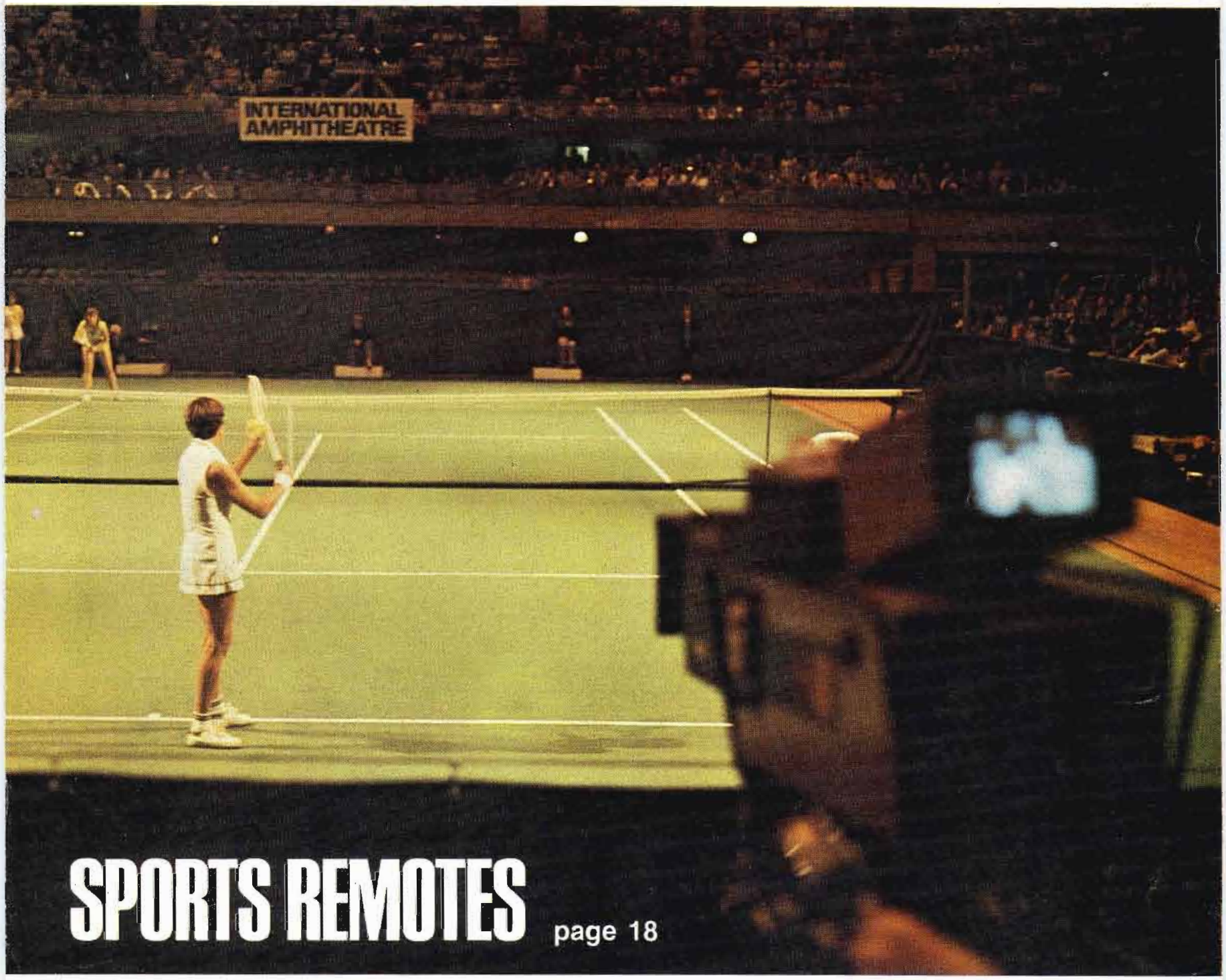
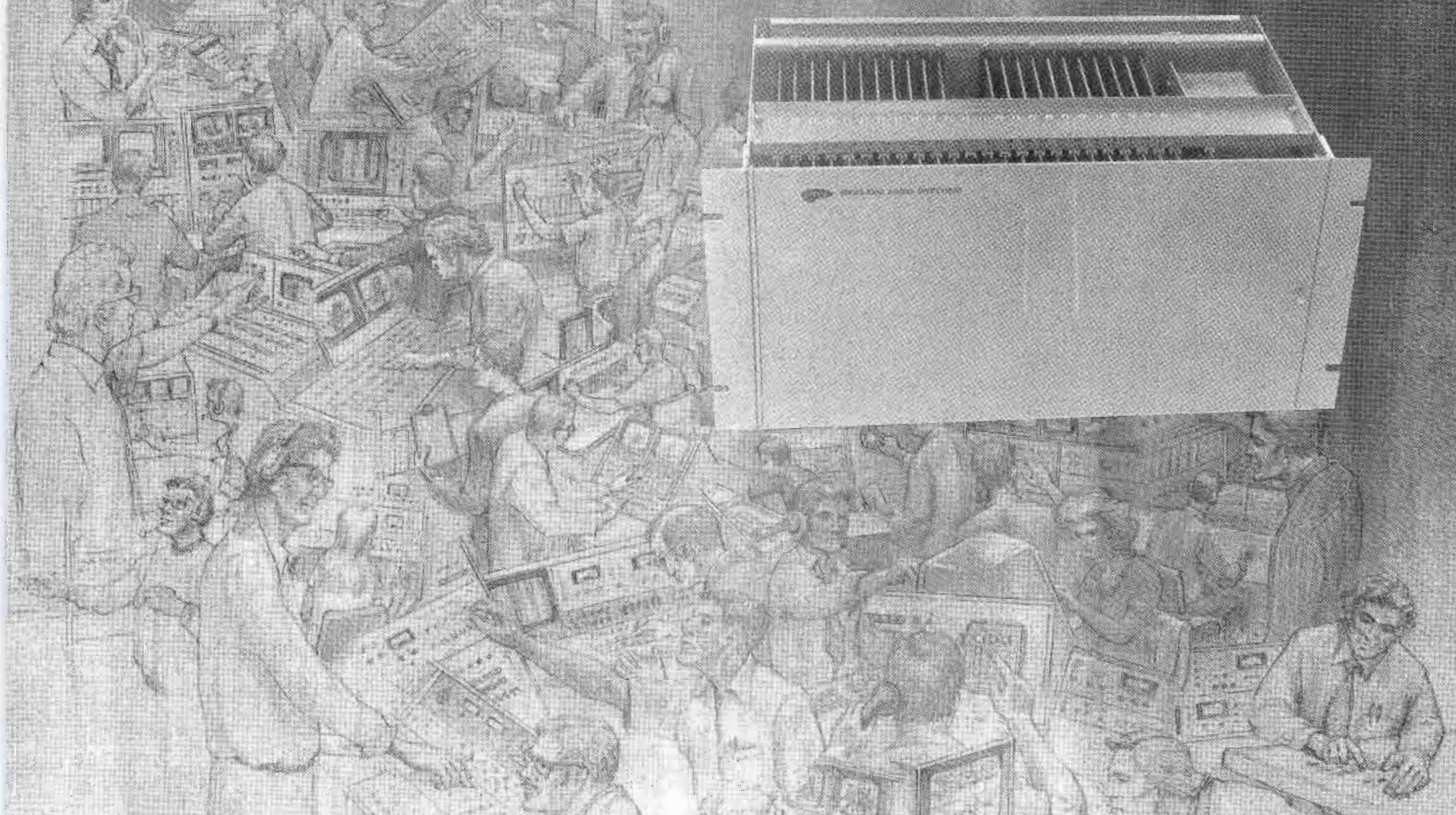
BROADCAST ENGINEERING®
April, 1975/75 cents



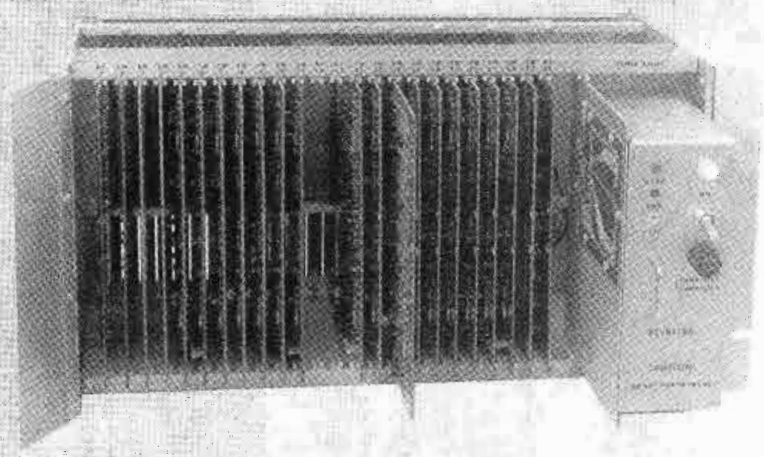
SPORTS REMOTES

page 18

Flexible, solid-state audio switching NOW under $10 per crosspoint.



Input-output configurations are virtually unlimited with this modular, building-block, solid-state, audio switch. And . . . this flexibility comes at reduced cost.



Starting with a single 8¾-inch by 19-inch rack frame assembly, the user can build to a 20-input by 20-output configuration through selection of plug-in switching and amplifier boards.

Still using the same basic frame assembly, other configurations such as 20 by 5, 10 by 20 or combinations in between can be assembled. Greater capacities, including dual inputs or outputs, are just as easy . . . just add.

Control? . . . a snap! pushbuttons, thumbwheels, dials, touch pads . . . even a computer.

Performance is outstanding. Using field effect transistor switching and integrated amplifiers, the Series-8100 handles -6 to +8 dBm levels through its balanced transformerless inputs. Flat within ±0.15 dB (20 Hz to 20 kHz) ±1.0 dB (1 Hz to 50 kHz), crosstalk (better than 70 dB below output), harmonic distortion (less than 0.15%) and hum and noise (85 dB below maximum output) the 8100 compromises nothing for its flexibility.

Best of all, users will really appreciate the economy. By specifying the initial capability for any remotely-controlled, switched audio distribution network, the buyer saves now and isn't penalized later. High reliability solid-state audio switching costs can be cut to as little as $10 per crosspoint . . . significantly less than competitive switching systems.

Write today for complete details to home office or eastern region office – P. O. Box 17342, Dulles International Airport, Washington, D. C. 20041; telephone (703) 471-4078.

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DYNAIR

For More Details Circle (1) on Reply Card

Flattest response, widest range of any dynamic.

Who would suspect that the RE55 is also one of the handiest interview mikes you could use.

It's a fact. We have yet to test any omnidirectional dynamic with flatter, more extended range than the RE55. It's so good it has often been used in labs as a secondary frequency standard. But that's not its real purpose in life.

FOR THE HARD-WORKING STUDIO

The RE55 was designed to solve day-to-day studio and remote sound pickup problems... without creating problems of its own. It is extremely rugged, and so reliable we can offer a 2-year UNCONDITIONAL performance guarantee, plus a warranty for the life of the RE55*. The flat response means less feedback than with ordinary omnidirectional mikes, and uncolored sound pickup, whether you are listening to voice or a mighty pipe organ. And even when you put the RE55 in sound fields so intense as to cause ear damage, the exclusive E-V Acoustalloy® diaphragm responds with distortion-free equanimity.

HAND-TO-MOUTH WITH THE RE55

What, then, about interviews? Well, the 3/4-inch diameter and extra length (which is a bonus of the design for extended bass) makes handling an RE55 easier than almost any other microphone. Light, long, and slender. It's really a natural. You can even use it while it is tucked under your arm, in order to handle papers, give away prizes, or whatever.

THE PERFECT MIXER

And as a bonus, the RE55 mixes perfectly with all other professional E-V mikes, like the 635A, RE15 and RE85. If you haven't tried an RE55, get your hands on one today. Most Electro-Voice sound distributors will loan one at no cost or obligation to responsible professional users. Or write today for a specification sheet and current catalog. Fascinating reading.

Electro-Voice® INC a gulton company

ELECTRO-VOICE, INC., Dept. 451V , 638 Cecil Street, Buchanan, Michigan 49107

*If the RE55 fails to perform for any reason at all during the first 2 years after original purchase, or during its lifetime due to a defect in workmanship or materials, return it prepaid to our Sevierville, Tenn., repair department. We'll fix it free. Finish, appearance items, cables, and connectors not included. Lifetime warranty does not cover things like abuse or operation at other than specified conditions.

For More Details Circle (2) on Reply Card

BROADCAST engineering.

The journal of the broadcast-communications industry — *April, 1975 Volume 17, No. 4*

About the cover

This month's cover includes shots taken for BE during the recent Virginia Slims Tennis Tournament in Chicago. See article on page 34. Cover and article photos are by Donna Roizen.

Departments

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Robert E. Hertel, *Publisher*

INTERTEC PUBLISHING CORP.
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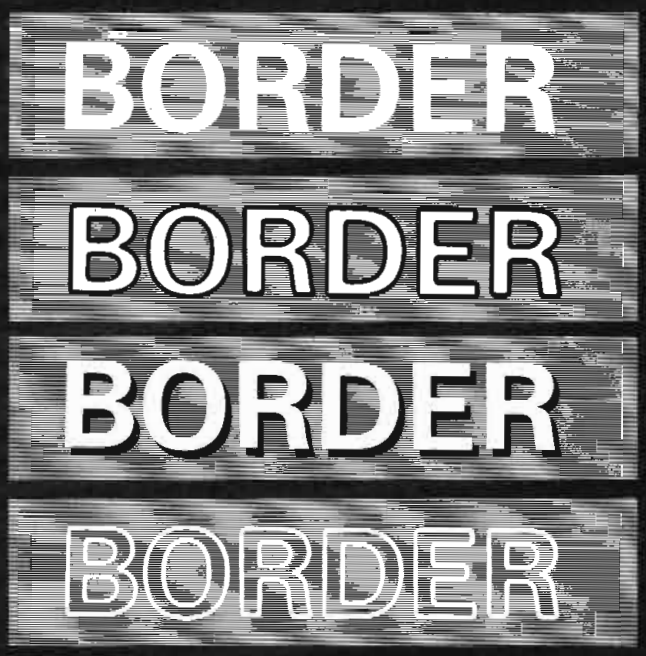
BORDERLINE GENERATORS

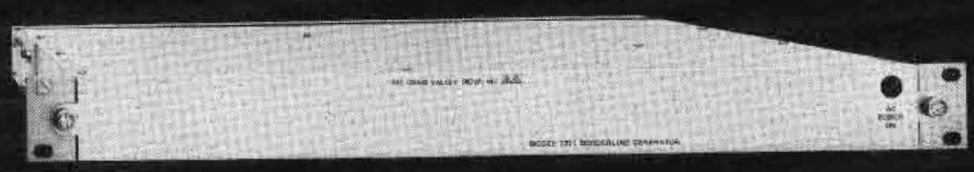


STARTING WITH A NORMAL KEY SIGNAL, THE GVG BORDERLINE WILL----------

PROVIDE A BLACK BORDER AROUND A MATTED TITLE OR ----------

PRODUCE A DROPSHADOW EFFECT ON LETTERING OR TITLING OR ----------

PRODUCE OUTLINE LETTERING FROM A SOLID TITLE SOURCE



DESCRIPTION

Grass Valley Group Borderline Generators are used to add borders to captions and titles from camera video signals or character generators. The added borders greatly inhance the insert visibility, and are particularly effective in situations requiring a white insert into a predominantly white scene.

Model 3271 is for use with GVG 1400 Series switching systems and 900 Series special effects equipment. The keying circuitry in the special effects amplifier is utilized for the inserting function, thereby enabling effects such as wipe key between bordered inserts.

Model 3272 is for use with special effects equipment of other manufacturers. It provides a widened key signal output which can be connected to the external key input of most special effects systems. The widened key output, together with a slightly delayed (H and V) title video signal, is used to achieve the border effect.

Model 3273 is a complete system which provides bordered inserts into a composite video signal, such as at the output of a switching system. The unit is entirely self-contained and requires no horizontal or vertical driving signals.

Borderline Generators are available for NTSC, PAL, PAL-M, and CCIR standards.

THE GRASS VALLEY GROUP, INC.

A TEKTRONIX COMPANY

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DIRECT CURRENT FROM D.C.

April, 1975 / By Howard T. Head and Harold L. Kassens

CTAC Report Filed With Commission

The joint Industry-Government Cable Television Technical Advisory Committee (CTAC) has filed its report with the Commission. The report consists of two volumes, one including the full text of the nine CTAC Panel Reports and running to almost 1000 pages, prefaced by a Summary and Recommendation prepared under the direction of the CTAC Steering Committee.

The CTAC report covers a wide range of topics, including cable frequency allocations, system operation, test and instrumentation methods, two-way operation, as well as many other topics. The CTAC Report is expected to permit the Commission to augment its cable technical standards with respect to various aspects of cable system performance.

The report is expected to provide basic source information for some time to come. A special technical session at the NCTA Convention will discuss the major points of accomplishment of the CTAC Report, and the possible impact on the cable industry.

Cable TV Receiver Specifications

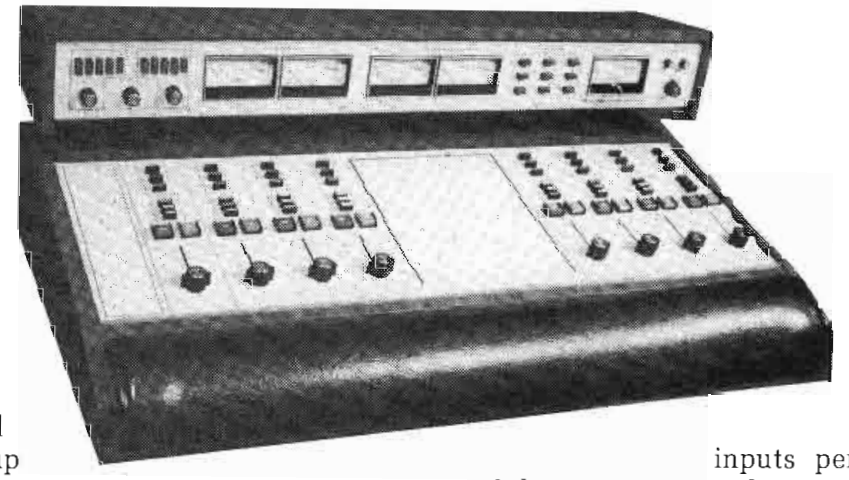
The Cable TV System Committee (CTSC) of the Electronic Industries Association (EIA) has adopted an Engineering Bulletin recommending characteristics for a "cable-compatible" TV receiver. The Bulletin provides that in order to qualify for the "cable-compatible" designation, the receiver must tune, in addition to the twelve VHF broadcast channels, at least eight additional VHF channels, beginning at midband. For more than twenty channels, the superband is to be used.

The EIA Bulletin establishes recommendations with respect to performance in high ambient fields, adjacent-channel performance for both receivers and cable systems, local oscillator leakage and terminal isolation, in addition to various other technical parameters.

A special technical session at the NCTA Convention will deal with "The Receiver and the Cable" and will feature a panel of members

(Continued on page 6)

It pays to read more than the name on the front.



There's that old saying about judging a book by its cover. The name does not always indicate the quality inside. The same theory holds true for just about any piece of equipment, typewriters, fleetcars or radio broadcast equipment.

To illustrate this point, we have prepared a list of comparisons based on current published data from the five leading manufacturers of stereo audio consoles.

We want you to examine all manufacturers' audio equipment claims. Inquire. Compare. Read the facts, the whole story . . . carefully. Make up your own mind. We feel that only when you have fully evaluated all equipment claims factually, are your best interests served. And ours.

Manufacturer & Model	GATES Stereo 80	CCA 10S	COLLINS IC-10	SPOT-MASTER BESL-1006	**SPARTA Centurion II**
No. of Std. Program Busses	2	2	2S & Metered Mono	2	**3S & Metered Mono**

Only the SPARTA CENTURION II gives you three stereo program busses, plus metered monaural output.

Manufacturer & Model	GATES Stereo 80	CCA 10S	COLLINS IC-10	SPOT-MASTER BESL-1006	**SPARTA Centurion II**
No. of Input Mixers	8	10	10	6 - 10	**8 - 12**

Only the SPARTA CENTURION II gives you from eight to twelve mixers in the basic console. With extender options for eighteen or twenty-four mixers.

Manufacturer & Model	GATES Stereo 80	CCA 10S	COLLINS IC-10	SPOT-MASTER BESL-1006	**SPARTA Centurion II**
No. of Input Sources	18 (4M)	20	28	18 - 30	**24 to 36, 54 and 72**
Input Level Selection	Set 3 Lo 15 Hi	Optional Cards	Selectable Hi-Lo	Optional Modules	**Switch Hi-Med-Lo**

Only the SPARTA CENTURION II gives you three inputs per mixer module in every configuration. And every one is switch selectable for high, medium or low level inputs.

Manufacturer & Model	GATES Stereo 80	CCA 10S	COLLINS IC-10	SPOT-MASTER BESL-1006	**SPARTA Centurion II**
Mixer Expanders Available	No	No	No	No	**Yes**

Only the SPARTA CENTURION II gives you the availability of mixer extender options.

Other SPARTA CENTURION II features include: remote turning on/off of all mixers; remote start capability through the mixers; motherboard construction with ground plane PC techniques for elimination of wiring harness; silent operation; audio-follow-video switching; fully interchangeable mixing modules; only three types of amplifiers throughout; optically isolated audio switching; either slide or rotary attenuators as options, at the same price; 25 Watts per channel monitor amplification; five VU meters as standard equipment.

There's much more to the story, theirs and ours, that you should know. We're only too happy to tell you ours. Write or call us collect, today, for all the facts on SPARTA Audio Equipment.

