along the printed circuit ru You will notice a decrease in r sistance as you approach the l cality of the short, and an increa in resistance as you move aw from the short. Move to the point minimum resistance.

rom blue ananas to ag tails

Dead silence

hat was always the most grim, ressing but necessary segment of morning programming recently oked an unexpected grin when local funeral home's obituary rt swallowed a blue banana.

he obligatory organ struck up painful dirge as our morning announced the funeral arements of the previous eve- 's dearly departed. After he ed, "And now, today's prayer," egan to play the tape that was posed to contain the pre- rded prayer, only to find dead ce. With the listening audience ing their heads in reverential ce, awaiting the daily prayer, DJ angrily groaned, over the mike, "Oh, GOD!!!" *Rick inson, WBHN Radio.*

And on the same wavelength...

s with most small class IV ions, WBAT has had many an- ncers come and go, each with y tales of "blue bananas." One he announcers related an ex- ence that happened to one of Sunday morning announcers at nall FM station in Maine, back n all religious programs came he old 16-inch transcriptions.

fter sign-on the announcer ted the disc, locked up and t across the street for breakfast. preacher started his program during the opening prayer— d the Lord Jesus Christ"—the le stuck in the groove and the ase "Jesus Christ" was repeated. telephone started ringing but e was no one to answer it. After ut 10 minutes the irate listeners an calling the manager at home, him out of bed and told what heard.

he manager dashed to the ion and, upon arrival, met the ouncer returning from break- . After correcting the stuck le the manager promptly fired announcer and completed the t. *Warren Arnett, WBAT Radio.*

continued on page 52

from blue bananas to sag tails

continued from page 51

House calls are not a thing of the past

As a TV newsman, regu telephone calls from viewers w want to comment (or compla about a news story are usual me.

Some callers, however, quic wear out their welcome with peated complaints about the sa thing. The news staff had a p ticularly difficult time with caller, but a new employee sol the problem—and gained for h self a warm niche among the m experienced personnel.

After listening with understa ing concern to the complaintant several minutes, the new man spo up sympathetically: "Madam, we really sorry you're having so mu difficulty with our broadcasts. you'll just give me your name a address we'll send a crew out f thing in the morning to disconn our station from your set."

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

Clipping the problem at the sour

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

Our station never had a bo fide chief, all the maintenan work had always been contrac out. With a construction permit a new FM station to go along w the AM, and knowing that planned on putting in an autom tion system, the owner of station decided to hire a chief. this case he hired a young man w was fresh out of space (literally, was always high on something). T young chief immediately set out rebuild the entire station, ev though the operation had be working smoothly before his arri ...all of this the owner patien tolerated until one night about t weeks after he arrived, the you engineer decided he was going tear into our five-spotter. He co

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 incidentals). 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.*

nded the sign-off DJ to help him immediately started to destroy five-spotter, during which the chine became unplugged from AC receptacle. The DJ noticed and tried to tell him, but he isted **he was the engineer** and DJ was not technically inclined e could not possibly know what problem was.

n order to find the supposed ak in the power line he started ing the power cord (at the chine) one inch at a time until. ut ten minutes before sign-on, finally discovered the problem plugged at the wall. Not having power cord handy, he wired in r old one-spot machines and had m placed all over the control rd.

leedless to say, when the station ner arrived that morning and the mess, the young engineer w his final pay check and I nkfully) received a phone call. *Greer, KVOW Radio.*

ook, up in the sky, it's a bird, it's a plane, it's....SPLASH!

While running camera for dge Podge Lodge," a clever

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.

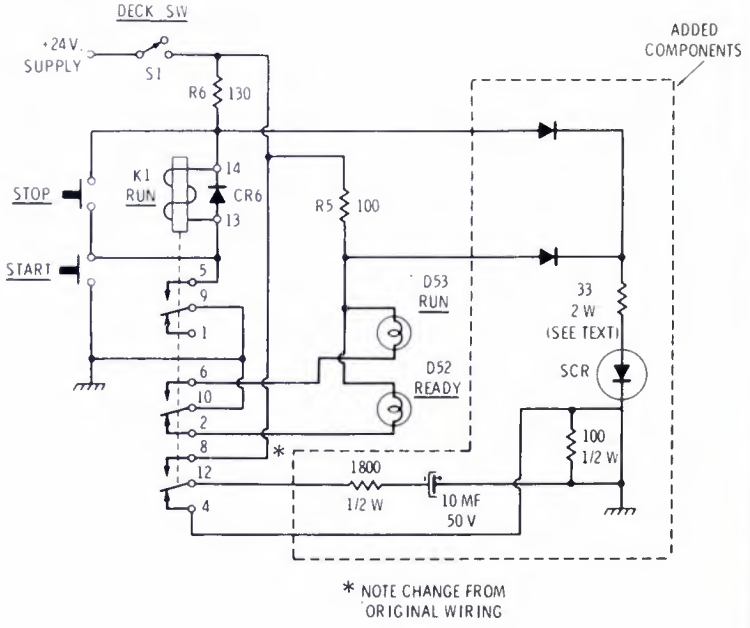
If the operator has neglected to remove an already-aired cart, the machine is disabled until a new cart is inserted. Existing panel lamps will indicate which status the machine is in at all times. Faced with a "do something **now**!" panic situation, the operator can, without reading labels, instantly 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 requi to the original compact wiring. T green wire on pin 12, K1 R Relay socket (carrying the 24 V supply) is removed and reconnec to pin 8 of the same socket.

When a cart is playing, K1 energized, closing contacts 8 a 12. This charges the added capa tor in the 24 Volt supply. When machine stops and K1 is releas contacts 4 and 12 close. T capacitor then discharges throu the 100 and 1800 Ohm resist triggering the gate of the SCR i conduction until its anode supply interrupted.

The SCR anode current flowi through R5 and R6 reduces t voltage available at K1 coil a DS2 Ready Lamp to a level (abo 11 volts). This disables the R Relay. At the same time the Rea lamp is **nearly** extinguished, in cating that the cart has alrea aired.



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

he value of the SCR anode stor was chosen so that the is just barely lit, not com- ly out, during SCR operation. his way a burned-out lamp will cause operator confusion. The I arrived at was 33 Ohms imum, but you can increase to a value giving the lamp iance you prefer. With this one ption, component values are in ay critical. The two diodes and may be any with a minimum Volt rating. I used a 2N5061 . I would advise replacing the inal 100 Ohms ½ Watt R5 with Watt size, due to its increased ent flow during SCR operation.

desired, you can implement addition so that its operation be readily defeated. The capaci- and the two resistors are wired tly at the K1 socket, and a ll then run from pin 4, K1 ket, to an unused pin of J1, the in Remote Control socket. (Pins 17 and 18 of J1 are available.) ther wire is run from pin 9, K3 ondary Cue optional relay ket, which is the junction of R5 the Ready and Run lamps, to her unused pin of J1. The tion of R6 and K1 already ears at pin 7 of J1.

he remaining additional compo- s (the SCR, anode resistor, and steering diodes) are now wired the J1 mating plug (supplied the machine) by using pins 7, 1 (ground) for the SCR ode, as tie points. Then, to re the machine to a repeata- y function, merely remove the ote control plug.

hould you prefer the machine to in the repeatability function to **only** notify the operator n the inserted cart has already d, by way of a dimmed Ready

continued on page 56

Station-to-Station

continued from page 55

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

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

I think you'll find this idea e... adaptable to other makes of ... tridge playback machines ... additional modifications, such... adding series resistors in the e... ing relay and lamp circuits. In ... event, it is well worth the small ... vestment in components and ... so as to eliminate program ... ruptions and red faces!

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 somewhat inefficiently. The s... information currently carried on ... double sideband suppressed-car... subcarrier could be carried just... effectively on a single sideband, ... upper sideband being redund... and useful primarily in that ... simplifies the receiving hardw... substantially.

The effective sampling freque... is 38 kHz; thus, the upper frequ... cy limit is 19 kHz. If we were to ... to encode a 20 kHz tone, it wo... move from main channel to s... channel and be decoded at 18 k...

Regardless of whether lowpo... filters are employed, the maxim... bandwidth of the FM stereo sys... is 19 kHz. Thus, lowpass fil... have three functions: to prev... aliasing distortion (which is hig... offensive to the ear, being h... monically unrelated to the desi... signal and sounding like teleph... crosstalk); to prevent interferenc... the pilot; and to prevent out... band emissions and interference... SCA subcarriers. Since our OP... MOD-FM successfully deals w... the problem of overshoot in th... filters, we can think of no ... vantages whatever in omitting th... from the stereo system—only s... ous disadvantages.

I hope this will, to a cert... extent, assist your readers in und... standing this term.

Robert Ort...
Chief Engin...
Orban/Broadc...
San Francis...