We're in the business of You.

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For More Details Circle (3) on Reply Card

(Continued from page 4)

from the cable and receiver industries.

NAB Asks Extension of Third-Class Tickets

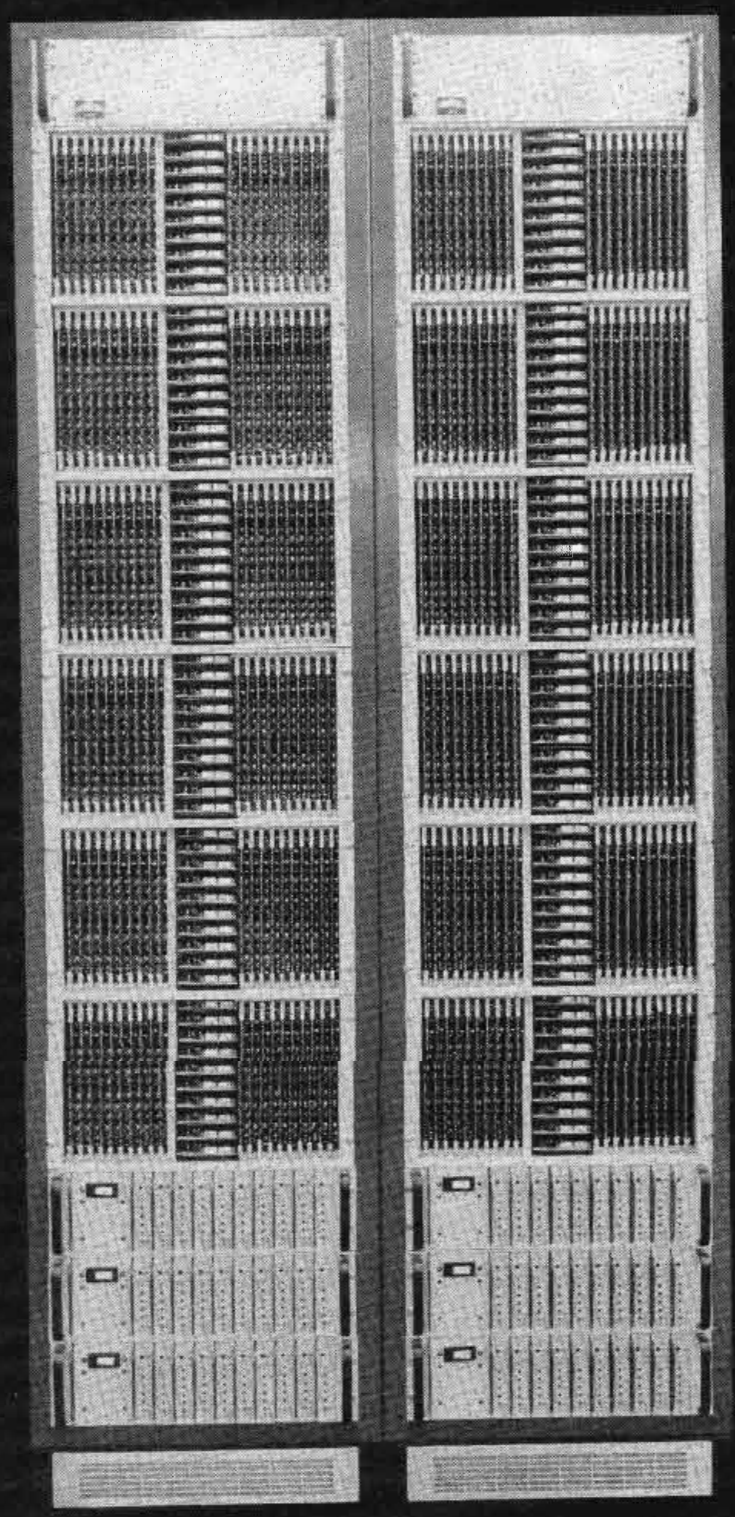
The National Association of Broadcasters (NAB) has asked the Commission to extend the life of the Provisional Radio Operator Certificate (for a radio-telephone third-class operator permit endorsed for broadcast operation) from one to three years. NAB complains that: (1) the Commission's Third Class Radio Telephone Study Guide is lacking in content as it relates to the license exam; (2) the lack of such study material has a detrimental effect on the successful completion of the exam; (3) the number of applicants successfully completing the exam is wanting; and (4) the lack of study material and consequent exam failures is excessive and working an undue hardship on the broadcast industry.

The FCC's Field Operations Bureau (FOB) has been trying to improve the situation and conducted a training seminar in Kentucky last September for those intending to take the 3rd Class exam. (The subsequent passing rate was 60%). Another such seminar was held in Illinois in March. (The results are not yet in).

The Commission also has an active project in which the Civil Service Commission is giving FCC examinations (including code tests) at more convenient locations. This project will be evaluated after a one year period.

Short Circuits:

Various organizations investigating the use of earth-orbiting satellites for cable program distribution continue to make quiet but steady progress...The ATS-6 Satellite Demonstration (see 11/74 D.C.) has been accused by a Rocky Mountain newspaper of favoritism, misuse of funds, and poor planning. Only three Rocky Mountain cable systems are carrying the ATS-6 transmissions...The FCC is expected to have a short form renewal proposal for radio stations and a Notice of Inquiry on automatic transmitters released shortly...A consulting engineering firm has proposed to the Commission that a new VHF TV channel be created by clearing out the 72-76 MHz band and adding 2 MHz at either end of the band...The Commission has proposed a requirement that stations in the Safety and Special Radio Services operating between 25 and 960 MHz automatically transmit station identification.



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THE ADC 900

A distribution switching system for those who demand the finest performance available today.

The 900 is the ONLY system to feature a "developed for television" Integrated Circuit Crosspoint to *discretely* switch video-audio-tally, all with superb specifications.

While designed for computer control, the system is supplied with the facilities to accommodate any conventional or non-conventional control scheme.

The 900 is the most flexible, versatile and superior system available today.

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INDUSTRY NEWS

NAB attacks fee ruling

Broadcasters have branded as "legally reprehensible" the Federal Communications Commission decision to recapture annual broadcast fees which were suspended after the Supreme Court found similar cable fees to be illegal.

A nine-page petition filed by the National Association of Broadcasters urged the FCC to reconsider the recapture provision in its recently-announced fee schedule which the Commission claims is now in line with the Supreme Court ruling.

NAB recalled that FCC traditionally has held that its fees "are not recoverable retroactively" and its own precedent thus "belies its ability to reinstate annual broadcast license fees for the period of suspension."

"NAB opposes this endeavor to recapture annual fees and respectfully requests the Commission to reconsider its order in this regard," the petition said. "...The recapture provision now envisioned is legally reprehensible."

NAB's petition also held that the inclusion of FCC hearing costs in amounts to be recovered under its new fee schedule "is inconsistent with the dictates" of the Supreme Court. It noted that the Court excluded from recoupment by the FCC of "agency costs for the protective services rendered the public."

Asserting that hearings reflect the Commission's "protectorate role," NAB said the Commission "does not attempt to refute that these are of benefit to the public... (but) simply concludes that the costs are recoverable."

"Nowhere does the Supreme Court distinguish among those protective services whose costs may or may not be charged to the regulated industries...The Commission is not empowered to color or qualify that judicial conclusion..."

NAB also objected to FCC's requirement that licensees pay fees equalling one-half the cost of a new construction permit to change the location of their antennas and/or

"Hold it!—This camera guarantees I can broadcast **live!**"

transmitters, increase antenna heights or change the array. In many cases, it said, the change is forced on the licensee and he should not be called upon to pay such an "exhorbitant fee."

It noted, for example, that a change in local zoning regulations might force a station to move its antenna, or an expiring lease might force it to relocate its transmitter. Under such circumstances, it said, "the cost to the licensee should be less than that dictated by the fee schedule."

TV committee buck NAB ruling

The Secondary Market Television Committee of the NAB has changed its name to the Hundred Plus Market TV Committee.

The Committee, acting on the suggestion of Burns Nugent, executive vice president for station relations, feels the new name better reflects the industry segment it represents: stations whose area of coverage is less than those of the top 100 markets.

At its full-day meeting, the committee passed a resolution stating that it "strongly objects" to the decision of the NAB's Television Board of Directors making subscription to the NAB Television Code mandatory for all NAB television members.

The resolution further states that the Code rule is not "in the best interest of television broadcasting and the National Association of Broadcasters" but specified that the committee does "subscribe" to self-regulation on a **voluntary** basis."

The Secondary Market TV Committee also met with representatives of the Arbitron and A. C. Nielsen Companies. The committee adopted the following recommendations for television broadcasters:

1. That all television stations oppose extension of the current four-week surveys to eight weeks.
2. That stations make their objections to the eight-week survey known to ARB and Nielsen, and
3. That television stations completing the recently-mailed ARB questionnaire respond in favor of a four-week survey and no July Book.

The committee felt that an eight-week survey would add substantial cost for the individual stations without providing added information to published data currently obtained with a four-week survey.

Members of the Hundred Plus Market TV Committee present were: William F. Duhamel, KOTA-TV, Rapid City, South Dakota, chairman; Robert E. Krueger, KTVB, Boise, Idaho; Ray Butterfield, WLOX-TV, Biloxi, Miss.; John Shott, WHIS-TV, Bluefield, W.V.; Sheldon Storrier, WKTV, Utica, N.Y.; and Howard Green, WENY-TV, Elmira, N.Y. Members of the committee not attending were Earl W. Hickerson, WCEE-TV, Rockford, IL. and Samuel S. Carey, WBOC-TV, Salisbury, Md.

FM opposes cable radio

Prompted by concern over the growth of so-called "cable radio stations," the National Association of FM Broadcasters has filed a petition with the FCC on behalf of its members, asking for a rule-making which would prohibit the origination of aural entertainment programming by CATV systems, which represents a potentially serious economic threat to the FM broadcast medium.

The NAFMB is not asking the Commission to "protect radio broadcasting from competition," states the petition which was filed by NAFMB Special Counsel, Paul N. Sternbach, of the firm of Burns, Van Kirk, Greene & Kafer, New York, New York, "but we are questioning whether licensed broadcasters who are heavily regulated, unionized and laden with complex and expensive equipment and operating requirements can fairly be expected to compete with the cut-rate and free-wheeling operation of cable radio."

The NAFMB petition further pointed out that licensed FM broadcasters must bear substantial operating and economic burdens, but cable radio stations are immune to such Commission requirements as those for a minimum schedule of hours of operation; they are not subject to the multiple ownership rules, have no defined service area, nor must they maintain a staff of licensed operators. Furthermore, they are not required to observe such rules as the fairness doctrine or sponsorship identification.

An NAFMB survey of some 2,500 FM stations indicated that there is a strong concern that cable radio, because of its economic attractiveness, will become an increasingly important competitor for local advertising dollars.

Cable radio operators now claim that they can compete for advertising revenues at rates 75-85 percent less than those of licensed broadcasters, a situation which could be especially inhibitive to struggling FM stations in small markets.

Spindler & Sauppe' offers seminar

Spindler And Sauppe', North Hollywood based manufacturer of multi-image presentation equipment, has announced an expanded multi-image Programming Seminar Series for 1975.

This year's traveling workshop programs are scheduled for San Francisco and Ottawa in May, Dallas and Houston in June, Chicago and Detroit in August, Saddle Brook, N.J. and Atlanta in September, and Los Angeles in October.

Conducting the workshops will be James Hulfish, S & S Director of Marketing and an eighteen year veteran in the field of A-V presentations.

The seminars are designed to help participants master multi-image programming equipment and techniques, so they may more fully explore its limitless potential.

Jampro tests circular TV antenna

Jampro Antenna Co., Sacramento, has announced that the Federal Communications Commission has authorized KLOC-TV, Modesto, to conduct technical experimentation with a circularly polarized transmitting antenna.

The Commission has viewed the station's request for such tests "as having merit," according to Peter K. Onnigian, Jampro president, and Chester Smith, owner of KLOC-TV.

This is the first time than an omni-directional, circularly polarized antenna will be used for TV broadcasting. The test antenna was designed, and manufactured by Jampro, a subsidiary of Cetec Corp., El Monte, California.

It is unique in its appearance, as well as its performance, in that it is not like presently used television antennas, which transmit only horizontally polarized radiation. The new antenna transmits half the energy in the conventional horizontal mode, and the other half in the vertical.

The authorization permits the Modesto station to conduct tests with the new antenna during the day, for a 12 month period. Jampro will conduct the field evaluation tests of the new antenna.

HEW announces final resolutions for facilities

Final regulations affecting the Educational Broadcasting Facilities Program of the Office of Education were announced today by HEW Secretary Caspar W. Weinberger.

An important change in the regulations is that separate priorities will be given to educational radio and television broadcasting. For television applications, the highest priority will continue to be the expansion and upgrading of existing stations. For radio, priorities will focus on the establishment of full-service stations through new construction, especially in communities without such services, and expansion of low-power stations.

The new regulations incorporate proposed rules which were published in the **Federal Register** on August 14, 1974. They reflect comments from a public hearing October 1 and those comments submitted in writing by interested persons.

The regulations apply to grants for Fiscal Year 1975 for providing assistance in the development of noncommercial educational television and radio broadcasting facilities serving local communities.

Suggested electrical performance standards for television broadcast transmitters also have been incorporated into the regulations.

The regulations, which will become effective within 30 days, appear in today's **Federal Register** along with a list of new applications accepted for filing. The applicants will also be notified individually.

SOCIETY OF BROADCAST ENGINEERS INC
P O Box 88123 Indianapolis Indiana 46208

New SBE editorial office

Broadcast Engineering magazine provides this means whereby the members of the Society of Broadcast Engineers can report on SBE Chapter meetings, announce future events, and have articles, papers, and other technical and nontechnical items published. Chapter chairmen should see that information on meetings and other news is sent promptly, as soon as it is available, to the SBE Editor, Laura A. Stroube, c/o Smith & Powstenko, 2000 "N" Street N.W., Suite 210, Washington, D.C., 20036. Include photographs whenever available; preferred photograph size is 8 x 10, but smaller sizes are also usable.

The deadline for submitting copy to the SBE Editor is the 25th of the second month preceding publication. For instance, the date by when copy must be in the hands of the SBE Editor for the June issue is April 25, and for publication in the July issue, the deadline is May 25 and so on.

Members and other interested persons are invited to submit letters to the SBE Editor; the mailing address is given above.

SBE Fellow

Risse's broadcast career began in 1948 when, after graduation from Walter Hervey Junior College in New York with a major in Radio Electronics, he was employed by WNBF AM-FM-TV, Binghamton, N.Y., as a transmitter engineer. He advanced to studio engineer and supervisor of operations and maintenance. In 1953 he joined WHUM AM-TV, a pioneer UHF operation, as assistant chief engineer; he then advanced to chief engineer, in charge of radio-TV transmitter, studio, microwave, communications, and their mobile TV personnel and facilities.

He left WHUM in 1956 to join ICS. Since then, Risse has authored and edited many of ICS's instruction texts, in addition to having written a number of articles and books. His books presently on the market are **Know Your VOM-VTVM,** Third Edition (Howard W. Sams and Co.), and **Electronic Test Equipment and How To Use It** (TAB Books). His published articles have covered test instruments, broadcast test signals, broadcast maintenance, educational television, and professional advancement for engineers.

Joe Risse is listed in "Who's

(*Continued on page 14*)

"Whose equipment did I look at when I was spec'ing recorder/reproducers?

Everyone's.

Whose equipment did I buy?

Electro Sound's ES-505."

As chief engineer for one of the nation's oldest and most respected stations, Dave Finley's primary concern is quality — both in equipment and over-the-air product.

Here's what Dave told us about the ES-505:

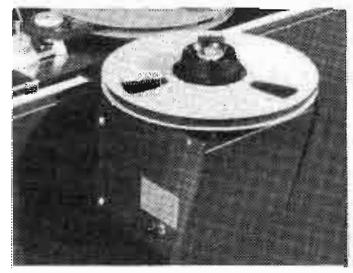
"My business is to compare equipment. When we had an opportunity to use an ES-505 against two XXXXXX's* in our production room, I was very, very impressed — not only with the machine's quality of reproduction, but with its ease of operation and unique features.

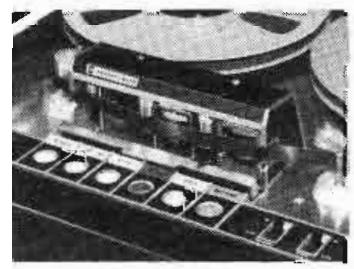
"Our particular application for the four-track ES-505 is in radio production, where recording with a great deal of creativity in mixing is needed. If there's a lot of editing involved, the third reel offered on the ES-505 is an especially nice concept.

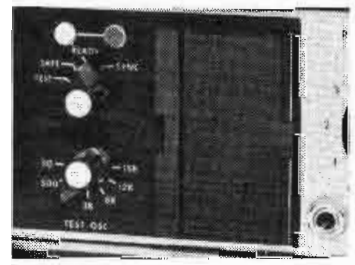
"The emitter follower on the playback head to minimize noise and hum vulnerability is an unusually clever idea. In fact, it's one that's been long overdue in the industry.

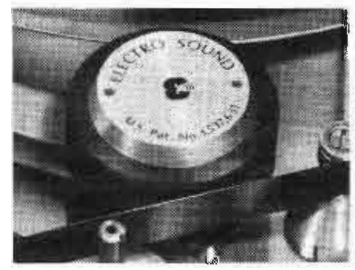
"Some exceptional human engineering went into the ES-505. It's not only well built and simple to maintain, but it's completely operator-oriented. For instance, the disappearing head gate which makes for easy editing and head cleaning; and the built-in test oscillator which speeds and simplifies calibration.

"A definite plus is Electro Sound's replaceable capstan idler, which allows you to instantly change the tire and not the entire assembly. We used to spend $35 for replacement assemblies on our previous machines. Now we only pay $8.50 for a spare tire.









"All in all, the ES-505 is a highly professional recorder/reproducer with a very competitive price tag that makes it a most important addition to our production facility."

That's what the man said. He looked. He compared. He bought. We rest our case.

But don't rest yours. Call or write us today for complete details on the ES-505 and Electro Sound's other professional broadcast products.

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SOCIETY OF BROADCAST ENGINEERS, INC
P O Box 88123 Indianapolis, Indiana 46208

(*Continued from page 12*)

Who In Engineering", (McGraw Hill); he is a Certification Administrator for the International Society of Certified Electronic Technicians. He is also certified as an Engineer-In-Training by the State Registration Board for Professional Engineers for the Commonwealth of Pennsylvania, and is a member of the Industry Advisory Board for the National Electronics Service Dealers Association. Risse has been associated on short assignments with WARM, WGBI-FM, and WDAU-TV, all in Scranton.

Risse grew up in Honesdale, Pennsylvania. He and his wife, the former Anne Stegner of Honesdale, now reside in Dunmore, Pennsylvania, near Scranton. They have five children: Bill, 20; Sally, 18; Joe, 17; Jane, 14; and Edward, 8.

Chapter meetings

Chapter 1: Binghamton, New York
Chairman: Bill Sitzman, Jr.
Tyrone, New York 14887

Chapter One's February meeting was held on the eleventh of that month, at the Owego Treadway Inn, Owego, N.Y. Bill Sitzman, chairman of the Binghamton chapter, was scheduled to speak in an Open Forum-type setting on the subject of "AM-FM-TV Performance Measurements, or, There's More To It Than Meets The Eye And Ear".

Chapter 2: Northeastern Penn. (Scranton/Wilkes-Barre)
Chairman: John Kowalchik
Wilkes-Barre, Penn. 18711

A business meeting was predominantly the order of the February meeting of Chapter 2. Its major purpose was to discuss and make plans for activities and types of meetings to be held during the coming year. Five sessions on integrated circuits were held, courtesy of the Abington Amateur Radio Club, open to members of this chapter.

Newly-elected officers to Chapter 2 are: John Kowalchik, Chairman; John Salu, Vice-Chairman; Gary Koerner, Secretary; and Milan Krupa, Treasurer.

The March Meeting, scheduled for the 3rd, is to include a guided tour of the RCA Semiconductor Plant, RCA Solid-State Division, in Mountaintop,

Pennsylvania. The tour was arranged by chapter chairman John Kowalchik.

Chapter 9: Phoenix, Ariz.
Chairman: Leon Anglin
Phoenix, Ariz. 85001

Several meetings to catch up on for Phoenix's Chapter 9; the November meeting included Al Hilstrom, Director of Engineering for KOOL, Phoenix, demonstrating the Ikegami "Handy Looky" Backpack color camera. Sony recording and editing equipment was also shown, to be used as an electronic news-gathering system.

December's meeting was a "Gala Christmas Party". The program and entertainment was unselfishly provided by Walter Lowe, owner/operator of KDJI, Holbrook.

The Ampex Corporation demonstrated some of their equipment for the January meeting; it included their 800 Time Base Corrector, and the 7900 Video Tape Machine. Several Ampex employees provided the lecture and slide presentation, as well as additional tapes and equipment. At press time, the February meeting was scheduled to include representatives of the Gates division of Harris-Intertype, for the purpose of discussing modulation techniques used in Gates' broadcast transmitters.

Chapter 20: Pittsburgh, Penn.
Chairman: Jim Hurley
Allison Park, Penn. 15101

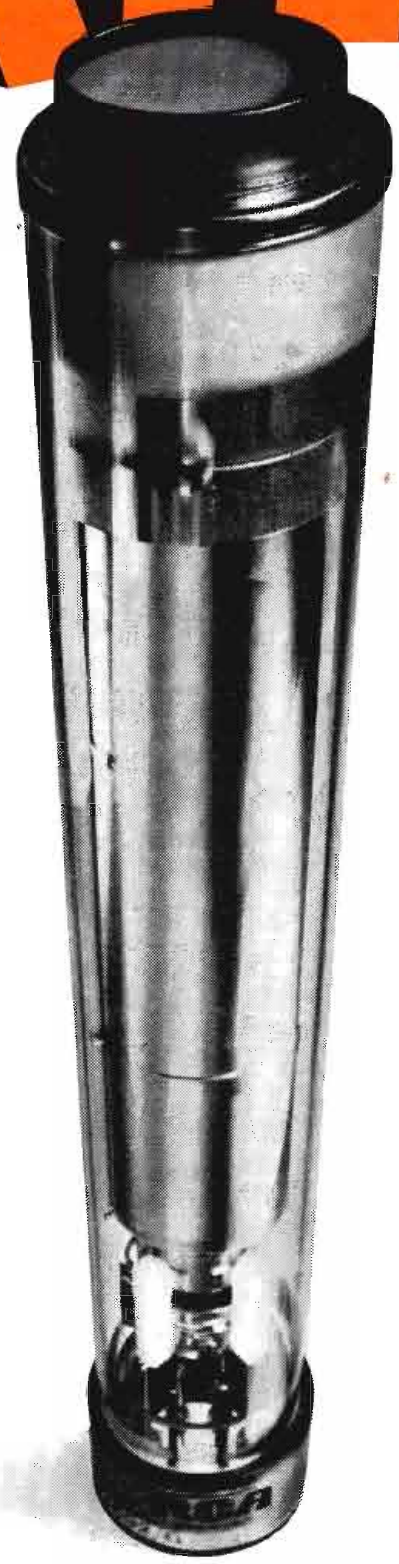
Chapter 20's January meeting included the setting of a deadline for the 1975 annual Mini-Convention location. Also included was a film and speaker from AT&T. In February, their guest speaker was Dr. Matti Sikuola, a member of RCA's research team on the Circular Polarization study. This meeting was also the annual membership drive meeting.

Chapter 22: Central New York
Chairman: Mort Miller
Dewitt, N.Y. 13214

The General Electric Company provided the location and demonstration for Chapter 22's February meeting, showing GE's new large-screen television projector, the 5000. It is capable of producing a color television picture up to twenty feet wide, and has no apparent scanning lines. The schedule for the March meeting was to include an expert on sideband analysis, with demonstrations on newly-developed equipment for analyzation.

(*Continued on page 60*)

EXTENDED RED



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APRIL, 1975

CABLE ENGINEERING

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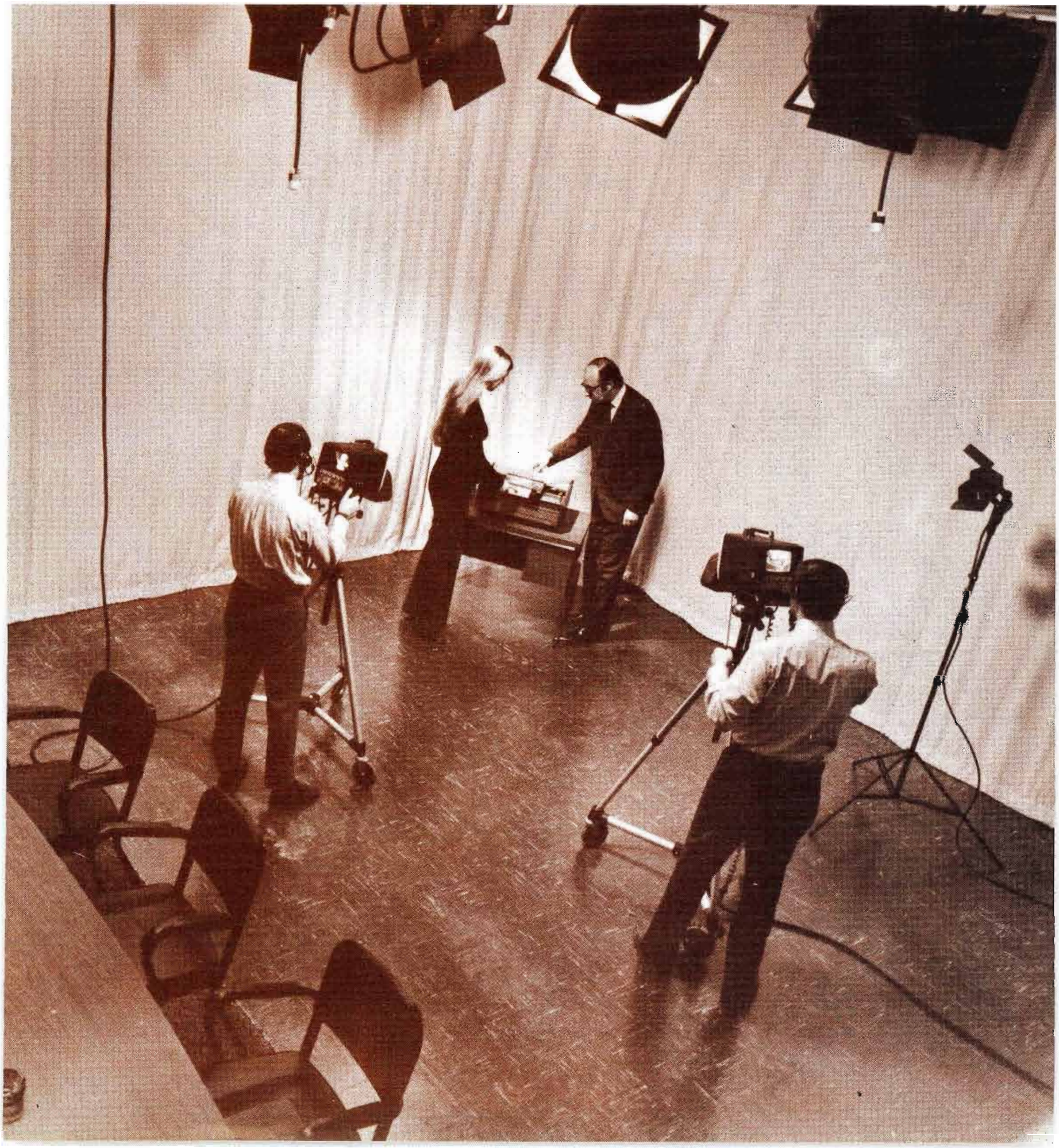
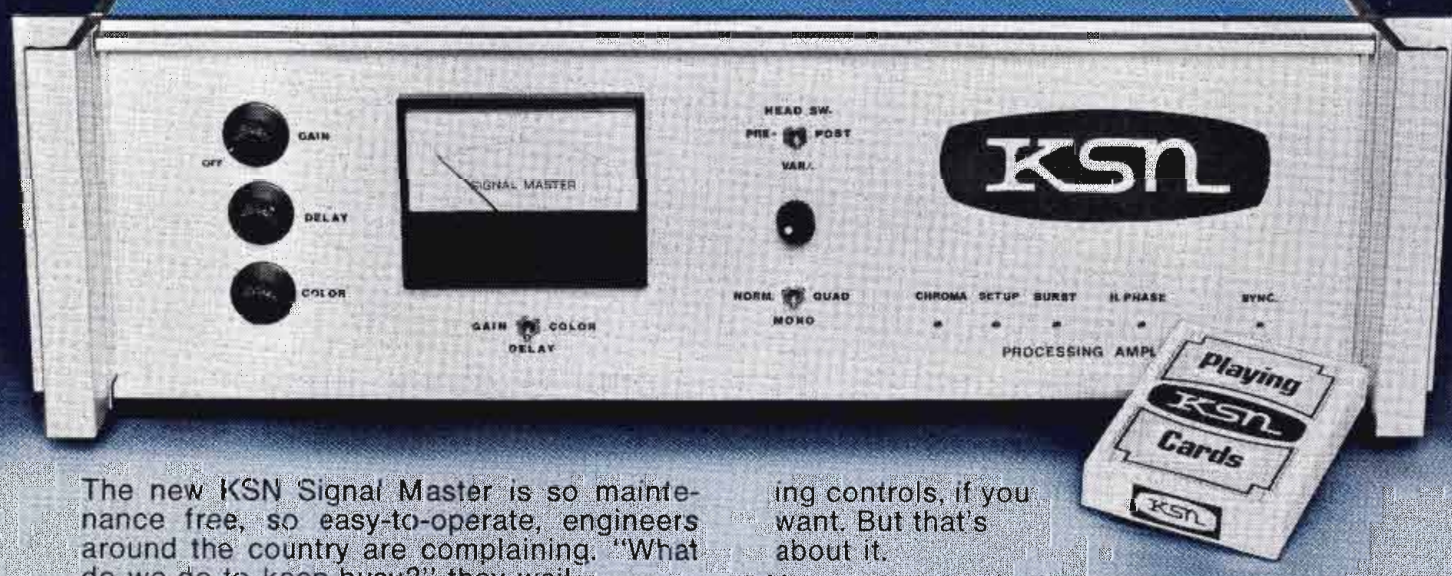


Gin? Poker, anyone?

The new KSN Signal Master TBC gives you so much free time, we pack it with a deck of cards



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INDUSTRY NEWS

Video Exposition in June

The forthcoming Vidsec 75 (Video Systems Exposition and Conference) will feature the second annual Video Library to be held at McCormick Place, Chicago, from June 1-3, 1975. The Library will be open to all attending Vidsec, and the Summer Consumer Electronics Show.

More than 2500 are expected to attend the three-day program, which also includes an extensive exposition of hardward and software, conferences, and working "Video Lab" exhibits.

Distributors of commercially available programs in video cassette/cartridge formats are invited to submit as many titles as they wish to the Library at no cost whatsoever. Of particular interest are materials offered for rent, lease or purchase for use in business, industry, education, health care, law enforcement, training and similar areas. Programs of general consumer interest (entertainment, sports, etc.) are also welcome.

Further information and applications for library participation are available from Vidsec 75, 11th floor, 331 Madison Avenue, New York, N.Y. 10017. Deadline for submission of applications is March 15, 1975. Please do not submit tapes. Upon receipt of the completed application, Vidsec will advise on program title selection.

Vidsec 75 is sponsored and produced by the Consumer Electronics Group of the Electronic Industries Assoc., Video Systems Subdivision. Exhibit space information is available by calling Robert Pomerance at (212) 682-4802.

C-COR to hold engineering seminar in May

C-COR Electronics has announced that it will hold an engineering seminar in State College, Pennsylvania May 12-13. The seminar theme will be built around the demonstration and performance testing of a cascade of 20 amplifiers in C-COR's climate chamber.

Measurements will be taken at 70°F, at -20°F, and at +130°F. Detailed discussion of the instrumentation for measurement of the performance under 30 channel loading will be featured. The amplifiers used will be C-COR's new trunk amplifier Model T-466, "rebuild" amplifiers made for drop-in replacement to upgrade system performance to 300 MHz of existing systems without changing coaxial cable.

The engineers in attendance will also witness tests on various surge protection devices and specifically C-COR's Surge Protection Module utilizing C-COR's lightning generating machine. Voltage surges up to 2 kV at 1000 A peak and a rise time of 2 μs will be applied to various devices and equipment. Stand-by power sources will be discussed and demonstrated.

Other discussion topics will include the '77 rules, system design philisophy, and cost trade-offs in system design.

Engineers interested in attending should contact C-COR Electronics at 60 Decibel Road, State College, Pa. or telephone 814-238-2461.

Send Your Industry News to Broadcast Engineering 1014 Wyandotte Kansas City, Mo. 64105

Cable engineers will sponsor technical sessions

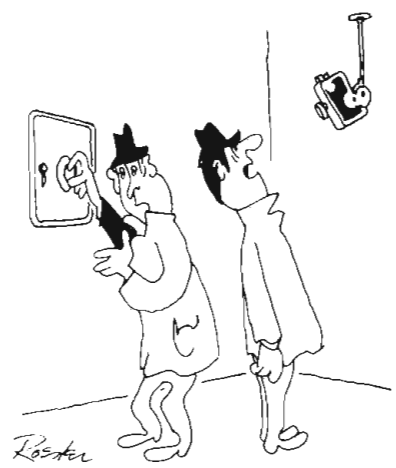
The Society of Cable Television Engineers will sponsor three days of technical Eye-Opener Sessions at the NCTA Convention in New Orleans, April 13-17, 1975. SCTE has chosen three important topics for discussion by the panels.

Monday SCTE Moderator Don Johnson, Lakeland Cablevision, will present the panel on System Reliability. The panelists include experts from cable operating and manufacturing companies. They will address the design and operation problems resulting from basic primary power system deficiencies which are finally yielding to organized engineering analysis, and discuss recent breakthroughs in the understanding of the problem.

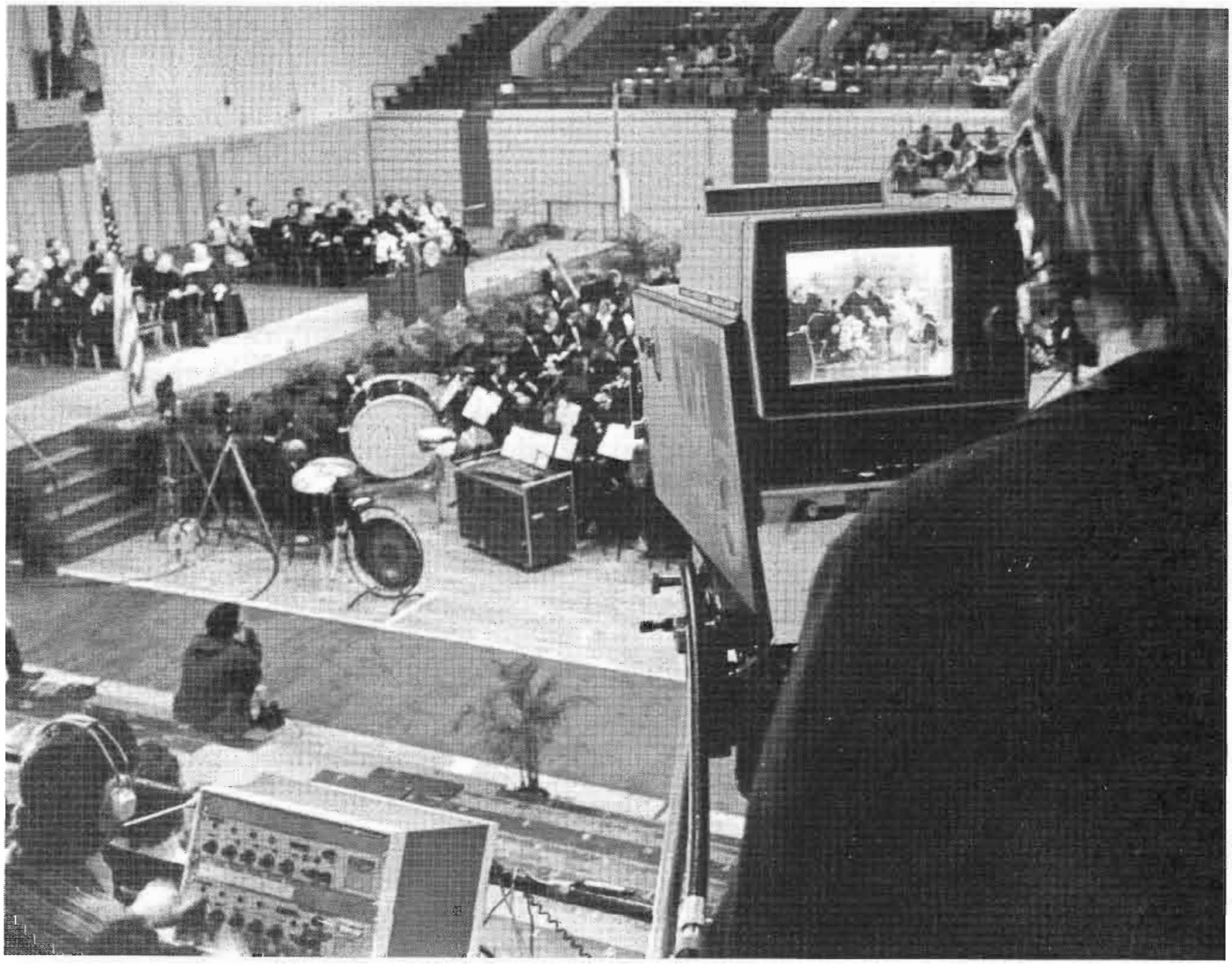
Stephen Dourdoufis of Vision Cable, Fort Lee, N.J. will moderate Tuesday's panel on Technical Training. The panelists will discuss problems of job classification, training, federal licensing and certification. The program includes the views of cable operators, educators and government regulators.

Advanced Receiver Design will be the topic for Wednesday moderated by Frank Bias, Tele-Vue Systems, Pleasanton, Ca. Members of the panel are leaders from the cable, receiver and broadcasting industries and will speak on the problems of compatibility, realistic tradeoffs, industry demands and requirements.

All sessions will be held at the Marriott Hotel from 8 a.m. to 9:30 a.m. each morning.



"HEY, BUTCH!- WHAT DOES 'CCTV' MEAN?"



Graduation time is coming. What better time to start planning to cover the schools in your area. It's another example of tuning in on community interest.

Launching local origination

By Ron Whittaker

The FCC recently adopted new rules requiring cable systems with 3,500 or more subscribers to have equipment available for local production by January, 1976. (See **Broadcast Engineering,** January, 1975.) The big difference between this rule and the 1969 mandatory origination rule no longer in effect is that the initiating responsibility for program content shifts from CATV owners and operators to non-operator groups and citizens. The FCC goal of local origination remains the same; it is just being approached from another direction.

While the exact meaning and implications of this directive will undoubtedly be discussed and debated for some time to come, there is another part of the issue which is becoming more and more clear as time passes. Local origination is starting to emerge as a significant competitive factor in attracting CATV subscribers (not to mention franchise renewals). CATV operators, therefore, need not enter into local origination begrudgingly, since, in many localities it will probably be directly linked to financial success.

Success Approach

The key to successful local origination, of course, is to be able to offer CATV subscribers something they want which is not available from over-the-air sources. When one looks at the multi-million dollar network movie buys and the high-budgeted dramas, situation comedies, etc., offered by the networks, this seems as if it would be an impossible task. However, the history of broadcasting itself shows that time and time again the telecast of a local issue or event has been able to steal away major ratings from national programming. There is an old saying that people are more interested in something that is happening to their next door neighbor than in a typhoon in Asia that kills 1,000 people.

Added to this is the fact that if deliberate efforts were made to cultivate these interests, the public would be even more concerned about local issues. With the possible exception of news, most television stations devote very little time to covering local activities and events.

Because of high overhead and operating costs, on-air outlets are understandably reluctant to go extensively into local programming. Even during the "prime-time ac-

cess" period, it has been easier and more profitable for most stations to run syndicated programming. With very few exceptions, therefore, little has been done to develop what many see as a rather strong potential for interest in local issues, activities and affairs.

A public broadcast station in Florida was recently surprised to find that their coverage of local affairs drew significantly higher ratings than any of their network offerings. The same station found that the most popular form of local affairs programming was its live and taped coverage of school board and city and country commission meetings. The second most popular local production on this station was a weekly black public affairs program.

Occasionally, a local origination even outdraws the audience for commercial network programming, such as with controversial school board issues. A high interest in local coverage such as this could be enough to justify CATV subscriptions, even when viewers can receive relatively good off-air signals from the networks.

Changes in Equipment

Equipment for local CATV origination has been getting much more compact and reliable in the past several years. The engineering and operating hours necessary to set up, run and maintain color equipment—both studio and remote—has also dropped substantially. Even though there have also been some significant decreases in the cost of equipment, as, for example, with some types of color cameras, the reduced costs which would seem to be indicated by extensive simplification and miniaturization of equipment has been somewhat offset by inflation.

It was just a few years ago that the preparation time for a color telecast took hours of engineering time to set up and align finicky cameras and production equipment. The move to solid-state alleviated most of this problem. It was also common to see 200-300 and even more foot candles of light used for acceptable broadcast video. Now, school board and city council meetings can be televised in color under normal existing room lighting (15-30 foot candles). Cameras and microphones have become so small and unobstrusive that their presence is almost forgotten during these originations. In the past, the "disruption factor" has been a big stumbling block in the way of televising certain types of governmental and community events.

Coverage Generally Welcomed

The realities of politics, public support and the human ego being what they are, you generally find that television coverage of board and commission meetings is now encouraged. Occasionally, school boards and commissions even go so far as to pay for certain production equipment and manpower costs. Some have found that this has proven to be a very good invest-

A school board meeting can be easily covered with cameras at either side of the room. This leaves the view of any audience in the room unobstructed, while providing the best angles for a home audience.

ment, considering the increased public understanding and support which has resulted.

Even though this shared expense agreement can be most helpful to a CATV system attempting to put together a production capability, it is important not to obligate yourself to the point of relinquishing control over your production capability. You may want to cancel some coverages upon occasion to allow the cablecast of another event which, would be a greater service and interest to your viewing public.

Occasionally, some public commissions or boards are—to put it frankly—scared to face public scrutiny. Although you might personally believe that the democratic process could take a giant step forward with these telecasts, you might get the excuse that the public would not "understand" what goes on at these meetings. (And, it can occasionally be said that the public might understand only too well!) This requires a diplomatic "education" effort to quell fears about disruptions from the cablecasts and to carefully outline the many civic (and even personal) benefits from television exposure.

Variety of Programming Possibilities

In most communities there is a large variety of interesting activities which can make good programming material. Already mentioned has been school board and city and county meetings. Beyond this, there are sports activities at the high school, junior college and possibly even university level. If athletic officials are worried that "live" coverage will hurt attendance, video taped playbacks can many times still draw a large TV audience. However, before assuming that "live" coverage will hurt attendance and would, therefore, be detrimental to a school or team, you might want to carefully consider the possible advantages of the additional interest the school support which could result from the "immediacy" of live coverage. The "unseen" audience may, in the long run, be more important to the school than possible losses in ticket sales.