How WCCO solved their speed problem

By Hal Schardin, *WCCO Radio, Minneapolis*

Varying the speed on synchronous motors 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 finest lubricating oils into the consistency of peanut butter. To correct tape speed errors, record the material at normal speed onto a two 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

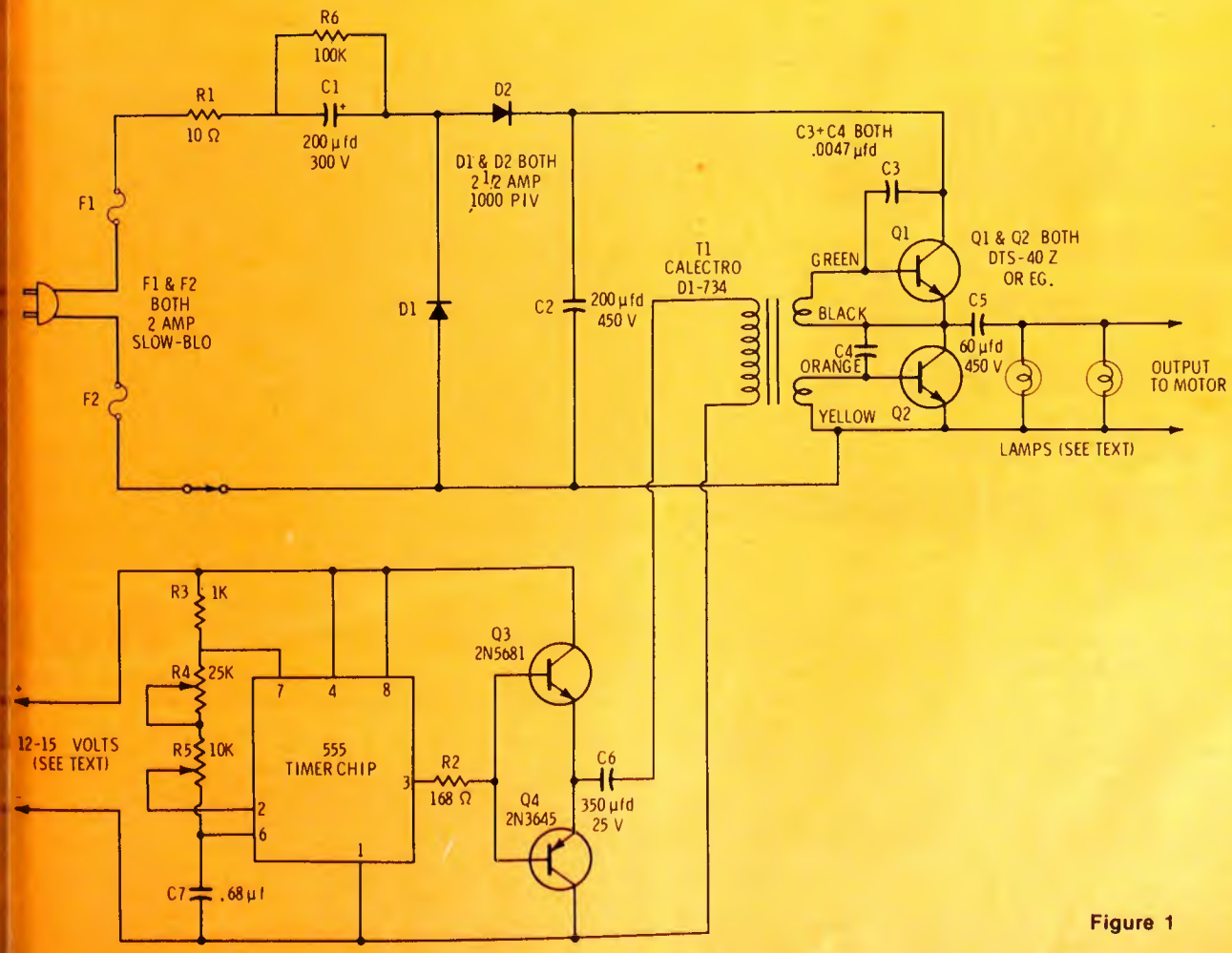


Figure 1

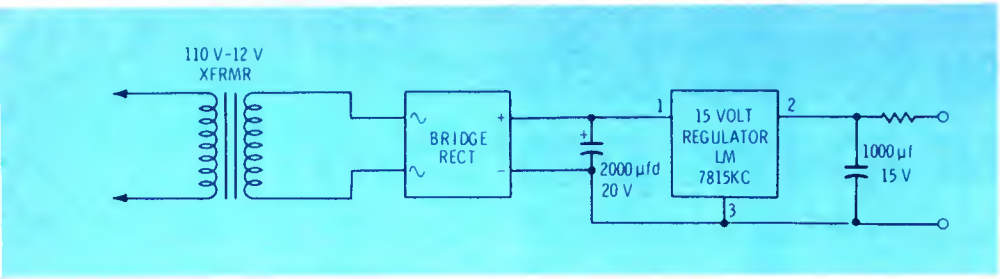


Figure 2. A possible low voltage power supply for the oscillator section. The resistor should be selected for proper drive (see text).

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 ha more of a sinusoidal output, why should we? The motors v quite well on a square wave, the transistors dissipate less when going right from saturatio cutoff (switching mode). And lin operation would require the us biasing and temperature com sating components.