In addition to the full range of scholastic sports, such as football, basketball, baseball, tennis, etc., there are leisure sports, such as bowling which are of interest to many people. Often, well-known local people can be integrated into these events as participants or commentators to arouse public interest and provide valuable publicity. The mention of any of these events, such as through an ad in a local newspaper, or as a straight news story, will start inquiries like, "Can we get that channel on our TV?"

But the list certainly doesn't end with sporting events. Local fashion shows by merchants can open the door to paid programming, if this is a goal. And then there are dance

A complete run-through is important before a production to completely check headset communication, mike feeds and camera viewpoints. Set up here was on location at high school gymnasium.

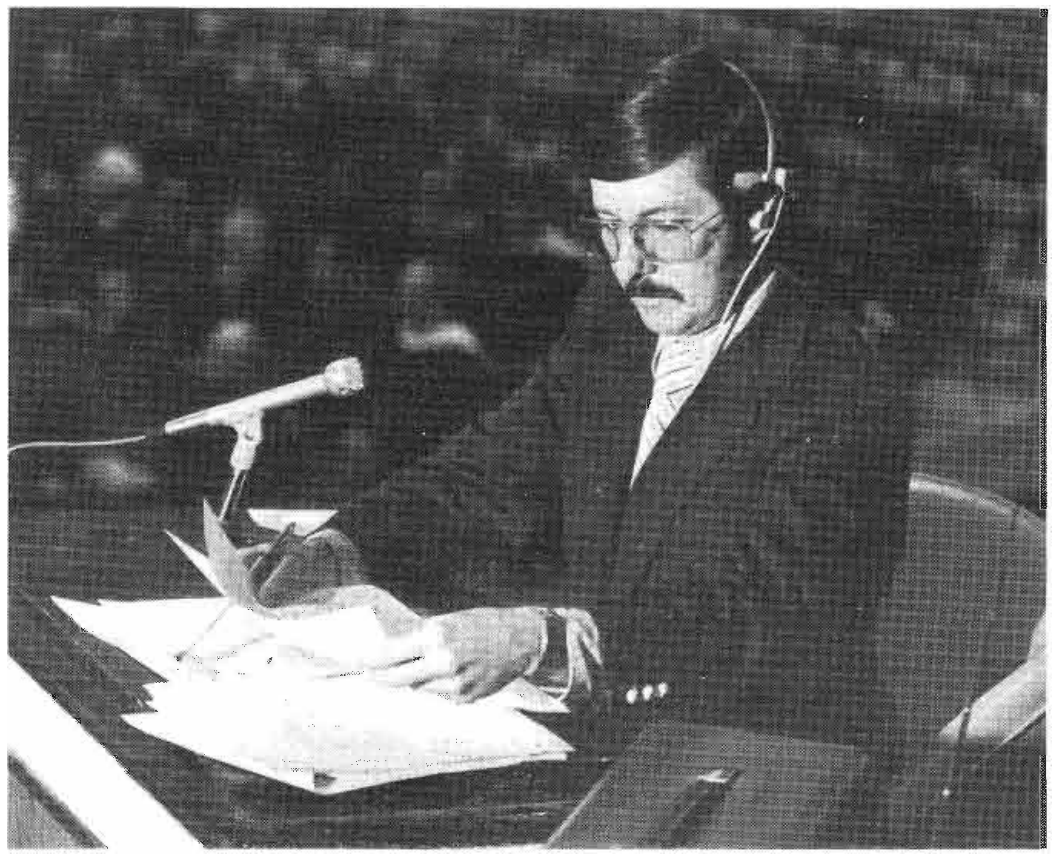
recitals, band concerts, karate exhibitions, dance exhibitions, music recitals, rock concerts, and auctions. With auctions, arrangements can even be made to take "phone-in" bids.

If you are in an area where there is a junior college or a university, you can consider instructional programming. Many schools give college credit for "TV courses." The instruction, in this case, can be cablecast, and exams can be taken at the school itself. Even without college credit, there are many courses that will be of interest to the general viewing audience: psychology, sociology, history, political science, etc. Community involvement with the schools can go a long way toward increasing public understanding and support.

As discussed in the article "CATV and Schools— A Promising Alliance" (**Broadcast Engineering,** August, 1974) sometimes manpower (and womanpower) costs in producing CATV cablecasts can be reduced through student volunteers. Since experience is so important for employment in the broadcast field, students will often volunteer their services just for the experience alone. Sometimes arrangements can be made with radio-TV classes in some schools for a cooperative education arrangement with the CATV system.

Minority Programming

Another important segment of a potential viewing audience should not be overlooked by CATV operators—minority programming. This can take the form of "ethnic programming," similar to the format of numerous radio stations throughout the country where programming is actually in a language other than English, or it can be an English-speaking program, highlighting the concerns and interests of a significant minority group. As mentioned earlier, a particular Florida public TV station recently did a survey which showed that a weekly black series was one of the most popular programs on the station, even though the city is only about 30 percent black. Surprisingly, a rather large percentage of the viewing audience for this series turned out to be white.



An on-camera announcer can be placed in a position overlooking an event and within range of camera. It helps to give him a video monitor so he can see what the home viewer sees.

Special Interest Programming

If the community has a significant percentage of retired or elderly people, special programming for this group can be instituted. This can take the form of a regular "magazine" format program, featuring recreational activities, information about retirement benefits, social security, health concerns, etc. The "over-60" group has long been recognized as being among the most reliable TV viewers. Although they are not as important to commercial broadcasters as the "high consumer" 18-35 age group, their reliance upon television is much greater.

Even with commercial and public television producing a considerable amount of programming aimed at children, this is one area of programming that also can create a significant following under the right conditions. A number of years ago, the author started a children's series on a commercial TV station and was very surprised to find that after a number of months the mail response on such things as birthdays and coloring contests, etc., had reached over a **thousand** letters a week! This was, admittedly, a rather unique situation where the program had absolutely no competition in about 75 percent of the viewing area. These days, old cartoons can be rented or purchased rather cheaply. Children seem to like cartoons better the more times they see them.

Occasionally, there are other groups which will make special cablecasting worthwhile. A regular program on union activities and projects in certain industrial areas could develop a following. High school news and activities, produced entirely by students and faculty members, is another possibility. If a significant percent of the community is engaged in a particular industry, a regular program featuring news, information and interviews relevant to this work could be important.

These are just some of the possibilities which are open to CATV systems that wish to expand their vistas into community involvement. The "handwriting" is already on the wall. CATV systems which are willing to make plans now to actively and creatively enter the local origination arena, and are not afraid to make some initial gambles and mistakes, will undoubtedly find that they will soon be recognized as a viable source of programming in the community and that the public will support them through their viewing and subscriptions.

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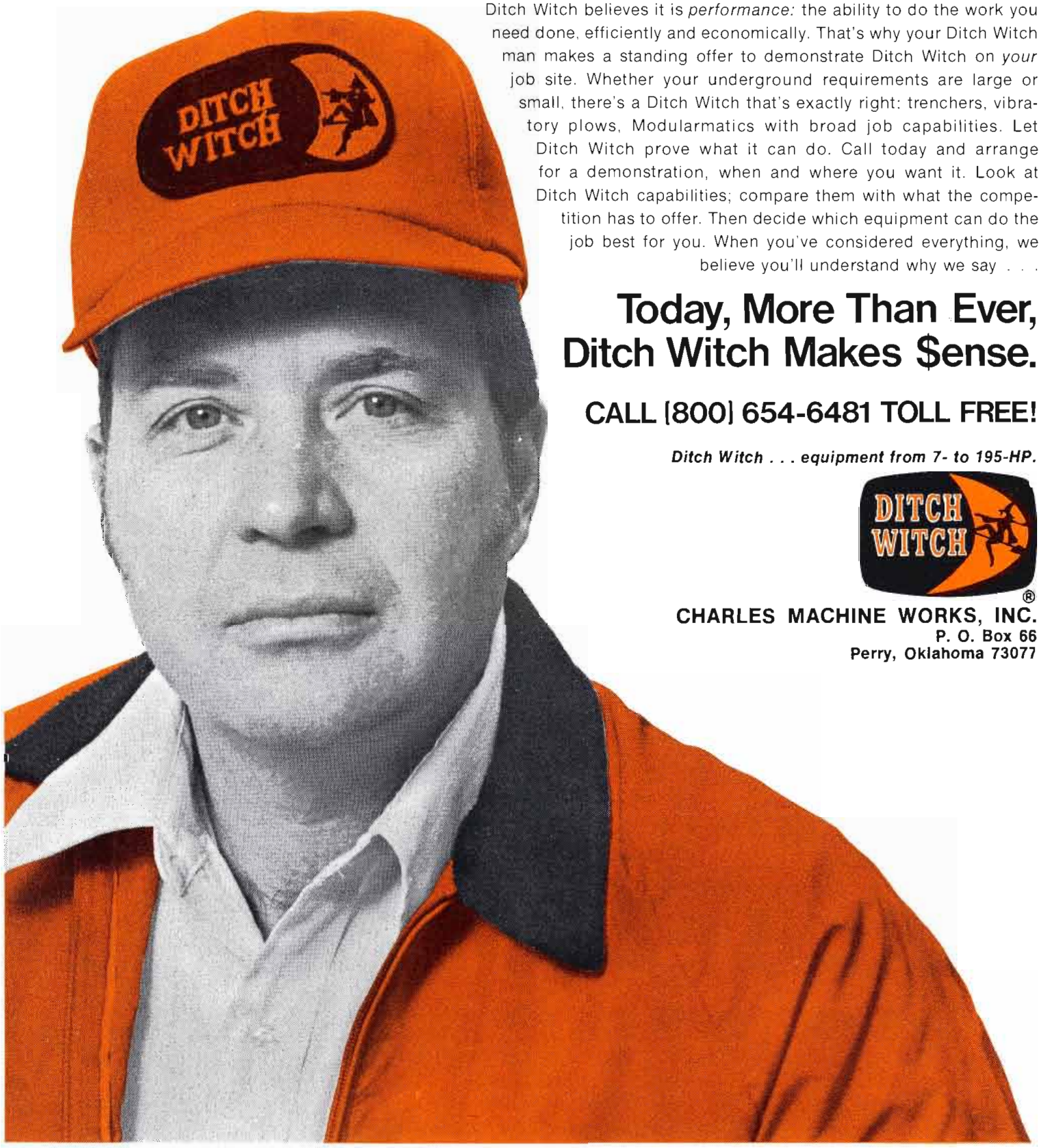

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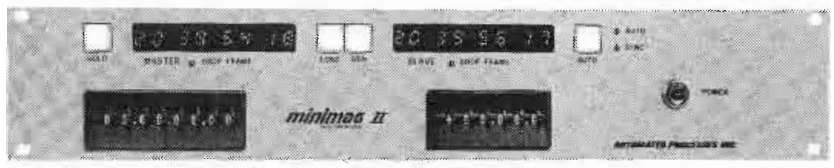

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*American National Standard Time and Control Code, C 98.12-1975.

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Perhaps one of the biggest challenges today is TV coverage of the Super Bowl. This photo was taken at this year's game. (Photos courtesy of Philips Broadcast Equip.)

SPORTS REMOTES:
A challenge to creativity or survival?

By Ron Merrell

Long before television became a way of life, radio had tapped into the heart of the American sports scene...brought to listeners all the mental images sports fans thought they'd ever need. And while their very own arena was within their minds, it was colored by the personality of such memorable play-by-play sportscasters as Red Barber and Harry Carey. As towering shots thundered off the bats of Ted Williams and Ralph Kiner, they found themselves leaning forward and pulling just as hard as they did for Dempsey to get back to his feet, or for Bob Cousey to put another two impossible points up for the Celtics.

In fact, after television did come along, it didn't cut greatly into radio's sports-imagining audience. Look around any baseball stadium and you'll quickly spot those five-dollar transistor radios glued to the ears of buffs who just don't want to miss **any** of the action. And that's a key point, because as you know—despite the prognosticators of gloom who say we're already saturated with sports—the viewer/listener has an insatiable appetite. They want to know all about what's happening and why.

Of course it adds color to a ball game to have a crowd mike and another placed so you can hear the crack of the bat as it slams into a fast ball. The undesirable crowd noises shouldn't offset the fact that effects mikes usually add another dimension to the game. The bold color of real time demands it.

Small market radio stations seldom can afford to compete for top sportscasters. Neither can they cover local or road games with the same total effect as a major sports network program. It's with this admission that the station must make a decision. Given the freedom of creative inventiveness, you'd be surprised what can be done to produce a truly interesting game coverage.

Aside from appropriately placed mikes, further depth can be added by taping interviews loaded with questions that are certain to be relevant to the upcoming action.

Years ago I was covering a state semi-pro baseball tournament. At first it seemed a much less than exciting assignment, even though baseball could engulf me at will. As it turned out, the leading pitcher was not on contract. Instead, he was paid after each game, and more if he won. His batterymate was a former catcher for the St. Louis Cardinals. What's more, I stumbled onto the fact that this level of baseball was either the last whistle stop before professional oblivion for former major leaguers, or the jumping off place for young players on their way up.

All the stories of that tournament could never be told. But the searching and probing offered all manor of levels of interest. Appropriately inserted, the outcome was, to be sure, more than reporting the action.

It's unfortunate that reporting on the Mudville Nine is not as interesting as describing a double-play at Shea Stadium. It's unfortunate, because the listener in Mudville is just as interested in this game as another might be in hearing New York's play-by-play.

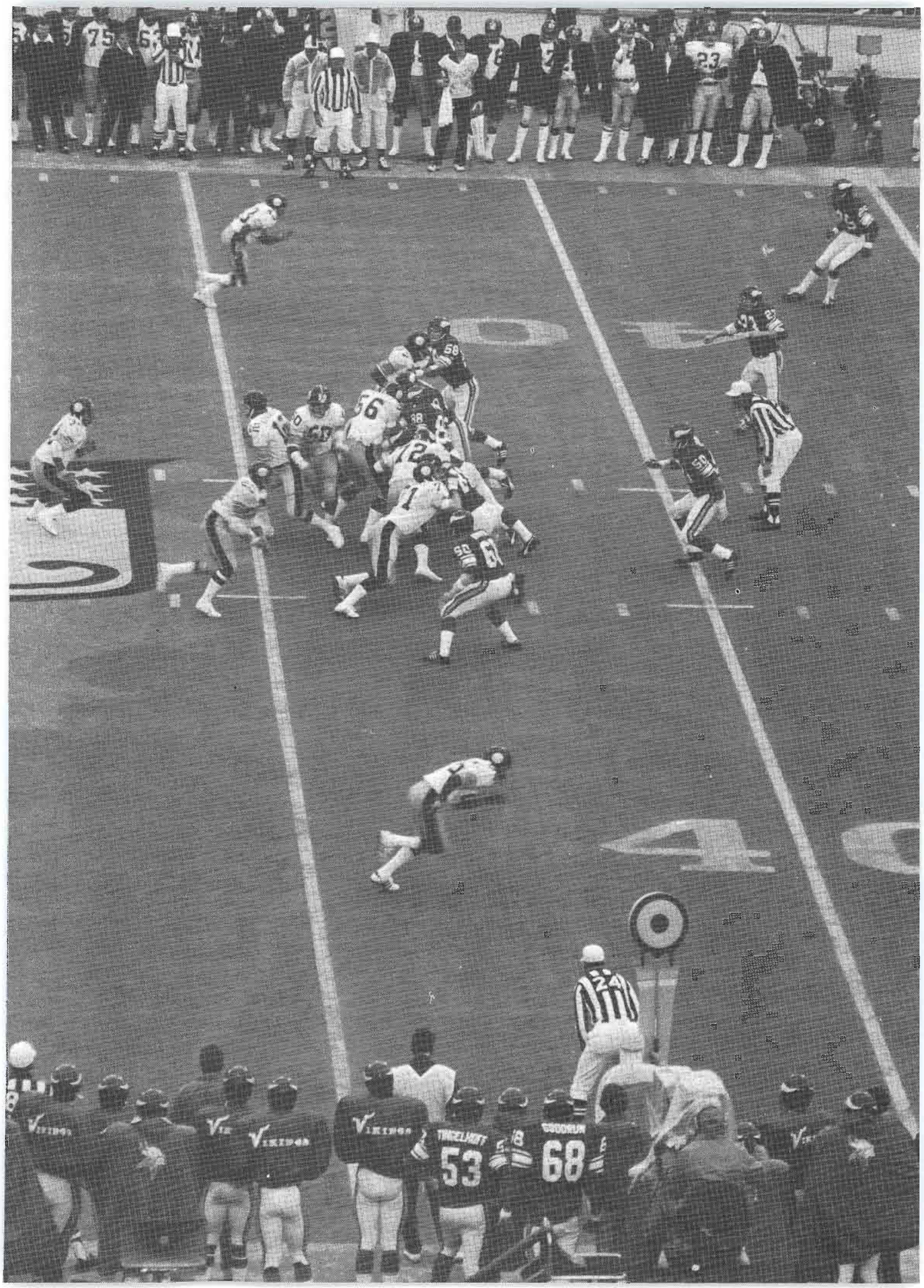
LIVE (or EJ or ENG) equipment are terms bantered about today because of the renewed interest in widening the real time window into news and sports. We know about the new equipment and the excitement it has created for television. Yet there has been a gradual and increased use of extra equipment by radio, in spite of the fact that a catchy term, such as Instant Radio, hasn't been on the tips of too many tongues.

Portable reel-to-reel and cassette tape recorders can be as much a part of the creative radio sports show as the interesting sportscaster. Even so, the whole effort can be lost on cheaper, but low quality phone lines; economical, but improper mikes; and paid for, but out of date remote amplifiers.

With all the attention given to improving product lines these days, there is only a half good reason for not investing: costs. And that's only half good, because to get more on the bottom line, you often have to invest more on the top line. After all, on the radio side, you depend upon the listener's imagination. When he's distracted by technical inadequacies, you can't capture his time.

There are many small market stations whose sports listener batting average is excellent. You can be sure when you visit one that the whole station approach to remotes is a challenge to creativity, not a challenge of survival. You'll find appropriate, quality mikes, state-of-the-art remote amplifiers, quality feed to the station, talk-back facilities for giving news off the sports wire from the station, mikes placed to advantage, tape recorders that can handle pregame interviews and the capability of inserting tape at the remote site.

Unfortunately, there aren't many arenas designed to facilitate crea-



tive sports coverage. For television sports crews, that's meant an extra special creative challenge. To cover some outdoor sports means finding cameramen who don't mind being suspended high above the field of play in a crow's nest or a blimp.

Because of the nature of the medium, especially with all the new and unique LIVE equipment available, television is capable of optimum coverage. Properly handled, the home viewer can be treated to a better view than sideline customers or sportscasters. All he lacks is a more complete sound of the game. There can, in fact, be so much effort put into capturing pictures that sound is considered only important in the booth.

Incredible as it may be, it all comes out at the home TV set on a three-dollar speaker! So, until the time comes when set manufacturers pay more attention to how their sets sound, television will remain on the doorstep of its potential. While this is no excuse for not equally capturing sound and image, it's true that if the home TV set were capable of exciting the viewer's second sense, it would soon be obvious that the potential was there and that it either was or was not being exploited.

Meanwhile, it's a curious fact that people with excellent component stereo and quad home entertainment equipment are audiophiles only so long as they have their prize system turned on. Let them channel in the big game, and they unknowingly switch off their audio criteria. So, the next major challenge for sports remotes on television—as well as studio productions—lies in their sound.

I think that too often we marvel at the overall excellence of the network feed, and we think that they are able to pull it off only because they seem to have unlimited budgets. Well, their budgets aren't unlimited. Further, their true long suit is the challenge of competition. Trouble is, too many don't see it that way. They feel that without the big staff and stock of immediately available equipment, they can do little more than provide play-by-play. Since the network does have more available equipment and a budget to match, it is under pressure to be creative in the use of that money and equipment. At the same time, the local stations, without all that money and equipment are challenged to produce a sports remote that approaches network quality. Unlike the audiophile, the sports buff doesn't unload the circuits of his mind and immediately accept the difference between maximum and minimum coverage.

One of the obvious missing capabilities is immediate playback and slow-motion playback. This means that local coverage makes special demands upon the positioning of cameras. And this is where the hand-held portable is going to be leaping from news assignments over to the athletic field. It certainly doesn't mean that it will replace the medium and heavy field cameras. But obviously, it can be instantly moved into places where too many angles and action have been too long bypassed.

If we can take the lead of the networks, we can greatly enlarge the scope of single event coverage. And we can be equally thankful that we can learn along with them. On the flip side, too much equipment on the scene can distort the action of the event, because the equipment can become a distraction, annoying both players and fans.

Eventually, of course, someone has to make the decisions about where and when in the course of an event these small cameras will be used. That's where we leave off, but with the note that the total package presented should be based on real interests of sports fans, not the whims and fantasies of anyone so removed from the sport that they neither understand it or know how to help others appreciate it.

Management Highlights

If we think about the new equipment being used in news and sports remotes today, we can see how one might refer to their use as Electronic Journalism or Electronic News Gathering. But neither of these really tells what it's all about. After all, we've been journalistically gathering news through electronics for a long time.

What's new? The new video equipment and the potential for instantaneous coverage of an event. We'd like to suggest LIVE, instead of EJ or ENG. LIVE would mean Live Instant Video Electronics.