This unit is not affected no-load operation (as is the p viously mentioned power amp-tra former combination). However shorted output would raise ha with the output transistors (a true with the amp-transformer s 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 Q 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 ments was accomplished by usin 10-turn pot for R5. A vernier on ordinary pot would accomplish same thing.

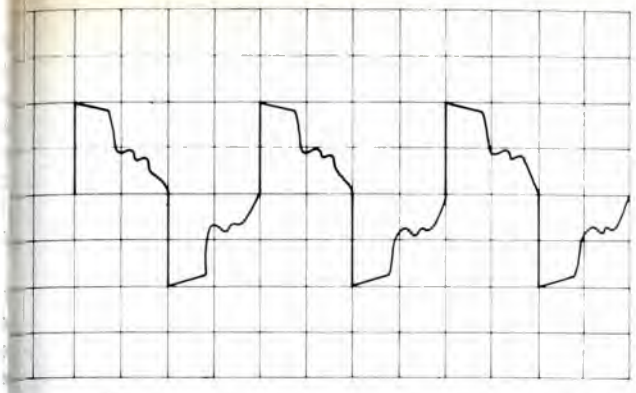


Figure 3. Shows transistors not turning on completely, due to insufficient drive. Note small amount of ringing.

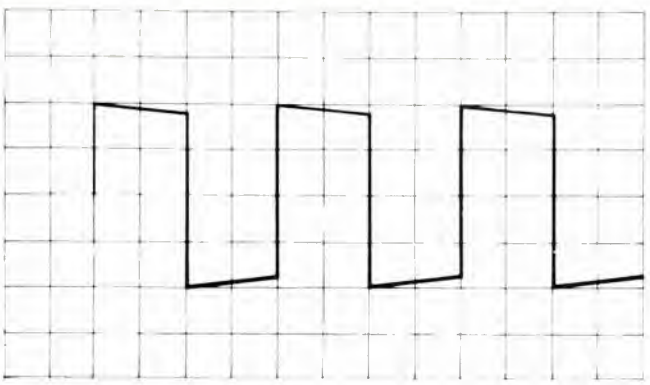


Figure 4. Shows proper drive on the transistors. Slight slope is due to capacitor C5 charging.

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 fuses (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 T1'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

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Speed problem

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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 12-15 volt range. If not, you m wish to check the various trans tor manuals, or hobby books. T untested possibility of a circuit shown in Figure 2.

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

The author adjusts tape speed WCCO, while CE Chuck Kunze wat es the operation. (*Photo by Den Long, WCCO*)

PARTS LIST

C1,C2 200 uf / 300 volt electrolytic

C3,C4 .0047 uf / 600 volt ceramic disk

C5 60 uf / 450 volt electrolytic

C6 350 uf / 25 volt electrolytic

C7 .68 uf / 15 volt electrolytic

D1,D2 2½ amp / 1000 p.i.v. diodes (Sylvania ECG 125, or eq.)

F1,F2 2 amp slow blow fuses

Q1,Q2 DTS-402 NPN silicon transistors (Sylvania ECG 163, or eq.)

Q3 2N5681 NPN silicon transistors (Sylvania ECG 128, or eq.)

Q4 2N3645 PNP silicon transistor (Sylvania ECG 129, or eq.)

R1 10 ohm / 20 watts

R2 168 ohm (180 ohm) / ¼ watt

R3 1000 ohm / ¼ watt

R4 25K trimmer

R5 10K ten turn pot (see text)

R6 100K / ½ watt

S1 On / off switch

T1 Calectro D1-734 Transformer

Also—Heat Sinks for Q1 and Q2

pe across the load, then apply 12 s to the oscillator section.

NOTE: In the next step, the scope l be hot with respect to ground, proceed cautiously. Apply AC wer and observe the waveform. It l probably look like the waveform Figure 3. Start increasing the tage to the oscillator section and p when the output looks like the ve in Figure 4. The transistors being properly driven at this nt.

n 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. □

people in the news

Jim Bennett, an acknowledged authority on te- vision transmitter technology, has been promoted the Board of Directors of Pye TVT Limited director of transmission engineering. Bennett forme was chief engineer.

The Hughes Aircraft Company has appoint **Norman P. Weinhouse** as manager of satellite ea stations for their microwave communications produ ...**Frank D. Baker,** former manager of engineeri services at Trans-American Video, has joined Ver- tile Video Inc., a teleproduction center located on San Francisco peninsula, as chief engineer.

E. G. "Ted" Atlee has been named manager market planning for National Semiconductor C- poration's Computer Products Group...**Allen Coll** has joined Automation Electronics, Inc. as sa manager.