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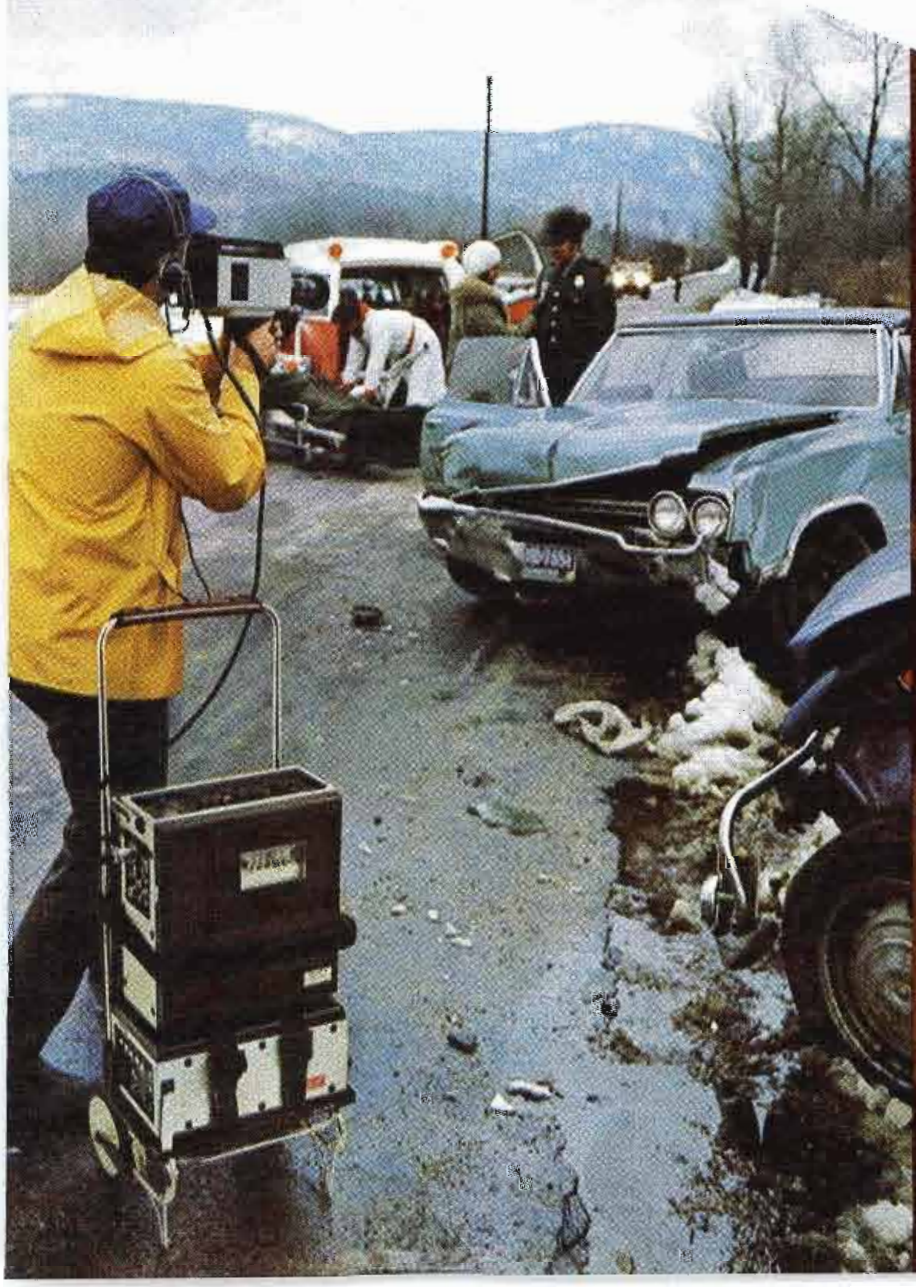

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Of perhaps even greater significance is the fact that originators of television materials now have at their option a wide choice of relatively low-cost, portable video recording systems. (Broadcast Engineering and B M/E—January issues.)

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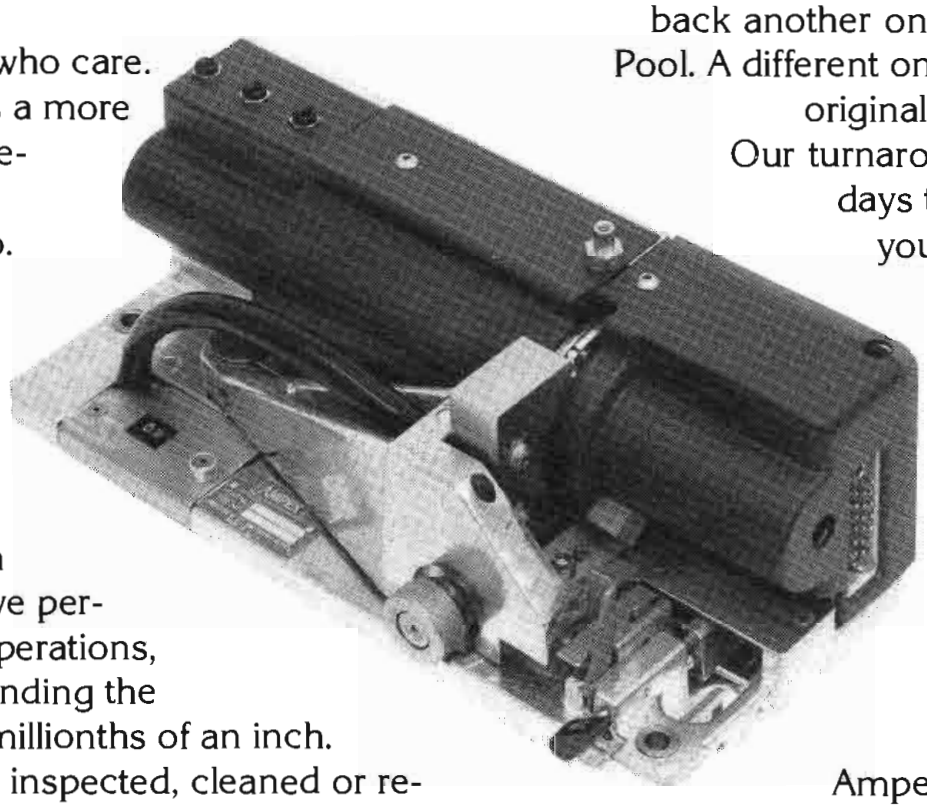

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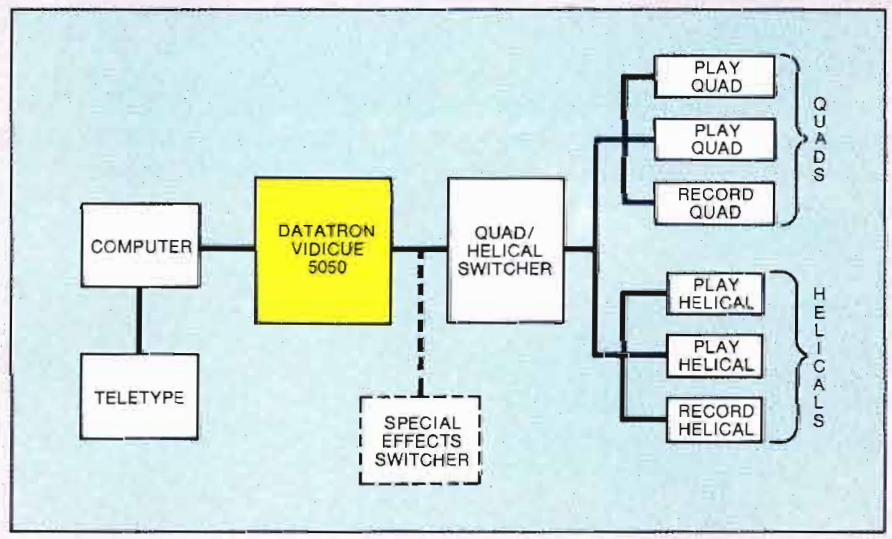

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Radio and the SPORTS REMOTE

By Todd Boettcher*

The prospect of doing a remote broadcast of a sports event can be exciting, yet at the same time there is always the underlying fear that something may go wrong. Hopefully, this article will alleviate some of the fears and put more of the pleasure back into your sports remote. Since we are getting ready to start another baseball season, I will emphasize that sport.

There are three major (and rather obvious) areas of concern when planning a remote: the remote site and set-up, the studio remote facilities, and the link in between. All areas will be discussed.

When planning a remote, you must keep in mind the golden rule of remotes: **There Is No Substitute For Adequate Advance Planning.** This includes everything from making sure all the technical equipment is working properly to being sure that all the personnel involved are aware of their responsibilities. It doesn't do anyone any good to have an engineer come to work saying, "Well, what am I going to do today?" only to find out he should have been on his way to the ball park a half-hour ago. Just as frustrating is getting to the park late, not being able to find any electrical outlets and then discovering that your battery supply hasn't been checked for a year and the batteries are dead.

Whether your Program department or Engineering department handles the planning and scheduling of remotes, it is their management responsibility to notify and coordinate with the other departments and personnel, and outside contacts, as soon as possible so that each person involved in the upcoming remote has as much time as possible to prepare for it.

*WTMJ, Milwaukee.

The Link

There are three normal methods of transferring the remote signal to the studio: microwave, telephone "loops" and business telephone lines. All three have benefits and drawbacks.

The microwave link must be licensed by the FCC and is a major capital investment. Its cost should be weighed against anticipated Telco line charges when considering its purchase. On one-shot remotes it means the remote man will have extra luggage to carry. Also, it will require additional set-up time. On permanent or semi-permanent remote set-ups, the microwave link, or at least its cabling, can remain in place. Security can become a problem if it is to be left unattended for a long period of time. However, within its normal operating range (local pickup), and barring any major obstructions in the link path, you will be guaranteed a high quality audio signal (50-15,000 Hz $\pm$ 2 dB or better). Some microwave units can multiplex a second audio channel for quality stereo pickups or for a quality one-way talk circuit. Microwave can be in use for last-minute remotes just as quickly as it can be installed by your staff.

On The Line

Your local telephone company and AT&T have a wide variety of services available to the broadcaster for remote use. However, these services can rarely be made available on the spur of the moment. Especially in phone companies away from large metro areas, specialized broadcast remote set-ups may require considerable advance notification and coordination.

Charges are made for all services provided. Some are one-time charges; some are based on length of actual use; some are long term or monthly billable charges. For a one-shot remote, you can expect an installation charge as well as a line usage charge. If you anticipate remotes from a given location on a somewhat regular, even though infrequent, basis, you may be wise to order a permanent line, thereby paying the installation charge only once and paying for the line on a monthly basis.

You can be provided with lines of varying specified qualities, from moderate to excellent. Your telephone company can provide you with these varying qualities of remote lines to be terminated anywhere, from two feet off your property all the way to the other side of the United States. You must specify the remote termination location very precisely, even to the specific area within a given room, or you may wind up with the installation in an unusable place (i.e., a stockyard remote with you on one side, the termination on the other side, and a pen full of Texas Longhorn cattle in between!). These quality lines are equalized to provide flatter-than-normal frequency response, and are called "equalized loops."

Billing for these loops is based on distance from remote site to studio, so the price of an out-of-state equalized loop can be very high. For that reason, voice couplers have become popular for out-of-town remotes. These couplers are attached to a business telephone (by your telephone company) both at the studio and at the remote site. Then your billing is simply for the equipment installation charge and the cost of a long distance telephone call. If your station does frequent out-of-town remotes, the voice coupler system will prove to be quite a bit more economical.

Program quality over a voice coupler system is marginal. Extensive testing from assorted remote

sites around the country to our studios at WTMJ have shown a usable frequency response from 300-3000 Hz ± 10 dB, with absolutely no signal present at 250 Hz or at 3500 Hz.

With pink noise being fed from the remote site, the response as seen on an audio analyzer at the studio looks like an inverted "V," with the peak at about 900 Hz. For this reason, we use a graphic equalizer as well as hi- and lo-pass filters at the studio. The signal-to-noise ratio is typically 30 dB with rare exceptions going to 35 dB. If your long distance voice coupler call is relayed over a microwave relay tower, your program signal is subject to interference such as fading and multiplexed signal crosstalk. Although this interference is not routine, I have experienced both problems at the studio end.

Studio Facilities

Program facilities necessary to handle the remote signal in the studio can be as basic as merely having a patchpoint for the Telco loop or the microwave receiver output. Then the remote signal can be patched to a test set or any desired console. In a small broadcast facility having only one or two remote lines, it may be expedient to terminate directly in the console. Any additional signal processing equipment may be used at the discretion of the individual operator. A patchable line amplifier may be helpful to adjust varied remote levels to center range on your console fader.

In addition, the studio operator should have a business telephone available to use as a communications link to the remote site. Some stations will try to economize by feeding program cue back down the line to the remote when the remote is not on the air. This is foolish economy because when the remote is on the air there is no way to relay an emergency message to the remote site or vice versa. The studio operator is the final quality control check before the signal goes on the air. If he detects a poorer-than-normal quality remote feed, he needs that telephone to notify the remote, so that the problem may be cleared up. To live with poor program quality when a call to the remote could clear it up is an insult to your audience. If your audience becomes aware of poor remote quality occuring with regularity, your station's integrity will suffer.

If the remote occurs within the coverage area of your station, the remote man can monitor off-the-air with a portable radio and earphone for cutaway cues and for the ends of spots being run from the studio. For a remote originating outside the listening area, off-the-air monitoring is impossible. Spot cues and cutaways will have to be timed with a stopwatch at the remote. For a 60-second spot cutaway, for example, the remote should allow a minimum of 62 seconds, with 65 seconds reducing the chance of double audio caused by late reaction time at the studio. In any case, there should always be a studio operator on duty and attentive to the remote programming. Whether or not he is actively involved in parts of the remote feed, he must be ready to act in case of an emergency such as a line failure and be able to air substitute programming while the emergency is being rectified.

The studio should be in contact with the remote site by telephone before the start of the remote to coordinate last minute changes and other programming details. If the remote is out of town, for example, the audience might like to be made aware of weather conditions there before the remote starts.

Voice Couplers

Voice couplers add considerable complexity to the necessary studio facilities. One voice coupler/business telephone with an exclusion switch is necessary to receive the remote program feed. The exclusion switch shuts off the transmit signal on the phone so that it will not interfere with the

coupler feed. A second business telephone is needed for communications, especially for out-of-town remotes. The recommended installation has two phones equipped with voice couplers. The remote site should also have two telephones equipped with couplers (these need to be ordered from your telephone company at the time of the remote installation request). Then, if the program circuit would deteriorate, or if the program phone would become disconnected, the studio could call the remote to inform them of the problem. The remote could switch his feed to the communications phone and the studio could do the same. The result is an absolute minimum of down time. Communication can then be restored on the former program circuit by re-dialing to confirm that the new program circuit is working satisfactorily. As a convenience in the studio, both telephones should be equipped with headset jacks and a handset/headset switch. Once a communication link is opened, the headset can be used to give the operator more freedom of movement.

The voice coupler or coupler changeover switch will have to be followed by an amplifier to make up the insertion loss of the equalizer and filter, as well as the -30 dB output of the coupler. Once a usable level is set on the line amplifier, the graphic equalizer can be adjusted for the most intelligible response, using a test of sample programming from the remote. Don't expect a nice, full hi-fi sound on the National Anthem, because the bandwidth, even after equalizing, is still narrower than that available on a 1920's acoustically recorded disc[1].

Since the quality of the voice coupler line can change considerably from remote to remote, the graphic equalizer cannot be set for one remote and then forgotten. The quality variations are completely random and unpredictable. I've already had coupler feeds from 80 miles away that sounded worse than feeds 2000 miles away. The filter is used to remove unwanted, but amplified, noise below and above the bandwidth of the coupler circuit. Since the filter slopes are not vertical, the filtering points must be somewhat outside the needed bandwidth so as not to attenuate the outer limits of the bandwidth that is available. In practice, I set the hi-pass filter at 150 Hz and the lo-pass filter at 5 kHz. These settings do not audibly affect the program quality, but they do noticeably reduce extraneous noise.

The coupler noise level of -30 dB that I mentioned before is an area of concern for any quality-minded engineer. This random noise can be rationalized away by saying that it sounds like a large crowd, which the real crowd will hopefully mask. If the noise level is worse than normal, hang up and re-dial. Chances are that you will get a better quality line the next time. On rare occasions, I've had to re-dial five or six times to get an acceptable line.

I have not had the opportunity to try any of the noise reduction circuits presently available—Dolby, DBX, or Burwen—and would welcome comments on experiences with this type of equipment. I would suspect that noise reduction using a calibration tone for set-up would not be advisable for voice couplers, because if there would be a line failure requiring a re-dial, calibration of the noise reduction circuits would have to be checked again. This time is available in the middle of play-by-play.

Pulling The Plug

There are some other coupler problems to contend with. Occasionally, dialing transients can become audible in your program circuit. If this becomes too much of a problem, your only recourse is to hang up and re-dial. If this problem occurs during play-by-play, you can establish a link on your communications phone, then switch over during the next convenient break (i.e., spot break). Of course, if you only have one coupler phone, you're stuck. In one instance, I had to call a remote site in another state, but could not be connected by direct-dialing; I had to go through an operator. Fortunately, I always put the remote fader into cue during spot breaks because during one such break in the above game, the operator cut in on the line and asked, "Is this line still in use?" She was ready to pull the plug! Therefore, the **studio operator should always monitor the remote in cue during breaks** to remain aware of impending problems with the remote feed.

At WTMJ we have a policy that the studio will always call the remote when establishing a coupler program circuit. Some cities have automatic disconnect on extended long distance calls, when the call is placed from that city. That can be disasterous for an excited radio audience: "Tie score, bases loaded, your hero coming to bat....CLICK." Dead line. We have had no disconnects when placing the calls from our studio; we have experienced several disconnects when the remote called the studio.

Remote Facilities

With the abundance of miniaturized broadcast equipment on the market today, your remote package can be smaller, lighter and easier to carry than ever before. One manufacturer even has a microphone

with a built-in limiter and a 600 Ohm, line level output for single-mic remotes, or for running extremely long lines back to a normal remote mixer (i.e., a mic in a dugout).

The heart of the remote—the mixer—needs to be flexible and very, very rugged. Of course you take good care of your mixer, but what if....? This past winter I did a basketball remote in which my set-up was at courtside, right next to the coach of one of the teams. The cables to the mixer were all neatly dressed across the back of the table and taped to a table leg to keep them out of the operating area and off the court.

During one debatable call by a referee, the coach jumped up and slammed his fist on my table. His fingers caught under the cables. My mixer went into an orbit as long as the free ends of the cables. It crested at about six feet and crashed, upside down, on the floor of the court. After I recovered from shock, I picked up the mixer, turned the power switch back on and continued with the broadcast. Total service interruption was about 20 seconds.

Another time, a fellow engineer used the same mixer to do audio for a television feed and noticed in set-up that the meter light seemed to be brighter than normal. Everything else worked ok, so he was not concerned. Besides, they had a problem with a TV monitor that kept popping fuses. After some checking, they found out that the electrician had wired up their power feed wrong, and he was running that 110 Volt mixer on 220 Volts! When the power was corrected, about an hour later, the mixer still worked fine. Even with this ruggedness, I still believe that it is a good idea to carry a spare mixer as insurance, especially now, since it is so convenient. Your peace of mind is worth it.

A typical remote in baseball consists of four audio sources: play-by-play announcer, color announcer or interview guest, crowd noise or bat crack, and tape playback (reel-to-reel, cassette or cartridge). If more sources are used, the standby mixer can be ganged to provide the extra inputs. Additional sources might consist of a third announcer, the desire to mix crowd noise and the bat crack effect, more than one tape source, a PA feed of the National Anthem, a dugout feed, or a "fan in the stands" feature. Of course, you can plug and unplug input connectors, but your chance for error on the air increases drastically.

Cream And Sugar, Thanks

The traditional micing of a sports announcer is to place a mic on a desk stand. Recently, the headset-type mics have been showing an increase in popularity. Their major advantage over the desk mic is that, when the announcer turns his head to follow the action or to check the stat sheets, the mic will always stay with him. This increases intelligibility, reduces the off-mic bobbing gain problem, and keeps the mic close enough to the announcer's mouth to prevent the crowd noise from overriding the announcer. An announcer should not be forced to use a headset mic, however, if he does not feel comfortable with it.

Last summer I did a baseball remote with an out-of-town announcer who does not normally use a headset microphone, but used it anyway on this game. After several innings of play-by-play, someone served him coffee. Being used to a desk mic, he leaned back and said "I'd like some cream and sugar, please." Now his whole listening audience knows how he drinks his coffee. If you're going to use headset mics, be sure each mic is equipped, at the remote site, with a spring-return cough switch. Occasionally, sports crowds will become so loud that the play-by-play announcer will speak up and talk directly into his mic. An alternative idea[2] is to have the announcer use a differential microphone. This type of mic will cancel some of the crowd noise, allowing the announcer to be heard clearly again.

Audience Pickup

There are two basic types of natural sound to pick up at a baseball game: the audience and the players. The audience is the most common natural sound to pick up because the crowd is usually large and noisy.

In placing a mic (or several mics) for crowd noise, it must be far enough away from individual fans to provide a combined sound of many people. You don't want to pick out individual crowd comments, especially heated ones; a large cheering crowd can greatly enhance the listener interest. A dynamic omni with a wind screen and bass rolloff is your best bet for a crowd mic. In the pro parks with double-level seating, the crowd mic can be hung over the edge of the upper deck or mezzanine, from the broadcast booth location. This mic will then pick up a good general sound of the lower grandstand.

At smaller parks with a booth, you may have to aim the crowd mic out of the window or place it on top of the booth, aimed toward the audience. At parks without a booth, it may be necessary to place the mic on the end of a pole to get it far enough away from individuals in the crowd. A major problem in placing the crowd mic is unintentional pickup of the public address system. Ideally, the crowd mic should be far away from any PA speakers. Otherwise, the public address announcer may be loud enough to interfere with the commentary of your play-by-play announcer.

The bat crack mic is intended to pick up primarily the sound of the players, specifically the sounds around home plate. This is generally accomplished with a shotgun mic attached to the backstop and aimed at the plate. This mic should be placed high enough on the backstop so that comments made by nearby fans will not interfere with the intended pickup. The mount should be designed so that the entire length of the shotgun mic is behind the backstop screen. With frequent foul tips heading back at the screen, one direct hit could put your bat crack mic out of service. Also, it may be wise to devise some type of rain shield for this mic in case of a cloudburst. With a little practice, the bat crack pickup can very effectively add a new dimension and liveness to the sound of your baseball pickups.

Interviews

Interest in the game can be enhanced by recorded interviews taped before the start of the game and played back as part of the pre-game show, or excerpted during lull periods in the game itself. Most convenient for this is the cassette. A

cassette recorder with AGC can readily be used by the announcer to gather the interviews while the engineer is setting up the rest of the remote equipment. A reel-to-reel could also be used for this. It would provide better audio quality and easier cueing for playback than a cassette, but is less convenient to use for the average non-technical person.

A cartridge machine could be used to cart excerpts from the reel-to-reel as well as to play back carted spots from the remote. Unless the client specifically wants his recorded spots to be aired from the remote, it would be better to air them from the studio. If the cart machine would malfunction, the studio would have a back-up machine to save that potential revenue, whereas the remote probably would not, and the revenue would be lost. Also, carts carried to the remote are more likely to be subjected to contaminants.

Now that your remote is set up, where does your mixer output go? It goes directly to the input of the microwave, if that is what you're using. If you have an equalized loop, there are two possibilities: a connecting block or a TACT unit. In both cases, the mixer output (at approximately +4) is wired directly to the terminals. The TACT unit (Termination And Continuity Test) has a switch which sends a pulsed reference tone down the line in the Test position, and feeds your program down the line in the Program position. Some telephone companies will install the TACT unit as a matter of course when a line is ordered, while others may require that you specifically request it[3]. If you are using voice couplers, the output of the mixer must be padded down and then plugged into the coupler, using a standard ¼ inch phone plug. A 9-10 dB pad is needed on the output of the mixer to bring the level down below -6. If this is not done, the mixer will overdrive the coupler line, creating clipping distortion. This distortion is quite noticeable. Be sure that voice coupler phones with exclusion keys and headsets have been ordered for the remote site along with the installation request.

The weakest link at the remote typically is the monitoring. A set of crystal headphones being fed at line level while you're surrounded by a cheering crowd of thousands is not monitoring! When the remote engineer asks the studio, "How's the crowd noise?", he's passing the buck. As the engineer who's doing the mix, he should **know** how the crowd noise is. A good set of dynamic headphones with a tight-fitting seal, and a power amplifier to drive them, should be included in every remote package. The ear seal will reduce ambient leakage, and the power amplifier will let the remote engineer hear more than just the crisp peaks.

Useful Remote Tips

One gadget that can be helpful in the remote package, particularly if you have to operate by specific real-time cues, is an electronic digital clock. When you check in at the remote site, the clock can be set to match the studio clocks exactly. This way, you can be exactly sure when to expect to go on the air.

(*Continued on page 54*)

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For More Details Circle (22) on Reply Card

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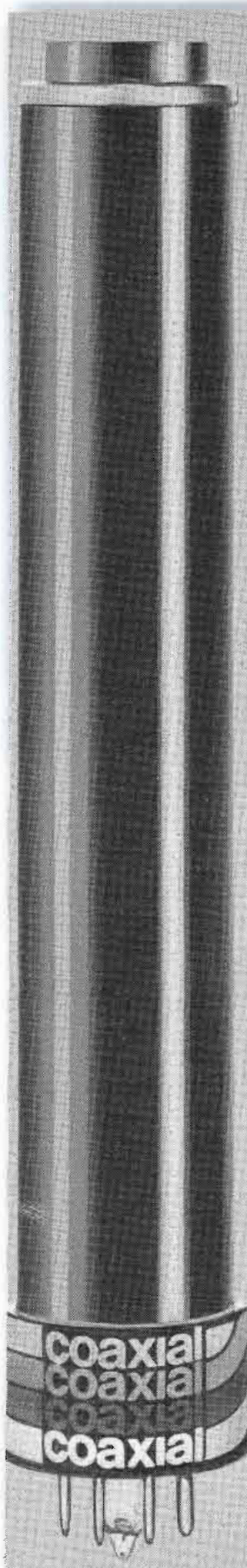

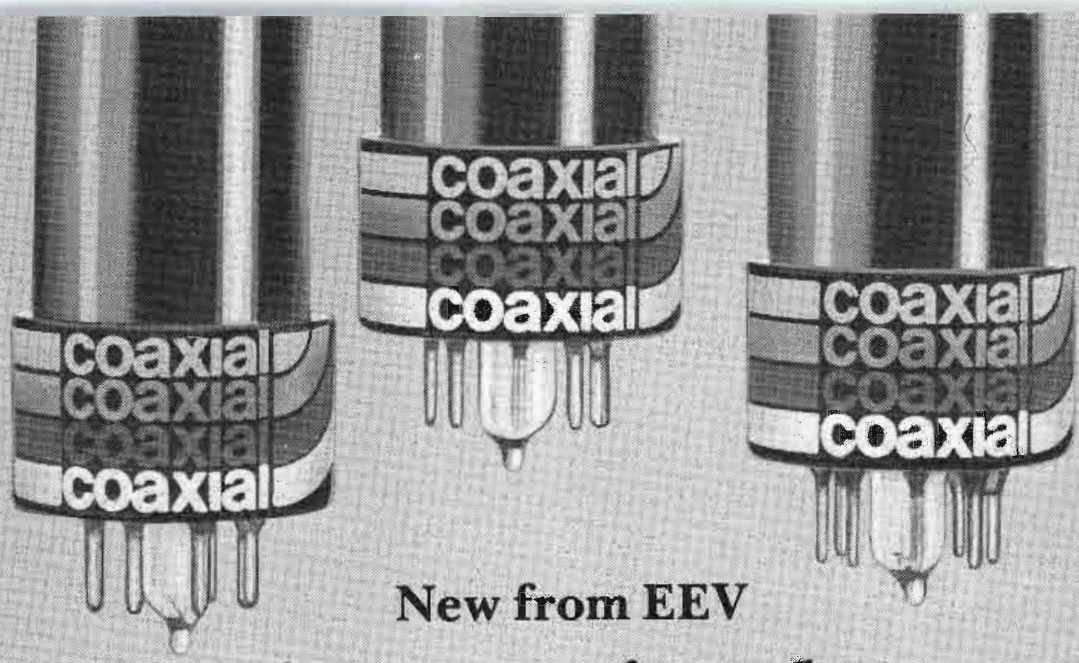

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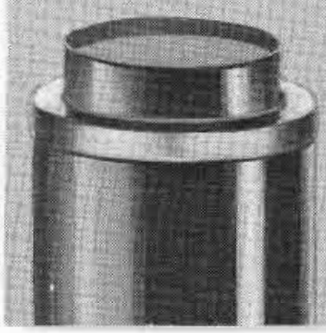


P8131 Coaxial Leddicon with standard layer and variable light bias.

P8132 Coaxial Leddicon with extended red layer and fixed light bias.

P8133 Coaxial Leddicon with extended red layer and variable light bias.

For More Details, Circle (27) on Reply Card

Getting the angle on major sports coverage

While CBS covers a multitude of sports year 'round, no assignment is any more difficult than covering a singles tennis match. In this article, you'll see pictures that show how the recent Virginia Slims tournament was handled.

What makes this assignment so challenging? The fact that the contestants are widely separated and the action is fast and close to the ground....and all this must be captured by cameras that should not distract the players.

As you can see from the pictures here and on the front cover, various angles and levels were used. And that's what makes for interesting viewing. Otherwise, the viewer would get an unreal impression of the match. When the challenge is met, the viewer gets a better seat than the courtside spectators.

From a coverage standpoint, other sports can present some problems in logistics. Golf, for instance, is one of the few sports where the viewer has had to accept the fact that he'll miss part of the action. Now the situation is changing.

If you have players strung out across an 18-hole course, how will you ever show **all** the action? You can't, but at least you can follow the leaders and go live on each hole.

About ten months ago, CBS began field-testing the Thomson CSF TTV-1515 triax studio/field color camera. Since that time, it has become a familiar silhouette on the sports circuit.

Groups of five or six cameras have been used from one to three times a week. And the sports covered included golf, tennis, football, basketball and horseracing, with venues from Miami to Chicago.

While this camera is a newcomer to the American scene, it is by no means an unknown in the international TV arena. Cameras of this type are in use by national networks of France, Belgium, the USSR and others.

Since we're going to look over CBS's shoulder as they cover a sports event, let's take a look into the TTV-1515. Bear in mind that this camera is designed primarily to bridge the gap between the light weight, hand held camera and the burdensome field camera, each of which has certain limitations.

The camera head, without the removable viewfinder or zoom lens, weighs 77 pounds, so it takes only two men to mount it on the tripod.

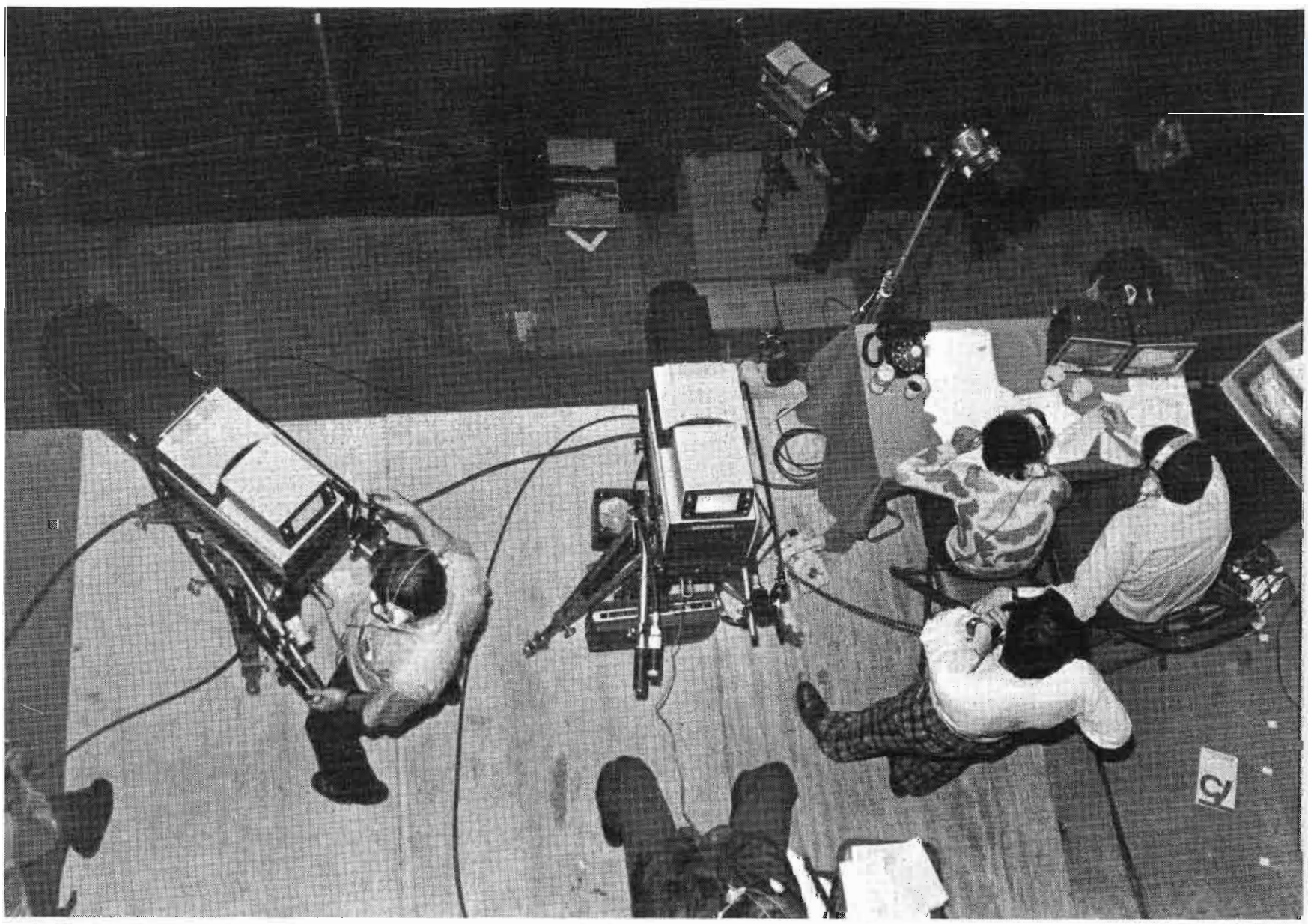
The viewfinder weighs 11 pounds and can swivel through more than 180 degrees while tilting over 60 degrees. This is especially useful in cramped locations, where the camera-person must operate in a restricted area.

A wide variety of manual or electrical zoom lenses of standard manufacture are attachable to the camera body. The optical aspect of the camera includes: two rotational step filters for a wide range of neutral density and colorimetric correction; a built-in diascope that accepts standard 5 x 5cm test slides; fiber optics to insert luminous reference markers into the optical path for the automatic registration system; and bias lights that reduce plumbicon lag at low light levels.

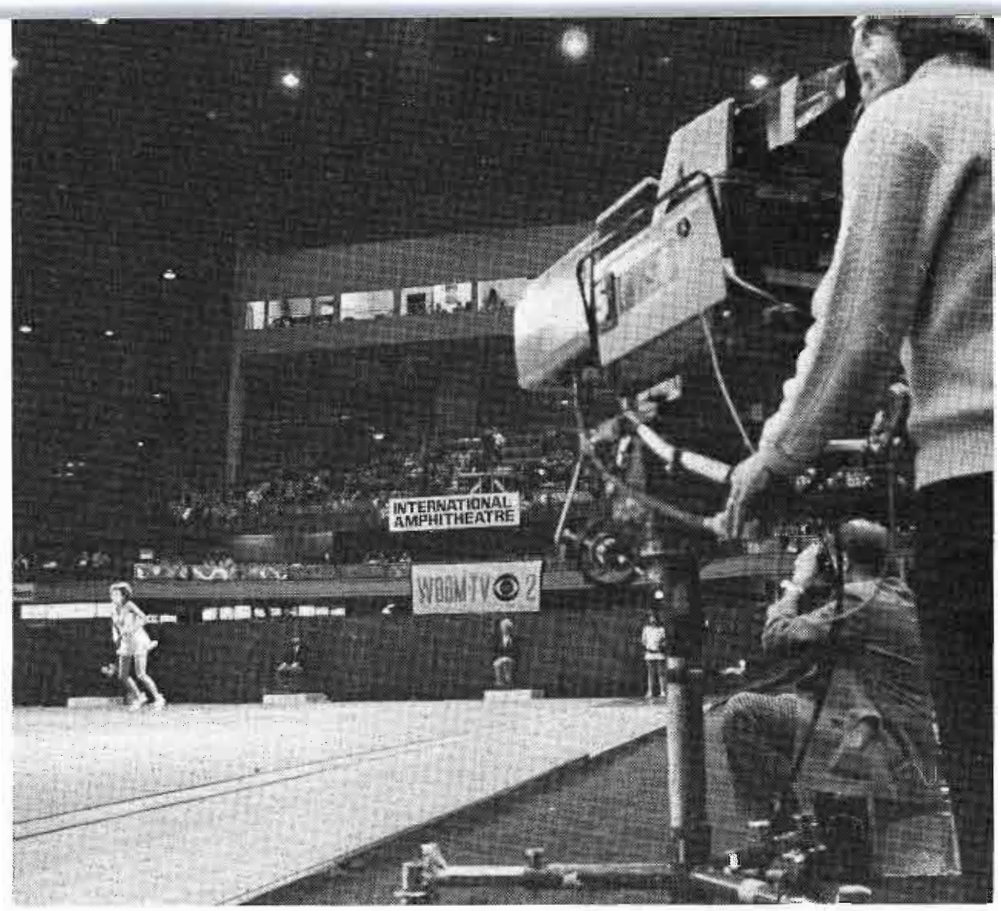
Probably the most interesting aspect of this remote camera is the use of a single small diameter triaxial cable between the camera and the CCU. This cable can be up to 2,000 meters (6,000 feet) long, allowing extended mobility in sports coverage.

All control and command signals between the control unit and the camera head are multiplexed on to 46 channels. These channels use coders and decoders employing pulse width modulation to transfer the necessary information. They occupy the first 3 MHz band in the overall spectrum of 70 MHz that is used for the complete system. In

In this series of photos you see Chris Evert from a floor shot. You note that she uses both hands on her backhand shot and only one for her forehand return. If you want to show this unusual tactic, you must anticipate it and place one camera at the proper level and angle. (All photos by Donna Roizen)



This shot was taken from a camera scaffold 40 feet up. It looks down on the announce booth. Below the scaffold you can see a camera at near floor level.



Wendy Overton charges the ball as a courtside floor level camera catches the action.

addition to regulated DC voltages, control and command signals, the CCU also sends back to the camera viewfinder a 6 MHz video signal amplitude modulated on a 58 MHz carrier, which can be the camera's own signal or external video from another source, such as the special effects bus.

From the camera to the CCU, the return signals consist of the red, green and blue image components amplitude modulated on carriers that are 22, 36 and 9 MHz respectively, and with differing bandwidths to optimize resolution and signal-to-noise characteristics. The three returning carriers also carry various technical signals during the blanking intervals.

The camera uses three 30mm (1.25 inches) lead oxide separate mesh tubes. It is available for operation on 525/60 or 625/50 scan rate versions. The RGB output signals may be encoded in either NTSC, SECAM or PAL color standards.

Electrical and mechanical construction was purposely made to simplify in-field service.

Like many modern high quality color cameras, the TTV-1515 also provides color masking, contour enhancement, selectable gamma correction, automatic timing and video response compensation (for varying cable runs), separate remote control for major functions, and matrixing for a pseudo-luminance signal in the green channel.

On The Scene

At the Asian Olympic Games in 1974, the cameras were operated under a wide variety of environmental conditions by Iranian technicians and camera-persons who had only a last minute cram course in color TV, since Iran did not yet have a national color TV service.

Color monitors set up throughout the Press Center constantly displayed the various venues where the contests were taking place. Proper colorimetric images were primarily encoded in the SECAM standard. The color pictures were converted to PAL for Far East transmission to Hong Kong and Thailand, and translated to NTSC for distribution in Japan through the NHK network.

On The Line

In an interview with Bob Wussler, the Vice President of Sports at CBS revealed that the lightness of the triaxial cable permits reaching to any corner of a large area, and for the first time, CBS is able to cover all 18 holes of a golf match. They even expect to do a back-to-back golf tourney this year.

At the Virginia Slims tennis tournament in Chicago, the CBS mobile vans arrived on Thursday. By Friday noon, six cameras were deployed around the tennis court in the International Amphitheatre. Two cameras were at or near floor level, two were on a 20-foot scaffold, one on a 40-foot platform, and one on an opposite balcony. For the next day and a half of exciting competition between the greats of women's tennis, such as Margaret Court and Chris Evert, the challenge was continuous.

For special effects, with three-way split screens, the camera-person could select the external video mode on his viewfinder and see exactly where his picture fitted in. The viewfinders were bright enough that most of the cameras operated without viewfinder light hoods.

Your Serve

While it's true that local coverage may not be nearly as demanding as network sports remotes, the challenge is consistent: give the viewer the best seat in the house. That means making the best possible use of cameras, levels, and angles. To be really effective, sports coverage requires as much creativity as any other video production assignment.

Management Highlights

The challenge of sports coverage is never ending. We thought you'd be interested in seeing how one major network is meeting that challenge. In this case, it also means an introduction to a camera that CBS is using to extend its flexibility for major sports coverage. Here, in picture approach, the author zooms in on a recent tennis tournament in unique perspective.

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For More Details Circle (24) on Reply Card

Using the Sin^2 Window

Part 2 of a series/By Harold Ennes

Note: This article contains brief excerpts from this writers' "Television Broadcasting: Systems Maintenance," published by **Howard W. Sams & Co., Inc.** and appears here by courtesy of the publisher. New and additional data included in this article is an actual circuit for "triple-triggering" the scope to obtain precise measurements of pulse-to-bar amplitude ratio, and slope of the window signal. (Appeared in Part 1.)

To correlate test-signal measurement with an actual degree of picture impairment, the **K factor** is used. The K factor is basically defined in terms of a standard picture distortion which is a single echo spaced in time 8T or more from the main transition. For example, if the peak amplitude of this single echo is 4 percent of the original transition amplitude, the K factor is defined as 4 percent.

See Figure 18. A signal transition with a sine-squared shape occurs at t=0. At a point spaced at +8T, a certain amplitude of "ring" or echo, exists. Let us arbitrarily assume that this amplitude is 4 percent of the original amplitude, so B=4 percent. A waveform distortion (A in Figure 18) much closer to the transition is larger, but its effect as judged by an "average observer" is only equal to the picture impairment caused by echo B. Thus, although echo A may be 16 percent of the original amplitude, echo B, of only 4 percent amplitude, results in the same degree of picture impairment. We may construct a graticule mask which defines limits within which a waveform must fit if it is to have a K factor equal to or less than the limits specified.

For the purpose of assigning a numerical value to a subjective assessment, we can say that for a K factor of 5 percent, picture impairment is noticeable to an experienced and critical observer, whereas a K factor of 3 percent is not noticed by the same individual.