Paul R. Beavin has joined Scientific-Atlanta national sales manager of their Cable Communi- tions Division...**John Dale,** manager of the Magne Tape Division of Fuji Photo Film USA, announc the addition of **Michael J. Carney** as broadcast vid specialist. Prior to joining Fuji, Carney was w Memorex.

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

Wilson C. Wearn, president of Multimedia, I and chairman of the Joint Board of Directors of t NAB, and NAB President **Vincent T. Wasilewski** a pointed two broadcast executives to the Associatio Engineering Advisory Committee. They are **Willi H. Hansher,** vice president for engineering, T Broadcasting Co., and **William E. Garrison,** vi president for engineering and government relatio Multimedia Broadcasting Co., Greenville, S.C.

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

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

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

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

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 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 printing division prior to his advancement...**Linda K. Hubkirk** has been appointed vice president of Imero Fiorentino 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 Northwestern Technology, Inc., has appointed **Carl Peterson** as west coast regional sales coordinator.

Robert J. F. Whistler, a founding member of Granger 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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FCC begins inquiry on FM quad standards

The Federal Communications Commission (FCC) ha begun an inquiry on whether to adopt standards fo FM quadraphonic radio broadcasting. The action is response to petitions by Pacific FM, Inc., the Gener Electric Company and CBS Inc.

There are three basic quadraphonic transmissio systems: discrete four channels—4-4-4; four channe by combining the audio channel into three signals be decoded later in the receiver back into fou channels—4-3-4; and four channels by an encodi process into two signals transmitted as left and rig stereophonic signals, which then are decoded in th receiver back into four channels—4-2-4.

The Commission said the purpose of its inquiry is t determine whether there is sufficient public an industry interest to warrant adoption of standards fo quadraphonic broadcasting, and, if so, to develop record that would assist the FCC in formulatin standards.

Issues to be resolved

Some of the issues to be resolved before the FC can propose to adopt specific standards, if any, fo quadraphonic broadcasting, and on which it asked fo 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 o several system designs proposed by various manu facturers.

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

3. Whether the broadcast industry is interested an willing to spend the money necessary to transmi quadraphonic sound; whether there are sufficien listeners interested in quadraphonic sound willing t spend funds to purchase new equipment or adap existing equipment; and whether sufficient softwar (program material) would be available for discret quadraphonic broadcasting.

In addition to determining the ability of monophoni and stereophonic receivers to function normally in th presence of quadraphonic broadcasting, the FCC als said it was interested in determining whether these receivers could be modified or adopted, through practical means, for quadraphonic and, compare with current stereophonic receivers, how much more quadraphonic 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 o the quadraphonic systems might create problems o produce less than optimum sound reproduction o station coverage. Therefore, it said it was importan that broadcasters consider the effects on statio

rage, protection ratios, increased occupied band- and multipath that are characteristics of 4-4-4, and 4-2-4 systems.

e FCC urged radio equipment manufacturers, dcasters and the listening public to make known interests and to contribute relevant information sist it in this proceeding.

mments are due by September 15, replies by ber 17.

SFA tall tower going up

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

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

ordination of the entire construction project is handled by Richard C. Payne, WSFA-TV chief neer. Payne also supervised the construction of tation's current tower when Channel 12 went on ir on December 25, 1954.

rvice from the WSFA-TV Tall Tower is scheduled gin in September.

dio code board asked review time standards

e radio board of directors of the National ciation of Broadcasters (NAB) has directed the Code Board (RCB) to review its time standards pecified four areas for consideration.

e board said RCB should consider (a) total nation of time standards, (b) bringing time ards in line with current FCC policies, (c) ork stations carrying uncompensated commercials wscasts, and (d) any other action the Board consider feasible.

o approved by the board was the establishment new NAB radio committee to represent small, um and large markets. The small market radio hittee and radio information office committee will bolished.

addition, the board of directors endorsed the ation of a committee to assist NAB's public affairs rtment in its relationship with the broadcast try and general public.

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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 that 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, which 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 FMs now transmitting stereo. It said 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 for 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 has technical limitations, susceptibility to interference or other factors that would limit its stereo quality and what differences the listener might experience between AM and FM stereo.

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

h the following basic public interest issues must onsidered:

- he actual public interest and need for an AM reophonic broadcast service;
- he extent the broadcasting industry and the anufacturers of home and automobile receivers are erested in meeting the public's interest;
- he impact AM stereo would have on the continu- development of FM;
- he cost impact on broadcasters for equipment r programming and on the public for receivers;
- he compatibility of AM stereo with all existing rnational radio regulations, terms of the North erican Radio Broadcast Agreement and any other rnational agreements to which the United States party;
- he extent to which the FCC should regulate stereo rformance from studio through radiated signal to ure that the public is provided with a quality gram service;
- he possibility of a "standard" response char- eristic for AM stereo receivers to avoid the rent problem in AM broadcasting where stations special processing of their audio signals to rcome limitations in many receivers.

he Commission requested the public, broadcast- and manufacturers of both broadcasting and iving equipment to comment on Kahn's recom- dations, to respond to specific questions con- ning the economic, operational and technical cts of establishing AM stereo and to submit any itional information they believe should be sidered.

he FCC said it must be recognized that AM stereo ht have both an operational and technical impact xisting AM in such areas as signal coverage and ophonic signal quality. Therefore, it stressed the information requested would be needed in mpting to balance this potential impact on AM o and the public interest and need for AM eo.