See Figure 19. Along the positive time base of the transistion, for h.a.d. = 0.250 μs, the time from t=0 to t=T is 0.125 μs (A in Figure 19). Then the time to 8T is 8 X 0.125 = 1 μs. Where h.a.d. = 0.125 μs, T = 0.0625 μs (B in Figure 19). Therefore 8T = 8 X 0.0625 = 0.5 μs. Obviously, the transition along the negative time base is the same, but progresses from t=0 in the opposite direction.

Now see Figure 20. At plus and minus 8T, lines representing the limits of the K factor are spaced in reference to the amplitude at t=0. If the K factor limit is to be 4 percent, then at the 8T points the

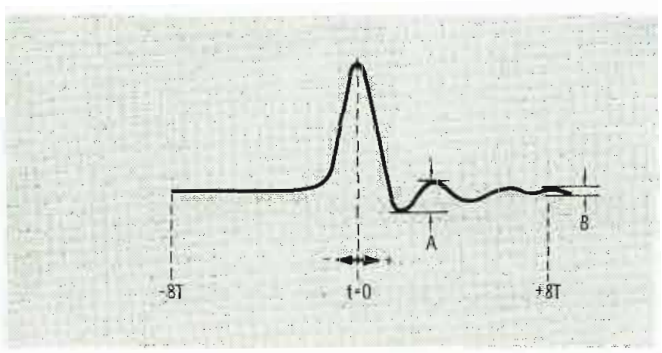


Fig. 18 Basic quantities involved in explaining the K factor.

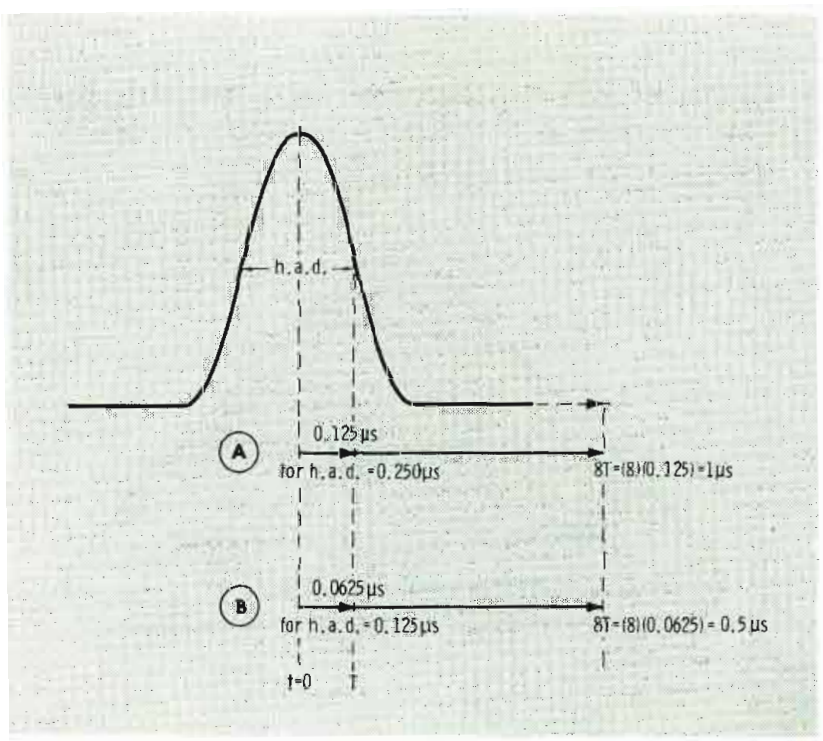


Fig. 19 Pulse transition along positive time base.

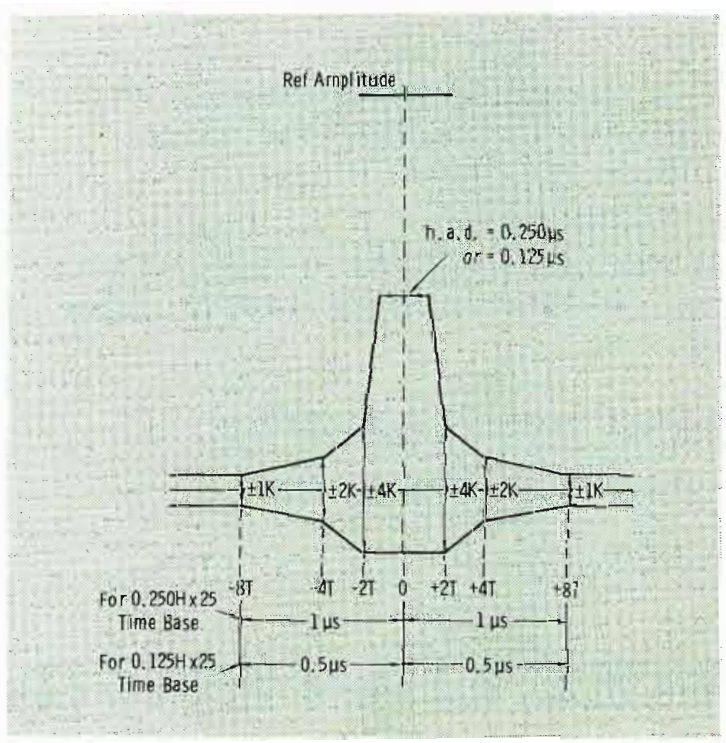


Fig. 20 Basic K factor graticule.

Table 1 - Waveform-monitor time bases

Horizontal Magnification	Display Switch on 0.125H/cm		Display Switch on 0.250H/cm	
	H/cm	μs/cm	H/cm	μs/cm
×1	0.125	7.94	0.250	15.9
×5	0.025	1.59	0.05	3.18
×25	0.005	0.318	0.01	0.635

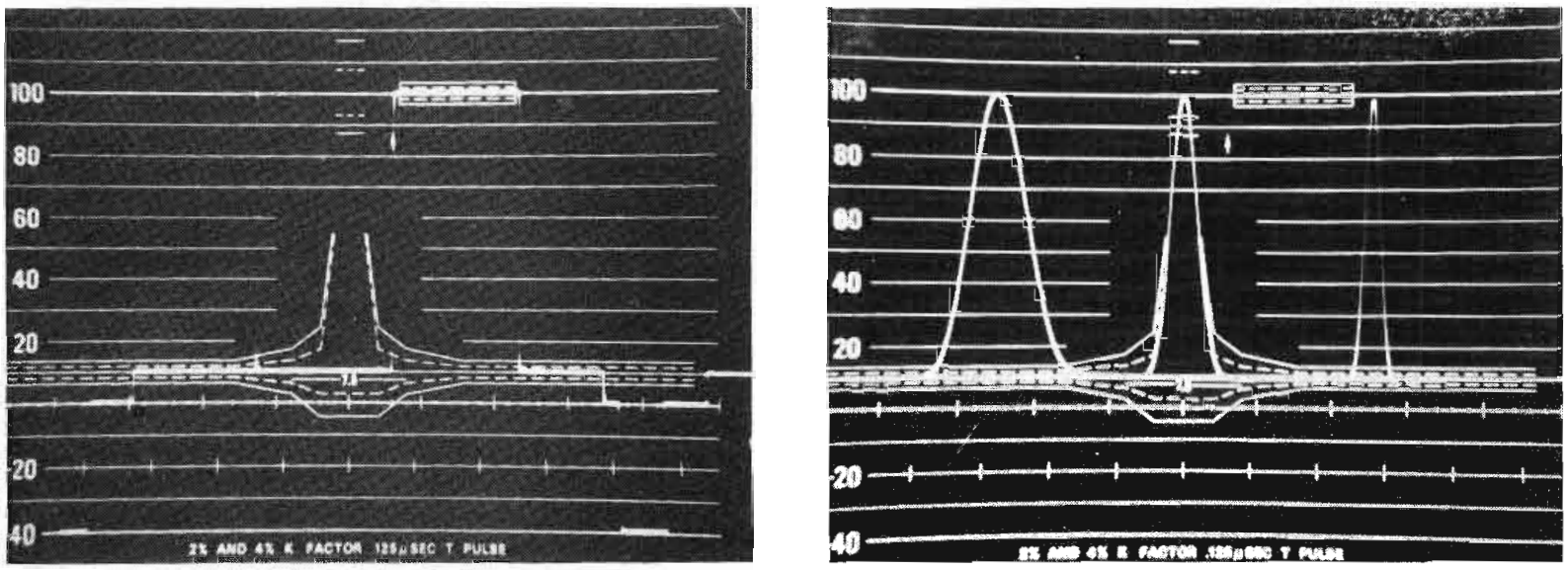


Fig. 21 (A) Graticule markings. (B) Sine-squared pulses.

lines are spaced plus and minus 4 percent of the amplitude at t=0. Echoes of larger amplitude may occur closer to the main transition with no increase in subjective picture impairment. Note, for example, that at 2T the limit increases to 4 times that at 8T. Thus, if the 8T point has a K factor of 4 percent, the 2T point is allowed an amplitude of 4 X 4 = 16 percent to fit within the 4 percent K factor mask.

Note also that the same mask can be used for pulses of either 0.250 μs or 0.125 μs h.a.d. by proper adjustment of the waveform-monitor time base (providing that proper precautions are used in interpretation for various systems, as described later). Table 1 lists time bases of the Tektronix type 529 waveform monitor. The time base of 0.250H/cm X 25 is the proper time base for the pulse with h.a.d. of 0.250 μs. For the pulse with h.a.d. of 0.125 μs, 0.125H/cm X 25 is the proper time base.

Figure 21A is a photograph of the K factor graticule on the Tektronix type 529 waveform monitor. The solid lines outline a 4 percent K factor, and the dash lines outline a 2 percent K factor. The sweep rate for the pulse-and-bar signal (hardly distinguishable in Figure 21A because the pulse is very faint and the bar is centered on the proper graticule lines) is 0.125H/cm, thus displaying one horizontal line. Note that a 10 percent setup level is used.

Figure 21B is a multiple exposure of the three basic sine-squared pulses from a standard generator. The time base used was 0.125H/cm X 25. Note that the pulse with 0.125 μs h.a.d. is well under the 2 percent line for the h.a.d., since we are looking directly at the

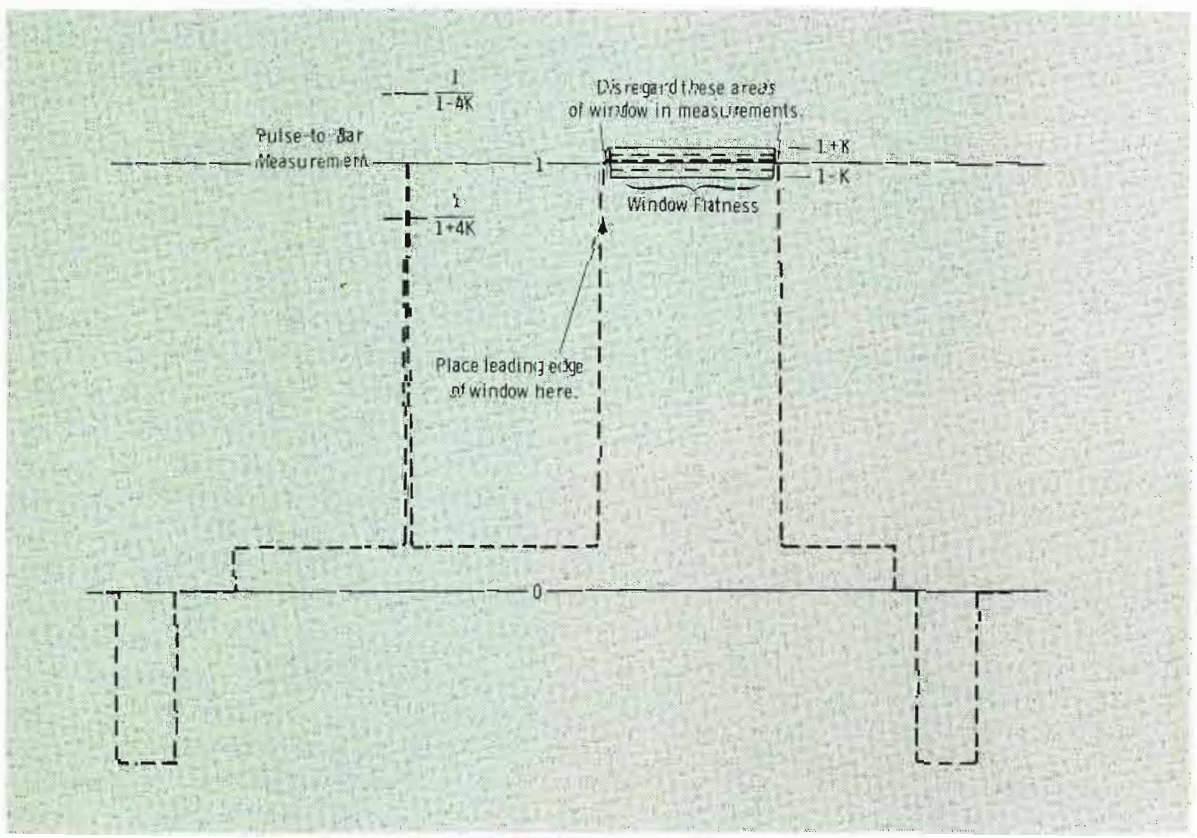


Fig. 22 Pulse and K-factor limits, normal horizontal sweep.

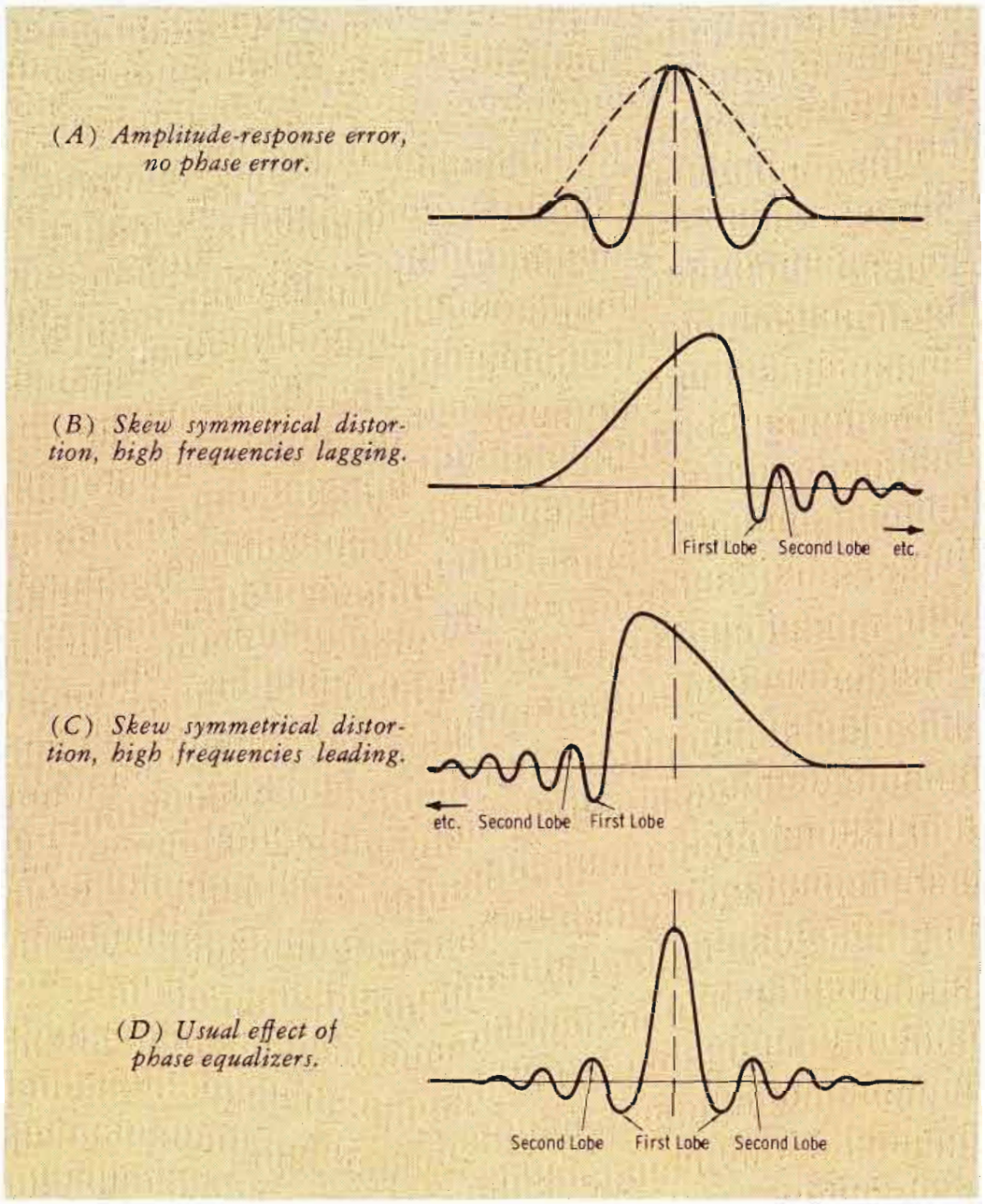


Fig. 23 Basic T-pulse responses.

generator output.

Also note in Figure 21B that the T/2 pulse (right) is slightly below the reference amplitude of 100 IEEE units. This emphasizes that a sine-squared pulse generator **must** be adjusted with an external test oscilloscope that has excellent response up to 30 or 50 MHz. When the T/2 pulse is properly adjusted in amplitude with such an oscilloscope, the type 529 specifications call for an amplitude of 94 to 100 IEEE units for the T/2 pulse display. The wideband response of the type 529 waveform monitor is flat within 0.3 dB to 8 MHz.

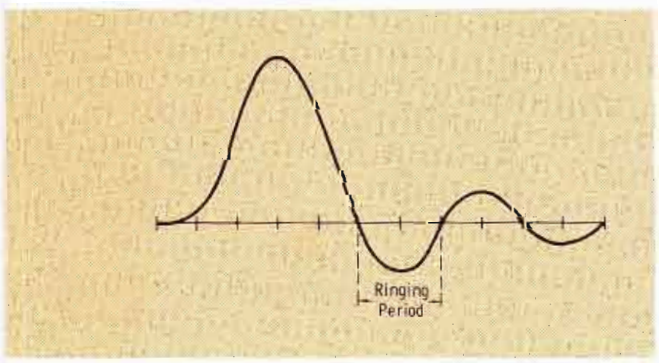


Fig. 24 Ringing period.

Waveform Placement

The K factor graticule includes the limits of flatness for the window signal, and the limits for the pulse-to-bar amplitude measurements for the K factor used. Figure 22 indicates how these limit lines are established. Observe also in this drawing that an indicator is used to show the correct waveform centering to place the leading edge of the window signal. Note that an area on either side of the window is disregarded in this measurement, and that only the enclosed area along the top of the bar is used. This is true for either horizontal-or vertical-rate waveform presentation.

Figure 23 illustrates the basic T pulse responses encountered. In Figure 23A, an amplitude-response error is apparent without phase-response error. Waveform errors this close to the transition do not impair the signal (unless excessive) as much as errors farther away. In fact, we should recognize this type of "error" as that obtained from "phaseless aperture correction" in camera chains. Thus we have a "crispening" effect of a single overshoot as compared with actual picture impairments such as would result from the remaining waveforms of Figure 23.

Skew Symmetrical Distortion

Figure 23B shows the "skew symmetrical" distortion caused when the delay increases with increasing frequency. Figure 23C shows the opposite type of phase distortion, where the delay decreases with increasing frequency. In a system with a fairly rapid rolloff that employs phase equalizers to correct the resulting phase distortion, proper equalizer adjustment is indicated when ringing amplitudes are equally distributed preceding and following the pulse as in Figure 23D.

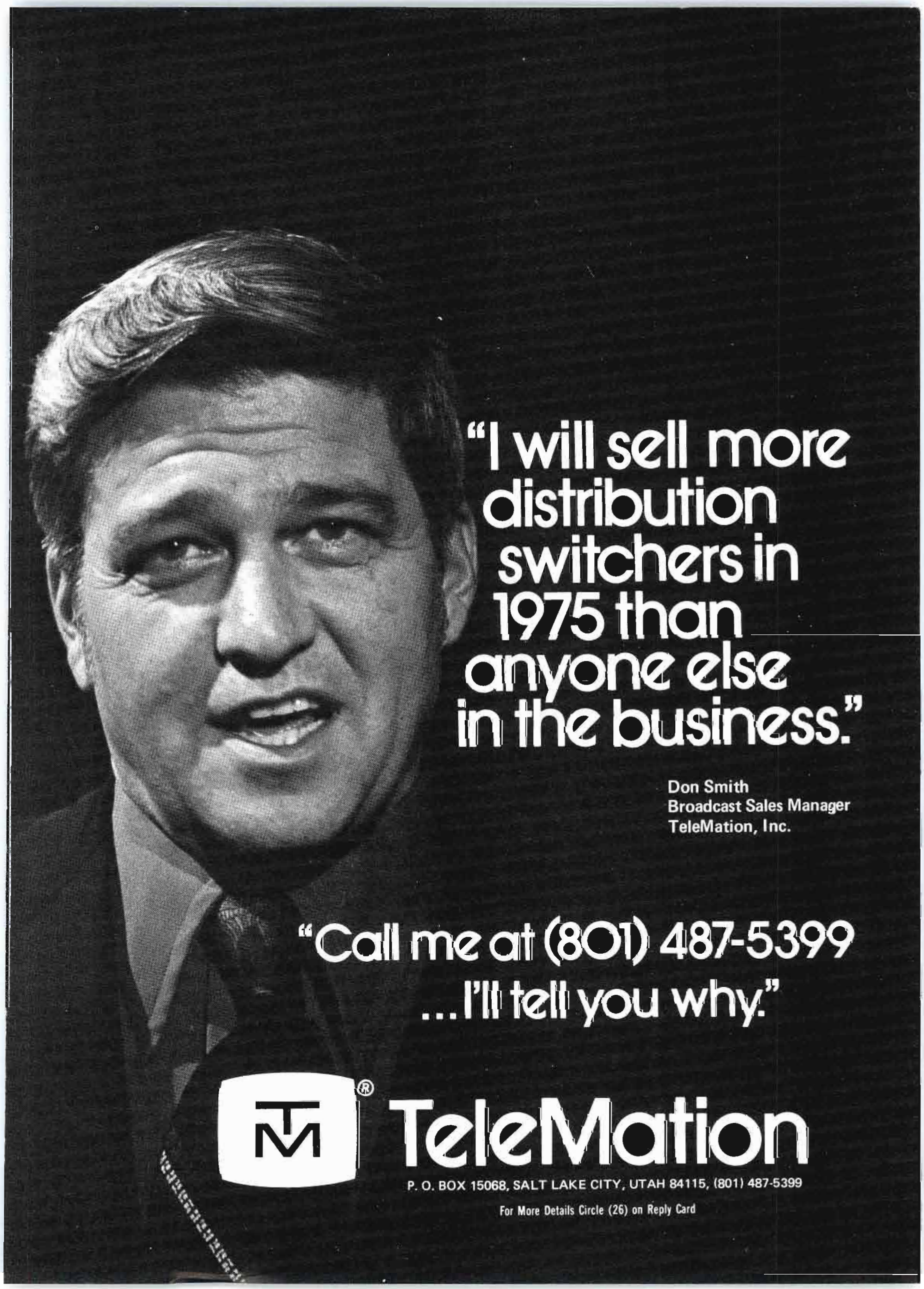
The amplitude-frequency and amplitude-phase response at frequencies higher than about 100 kHz is most evident in the measurement of the $\sin^2$ pulse. Amplitude-phase response at frequencies below 100 kHz is most evident in measurement of the window signal.