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

ee photo tip radio program available from Kodak

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

itable for a variety of programming uses, the ice will be distributed in 13-week packages. The page scripts can be scheduled regularly, used as material on music and talk shows, or used in ection with commercials for photographic equip- , supplies and services.

introductory-offer package covering August and tember is being mailed to program directors this th. Stations interested in this service also can in the introductory package by writing "Photo Tip he Week," Corporate Information Department, man Kodak Company, Rochester, NY 14650. □

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 assignab submasters and two program ou puts, plus foldback & echo sen with equalizers available on eve channel.

MAP "IMPAC" Series consol come made to order, either wired in "kit" form. Modules are availab 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-bas MQS-100 series synchronizing sy tem can cue and synchronize a three mag tape transports includi video, audio and mag film simu taneously. The SMPTE/EBU Ed Code, used for indexing of th tapes, need not be identical an tapes with drop-frame and no drop-frame formats can be inte mixed.

System modes include high-spe search and cue, follow the leader "Chase Mode," synchronized pl back, fast and slow re-synchroniz tion and roll-back with automat re-synchronization. Operational e fiency is demonstrated by contr simplicity. One button actuates transports to roll back, start fo ward and synchronize automa cally.

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

For More Details Circle (78) on Reply Card

Digital control system

Totally automatic operation of remotely-located broadcast tra mitter is possible with the mod DCS-2A digital control system fered by *Moseley Associates, In* The system employs fully digi techniques and provides comman telemetry, status and automa logging functions. Two basic se ments constitute the DCS-2A a companion computer option.

All basic functions desired f command and observation of a r motely-located transmitter plant a provided by the DCS-2A. The include direct commands and t

...metering of operating parame-

...lly of all command functions ... built-in system checks assure ...ation of the desired command. ...metry is in the form of a full ...digit number, with a resolution ...01%. Additionally, a parameter ...ing system will automatically ...rd desired parameters. The ...s subsystem enables observa- ...of other events as they occur. ...DCS-2A system will accommo- ...a number of separate transmit- ...ites.

...ith the computer option, addi- ...l flexibility is added to the ...m, such as totally automatic ...ation of the transmitter plant. ...r aids include a cathode-ray ...lay terminal (CRT) for the ...ltaneous display of a large ...ber of parameters.

...or More Details Circle (79) on Reply Card

Digital noise reducer

...omson-CSF Laboratories has in- ...duced a digital noise reducer ...ing it possible to process in- ...ng TV signals with mathemati- ...precision. Incoming video is ...zed in a picture element by ...re element basis, in real time, ...not as a function of the overall ...re.

...ture improvement is dramatic ... noise reducer achieves a 12 ...gnal-to-noise ratio improve- ... Thus a marginal 40 dB input ... TV signal becomes a high ...y 52 dB output signal. Achiev- ... improvement with the new ... noise reducer may even be ...gh as 15 dB. The noise reducer ...fective at low frequencies so ... streaky chroma noise often ...nt in ¾-inch tape recorders ...e removed.

...r More Details Circle (80) on Reply Card

Auxiliary Transition Unit

...hmond Hill Laboratories has ...nced their Auxiliary Transi- ...Unit (ATU), designed to expand ...apability of any existing pro- ...n switcher. It can be incor- ...ed as an option in the RGL ...300 series of switchers.

... ATU is a complete mix-key- ...ystem with sync-non-sync fade ...ck capability. When used on

continued on page 70

new products

continued from page 69

the output of a mixer, the program bus feeds imput "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. Multichannel 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-controlled double conversion ampli with an intermediate frequency 10.7 MHz. With the AGC sw turned off the amplifier has a t gain of approximately 76 dB, the level potentiometer set at m mum. The linear signal to modulation monitor is taken of center tap of bifilar transform Power supply voltage and sig level information are obtained f the 571 AM modulation monitor.

The model 572 is supplied wit shielded resonant loop antenna gether with 50 geet of RF-58 coa cable. Sensitivity is 500 microv for 45 dB S/N at 100 perc modulation. Residual hum and n are greater than 50 dB below percent. Distortion is less than percent. Bandwidth is -6 dB p minus 16 kHz; -60 dB plus-minus kHz.

Dimensions are 3½ inches hig 19 inches wide x 9¼ inches de The maximum operating tempe ture is 131°F (550°C) ambient.

For More Details Circle (83) on Reply Card

Recording console

Quantum Audio Labs, Inc. introduced the QM-168 record console, an eight-buss console v 16 inputs.

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

The stereo monitor has pu button selection of buss, line playback; separate control for a tional cue masters and solo c trols; and talkback slates to all e busses, two cue busses and studio monitor feed.

For More Details Circle (84) on Reply Card

Microphone

A new microphone, featuring smooth, flat frequency response speech, vocal and instrumen pickup, has been announced *Shure Brothers, Inc.*

The SM59 microphone is a namic type with a wide 50 15,000 Hz frequency response t provides clean reproduction with a presence peak in the hig frequency range. This featu coupled with its anti-feedba cardioid pickup pattern, makes SM59 ideal for use in studios, performances, churches and m ing rooms.

Another feature of the SM59 is

tented mechanopneumatic shock unt system which reduces me-anical noise and pickup of floor d desk-stand vibrations. A special "op" filter protects against ex-sive breath sounds.

For More Details Circle (85) on Reply Card

¾-inch videocassette cleaner/evaluator

Television Equipment Associates' Viet, model U 1, is a table- or k-mounted machine for auto-tic cleaning and evaluation of matic ⅔-inch videotape cas-tes at high speeds. Cassettes are sitioned in the transport and erating controls are initiated ich cause the machine to draw a o which is presented to cleaning luation stations. The machine nsport shuttles the tape to its l, automatically reverses, re-ds tape to the front end, and racts the tape loop. Tape clean-n is accomplished on both the ward and reverse pass and luation of physical damage on erse pass only. An erase head in tape path—when actuated—will uction on both forward and re-se cycles to erase tape to proximately 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—microphone input 78 dB ±1 dB, line input 80 dB minimum; maximum continuous sine wave power, +24 dBM ±.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

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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 trnasmission 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, rock concerts and traveling shows, movie and television productions.

The entire system can be used as 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

mponents to build their own stom-tailored system.

For More Details Circle (91) on Reply Card

Satellite earth station receiving system

Farinon's new FV4ESR Earth tation Receiver System for 3.7-4.2 Hz video satellite reception fea- res a dual-conversion IF hetero- ne receiver and a transmission elf providing a variety of base- nd treatment options.

Output options include combined deo and aural subcarrier for RF annel modulation or baseband crowave, 70-MHz output for IF terodyne microwave, or video and dio outputs for baseband micro- ve and cable distribution sys- ns.

Optional plug-in equipment in- des: AM and FM program trans- ssion channels; orderwire chan- ls; clampers; remote control and nitoring equipment; FM cueing; d 4.5/5.5-MHz aural carrier nerators. The system is fully mpatible with 525/625-line NTSC, L, PAL-M and SECAM system quirements.

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 ¾-inch cassette recorder-player.

The new camera is equipped with three ⅔-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

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new products

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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 Colormatch 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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wer located below the picture . A keyed back-porch clamp ntains true black level when rating with either composite or composite video.

For More Details Circle (96) on Reply Card

Wow and flutter meter

new wow and flutter meter for cking and alignment of audio- videocassette recorders and ntables has been introduced by *ips Test and Measuring Instruets, Inc.*

ne meter, PM6307, consists of a tal-controlled oscillator at 3 kHz .15 kHz, a measurement section two analog meters indicating and flutter to 3%, each in ne ranges. Measurements can be e using a weighted frequency onse, a linear frequency reose and via an external filter for ial work in the laboratory.

he PM6307 can differentiate veen electrical and mechanical blems. Generally excessive wow utter readings are indicative of hanical wear or failure and is often associated with faulty ronic circuitry. A standard DIN t/output socket located on the t panel of the meter easily nects the instrument to be tested. There are also BNC connections 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 sytem; 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 automatics with digital memory and intelligent, digital controls that streamline operations while minimizing 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 diagnostic interface with the camera automatics, the operator is informed when a command cannot be complete and why. The BCC-10's multi-

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new products

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plex system also permits the use of a ½-inch (12.7 mm) ultra-small cable.

BBC-10 offers "on demand" ACT for extended tube life. With the ACT system off, BCC-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.)

For More Details Circle (99) on Reply Card

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, 3½-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 the entire year are programmed into the unit at the time of manufacture, eliminating the necessity to reset the 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 TSC-1 is designed to operate over a two-wire 3 kHz voice-grade-type date circuit or equivalent radio circuit.

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

Consisting of a command terminal and remote terminal, the TSC-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 any desired location on the screen and

ction of the cost of the more mplex equipment. Prerecorded deotape, film and slides as well as video images can be reposi- ned anywhere on the TV screen. ames B. Tharpe, manager of the Video Group, indicated that in t instances the selection and ation of the key element of rest in a scene for repositioning s proven more effective than the rtion of a compressed full frame ture.

For More Details Circle (103) on Reply Card

Darlington transistor series

series of monolithic Darlington sistors that switch up to 500 s in 400 nsec is available from *TV Power Semiconductors.*

e NPN devices, suitable for use igh speed power circuits, have a ector-emitter voltage range of to 500 VDC. The series, desig- d SVT6000, can withstand a inuous collector current of 15 rs and peak currents of 20 amps. er dissipation for the devices is watts while the junction tempera- range is -50°C to +150°C.

e sustaining voltage rating for SVT6000, 6001 and 6002 are 350 and 400 volts, respectively.

For More Details Circle (104) on Reply Card

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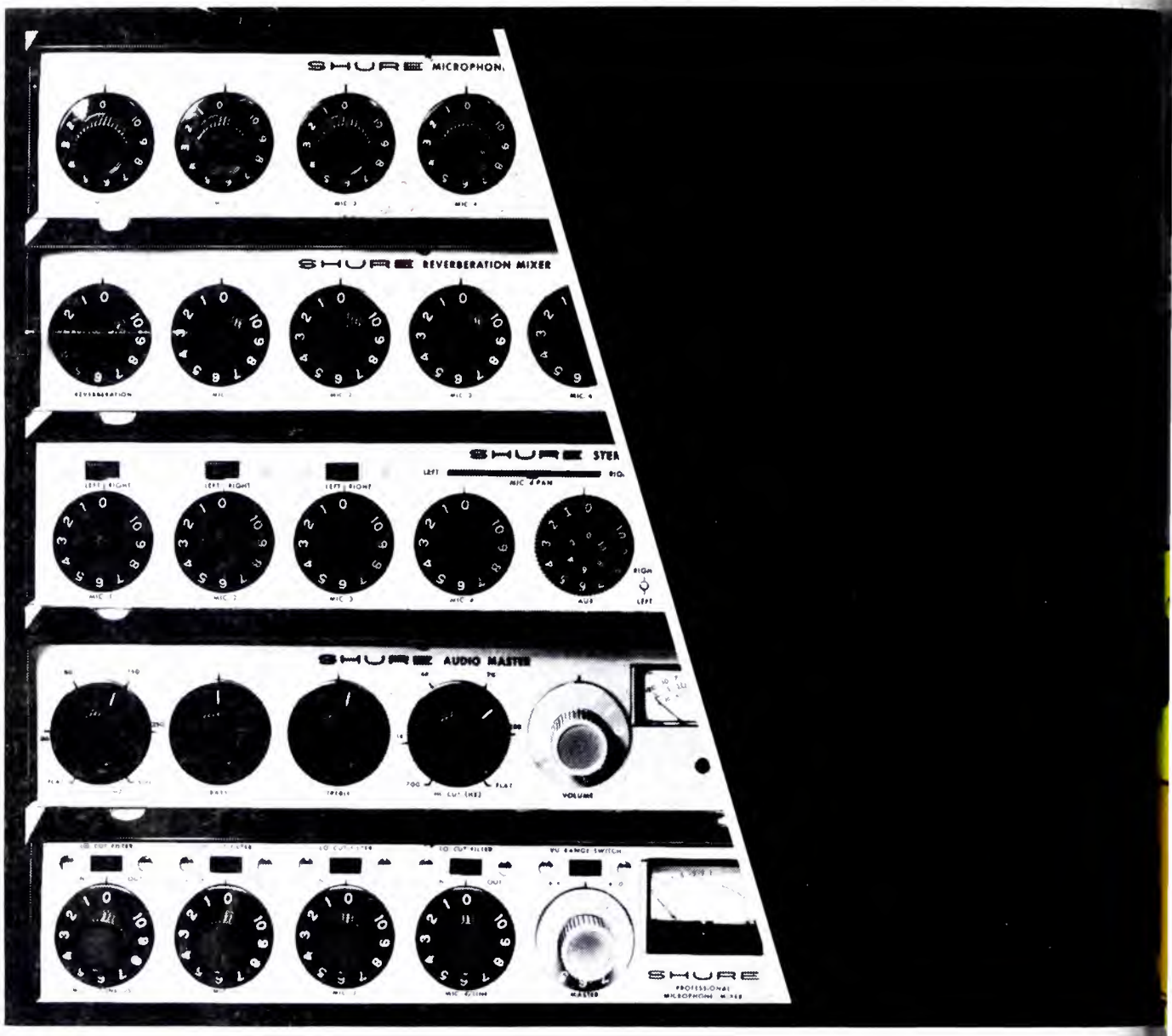

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