Note: Some generators place the $\sin^2$ pulse following the window rather than preceding the window. This has no effect on basic understanding of measurement principles.

Picture Errors

Distortions at low frequencies produce waveform distortion with a long time constant, as, for example, streaking. This is most evident in window measurement. Distortions at higher frequencies produce waveform distortions with shorter time constants as, for example, smearing, loss of resolution, or "edge effects" from bad transient response. This is most evident in $\sin^2$ pulse measurement or in window signal transitions.

High-frequency rolloff results in loss of amplitude of the $\sin^2$ signal relative to bar height. Loss of amplitude results in a **widening** of



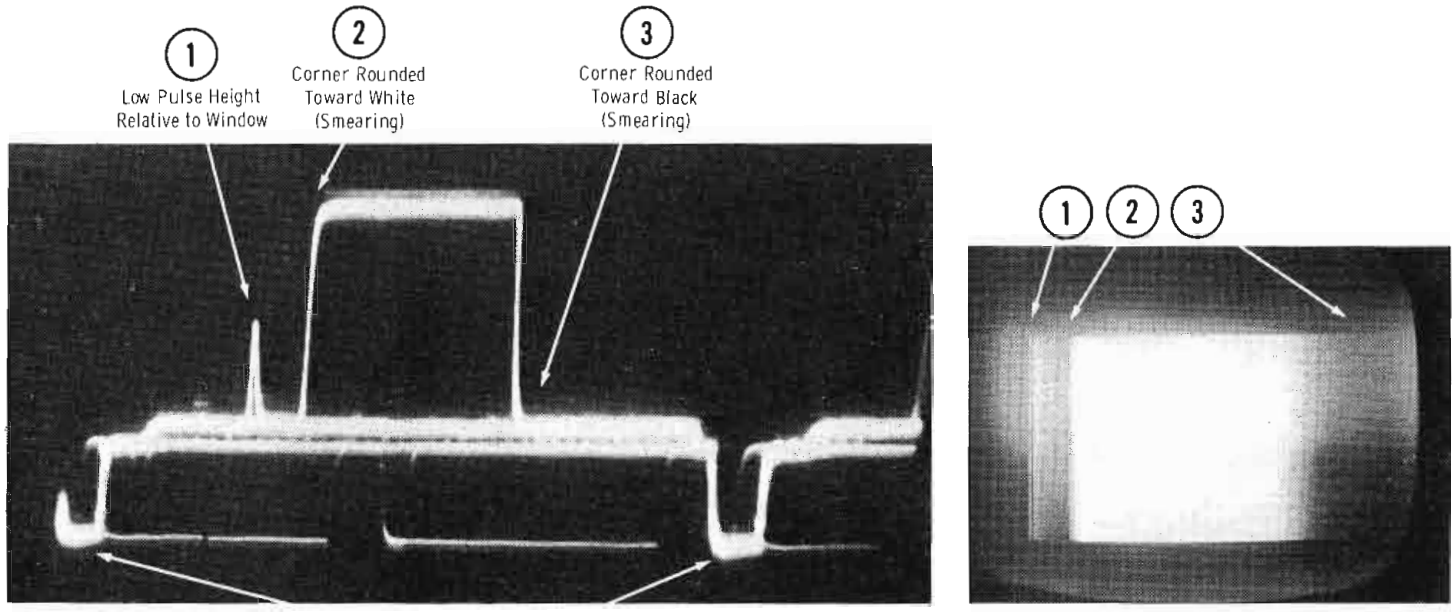


Fig. 25 Example of short-time waveform distortion. (A) waveform display. (B) Picture monitor display.

the pulse, since the area of the pulse represents a constant DC component. A slow rolloff within the video band produces a large reduction in amplitude, (and pulse-width increase) with little or no ringing. A rapid rolloff close to the top of the band but still within the desired video bandwidth produces both a reduction (perhaps slight) in amplitude, and ringing. A rapid rolloff (almost a cutoff) just above the video bandwidth concerned results in practically no effect on amplitude, but does produce ringing. The shape of the rolloff and whether the resulting phase shift is leading or lagging is revealed by the distribution of ringing before and after the pulse.

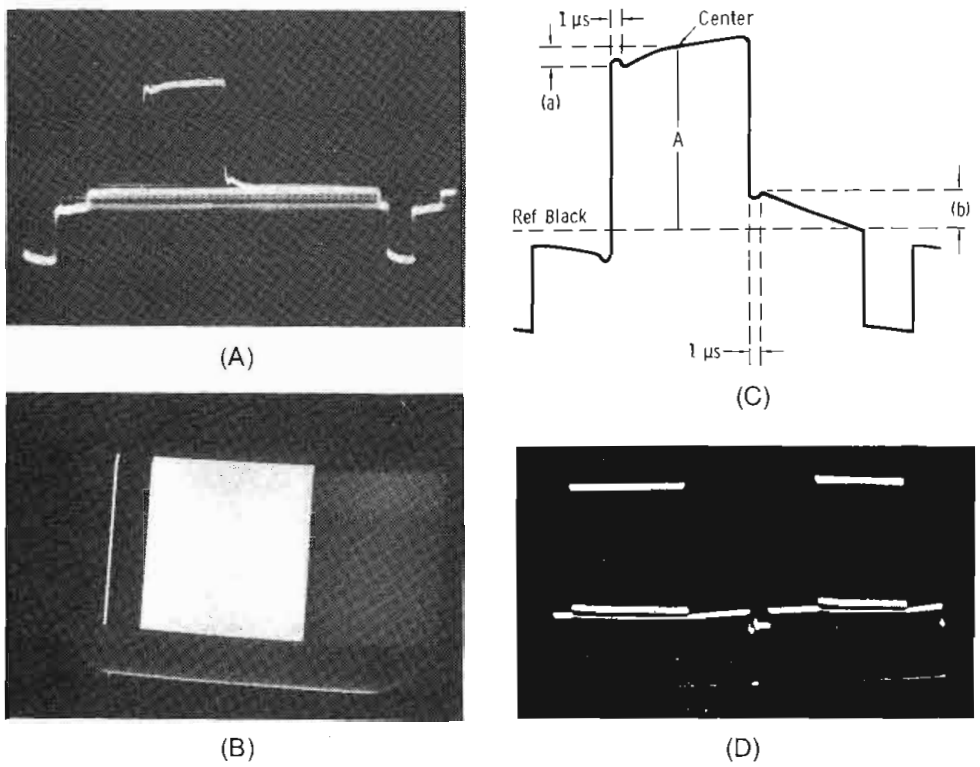


Fig. 26 Example of LD with leading and trailing positive streaking. (A) Window waveform at horizontal rate. (B) Picture monitor display, $\sin^2$ pulse added. (C) Details of window signal of A. (D) Vertical-rate waveform display.

The window permits detecting low-frequency distortion, which has practically no effect on the $\sin^2$ pulse. The window shows undershoot, overshoot, and horizontal tilt, depending on the time constant of the impairment. When used with the $\sin^2$ pulse, the window has the same rise time as the pulse so that no frequencies higher than the system test reference are introduced.

Ringing occurs at the frequency at which the gain dip occurs in the system being measured. The ringing amplitude depends on the sharpness of this gain-dip characteristic.

The ringing period (Figure 24) is defined by the following relationship:

$$R_p = \frac{1}{f_c}$$ where f_c is the cutoff frequency.

For example, if we have a 4 MHz cutoff, the ringing period (R_p) is:

$$R_p = \frac{1}{4(10^6)} = 0.250\ \mu s$$

To find the cutoff frequency for a given measured ringing period:

$$f_c = \frac{1}{R_p}$$

where: f_c is the cutoff frequency in megahertz
R_p is the ringing period in microseconds

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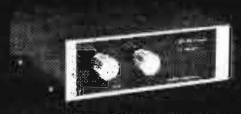

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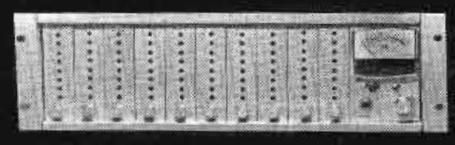
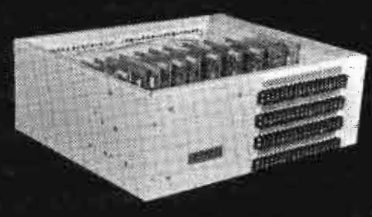
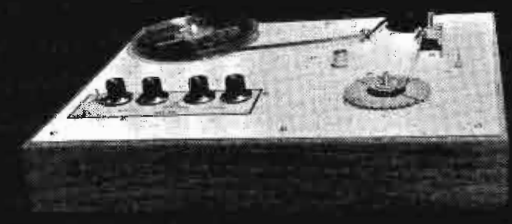


AUDIO DISTRIBUTION AMPLIFIERS



AUDIO CONSOLES & CONTROLLERS



AUTOMATIC TAPE CARTRIDGE & CASSETTE LOADERS

STUDIO MONITOR AMPLIFIERS

REMOTE POWER CONTROLLERS

TEN DAY FREE EVALUATION AND 2 YEAR GUARANTEE
INSURE YOUR UNCOMPROMISED SATISFACTION

TURNTABLE PREAMPS

Preamps costing almost 3 times more will not compare with these units. RIAA/NAB equalized ±1db, 0.5MV sensitivity at 1KHz for +4dbm out, balanced outputs, —75db s/n at 10mv in, 0.05% distortion, +21dbm max. out. Internal power supply.

MP-8E Mono $86 SP-8E Stereo $137

MIC & LINE AMPLIFIERS

Dual function and superb performance. Inputs for mic and line, ±0.5db response 10Hz-20KHz, 67db gain on mic channel(s) +26db gain on line inputs. Balanced inputs & outputs, +21dbm out max, 0.1% distortion. Internal power supply.

MLA-1E Mono $98

MLA-2E Dual Mono/Stereo $139

AUDIO DISTRIBUTION AMPLIFIERS

From 1 in/6 out to 20 in/80 out in one small package. Whatever your distribution requirements we have an answer. All units meet or exceed the following specifications: Balanced bridging/matching inputs, balanced 600ohm outputs, ±0.5db response 10Hz-20KHz, ±3db 5Hz-40KHz, 26db gain, +21dbm out. max. capability, 0.1% or less distortion, outputs isolated by 80db, hum and noise 90db down referenced to +21dbm out. Internal power supplies.

DA-6/E	Table top. 1 in/6 out.	$131
DA-6R/E	Rack mount. 1 in/6 out.	$149
DA-6BR/E	Rack mount. 1 in/6 out. Individual level controls for each output.	$165
DA-6RS/E	Rack mount. 1 in/6 out stereo or 2 in/12 out mono.	$229
DA-16BR/E	Rack mount. 1 in/8 out stereo or 2 in/16 out mono. Individual output level controls, selectable metering & headphone monitoring.	$287
DA-2080/E	Rack mount main frame with protected power supply, metering & headphone monitor. Will accept up to 10 slide in modules. Each module has 2 inputs & 8 outputs. Individual output level controls & selectable meter switch. Up to 20 in/80 out.	
DA-2080/E	Main Frame	$150
DA-2080/E	Modules 2 in/8 out	$135 ea.

AUDIO CONSOLES & CONTROLLERS

Our new series 35 audio controller introduces a new concept in audio mixing. Allows separation of controls from the audio functions. Controls can be placed in any convenient location in the studio, while electronics may be mounted anywhere for easy maintenance & hookup. Remote DC control for completely unaffected audio.

This versatility gives you a custom designed console at a standard production model cost.

Features include; 8 channels, mono, dual channel mono, stereo, dual channel stereo, or combinations; paralleling 2 units for quad, fail safe power supply & plug in interchangeable cards.

Performance specifications are; 0.3% or less distortion, 124dbm equivalent noise on low level channels, approximately 25w power consumption, —70db crosstalk, balanced bridging/matching inputs & response within ±2db 20Hz-20KHz. Series 35 audio controllers start at $1200.

AUTOMATIC TAPE CARTRIDGE AND CASSETTE LOADERS

So easy to use & accurate that our largest winder competitor has been using one of these to load their own carts.

Eliminates guesswork. Set the dials to the length desired. The exact amount of tape is fed onto the cart or cassette hub and then shuts off automatically. Also has exclusive torque control for proper tape pack on different size hubs. Winds at 30 IPS.

ACL-25/E $185

Winders also come in higher speed models (ACL-60 series). Same operation as above but winds at 60 IPS. Accepts 14" pancakes.

ACL-60T/E	(tone stop only)	$266
ACL-60B/E	(Blank tape loader)	$331
ACL-60BT/E	(for both prerecorded and blank tape)	$375

STUDIO MONITOR AMPLIFIERS

Exceptional reproduction! Internal muting. ±2db response from 20Hz-40KHz. 25w music power, 20w RMS into 8 ohms. Hum & noise 65db below rated outputs.

Distortion less than 0.25% at less than 20w out, 1% or less at 20w. Works into 4-16ohms. Balanced bridging inputs, variable bass contour, internal overload & short circuit protection.

SMA-50/E	Table top (mono)	$125
SMA-500/E	Rack mount (mono)	$142
SMA-1000/E	Rack mount (stereo-40w)	$196

REMOTE POWER CONTROLLERS (DUAL)

Safe, transient free means of controlling 110V/AC. Turntables, on the air lights, etc.

PR-2	(toggle switch on/off)	$39
PR-2B	(momentary contact actuation)	$54

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RAMKO RESEARCH

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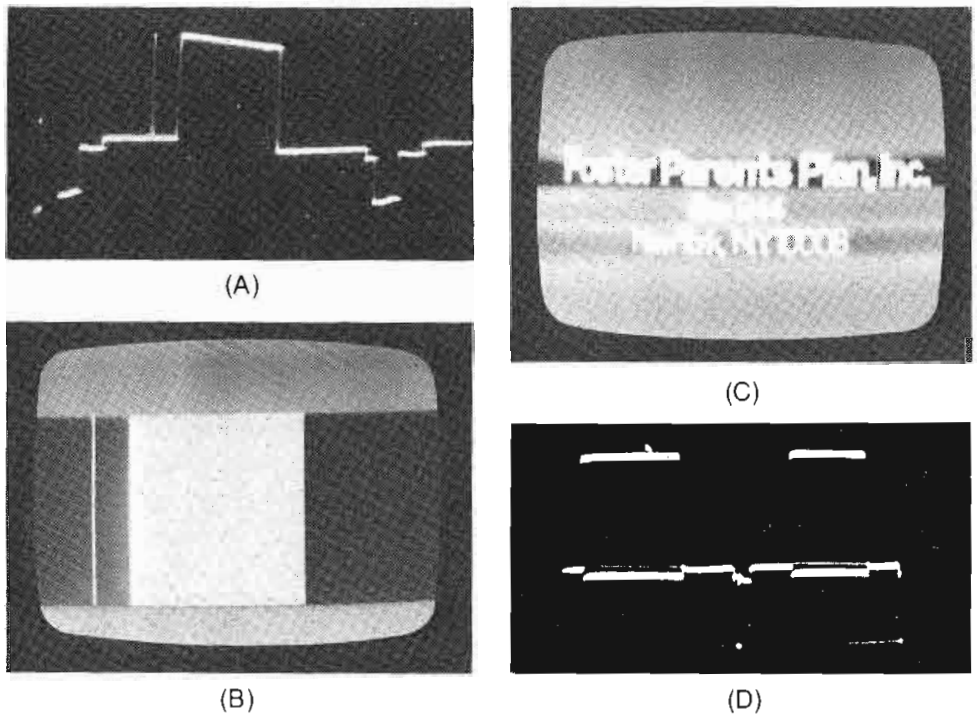

Fig. 27 Line-time waveform distortion with negative streaking. (A) Horizontal rate waveform display. (B) Picture monitor display corresponding to (A). (C) Effect on transmission of lettering. (D) Vertical-rate waveform display.

Distortion Terminology

In defining waveform distortions, certain terminology is becoming standard, and it is well to review this terminology here:

Short-time waveform distortion (SD) involves impairment of small picture detail in the horizontal direction. It is seen as blurring or smearing of a sharp brightness transition. It may or may not be accompanied by an overshoot or ringing to the right (or left) of the transition. Measurement of SD may be accomplished by observing the leading and/or trailing edge of the window signal displayed at the horizontal rate; the display may be expanded on the scope time base.

Line-time waveform distortion (LD) concerns a longer time constant than does SD, and results in impairment of brightness reproduction between the sides of a picture detail. When the detail is smaller than full picture height, the streaking is most noticeable to the right of the detail. Details extending all the way up and down the picture may result in streaking across the full raster horizontally. Measurement of LD is done across the top of the window signal viewed at the horizontal rate, and by the relationship of the leading and trailing edges to reference black.

Field-time waveform distortion (FD) results in impairment of brightness reproduction from top to bottom of the picture. Measurement of FD is done across the top of the window signal viewed at the vertical rate, and by the relationship of the leading and trailing edges to reference black.

Relative chroma level (RCL) is a measure of the faithfulness of reproduction of the saturation of all colors in a color picture. High RCL causes more vivid colors than intended; low RCL causes colors more pale than intended. Measurement of RCL is done most readily with the modulated 20T pulse, or the modulated 12.5T pulse.

Relative chroma time (RCT) is a measure of relative chroma and luminance delay. The result of RCT errors is misregistration of all colors with their respective luminance components. Delayed RCT places chroma to the right of its luminance component; advanced RCT places chroma to the left. Measurement of RCT is done with the modulated 12.5T or 20T pulse.

Note that we have defined only those waveform distortions associated with linear types of distortion. Linear distortion is any distortion independent of the signal amplitude, providing this amplitude is within the normal operating range of the equipment. Nonlinear distortion is a form of distortion which is amplitude-dependent, within the normal amplitude (and gain) range of the equipment.

Note: Linear distortion measurements can be invalid if a significant amount of nonlinear distortion exists in the test path. If the test results vary with a change in amplitude of any test signal over the normal operating range, nonlinear distortion is a factor. Nonlinear distortions are covered in the reference text cited at the beginning of this article.

Figure 25 illustrates SD, which may become LD with a slightly lower rolloff point and more severe phase shift. The waveform of Figure 25A indicates, in this example, a rolloff of high frequencies as indicated by the low amplitude of the pulse relative to the bar, and by the rounded window corners. Figure 25B shows the resulting picture monitor display which, in this example, is more appropriately termed "smearing" rather than "streaking." Streaking is shown by Figures 26 and 27.

Note that in Figure 25B, the pulse (point 1 on the waveform) is hard to see because of the low amplitude. The rounded transition from gray to white (point 2) results in a leading-edge smear, and the rounded fall-off toward black (point 3) results white-after-white smearing. A truly "short-time smearing" would be less severe than this, affecting only the finer transitions (higher frequencies) of the picture. If the duration of the transition is up to about 3 μs, it is termed "line-time smearing," as contrasted with SD, or "short-time smearing."

One type of LD is shown in Figure 26. In this example, positive streaking is indicated preceding the window (black-after-black) and following the window (white-after-white). Figure 26A illustrates the window signal at the horizontal rate, and the resulting monitor presentation is shown in Figure 26B. The reason for the appearance of Figure 26B is indicated more

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clearly by Figure 26C. Note the blacker-than-black tilt prior to the window, and the time duration required to fall to black at the trailing edge of the window. In actual measurement, the 1 μs intervals at the leading and trailing edges are not used, and the same durations for a and b relative to A are used. The window is approximately ½H in duration, and the time from the trailing edge of the window to the leading edge of sync is about ¼H. So one-half of the window tilt is included in the a measurement, as indicated on the drawing.

If the type of distortion is strictly linear, dimensions a and b are equal. If nonlinear distortion is present, these dimensions may differ. If reducing the level of the test signal into the system changes the relative dimensions of a and b, nonlinear distortion is present, and a lower level of test-signal input should be used to check the actual linear distortion.

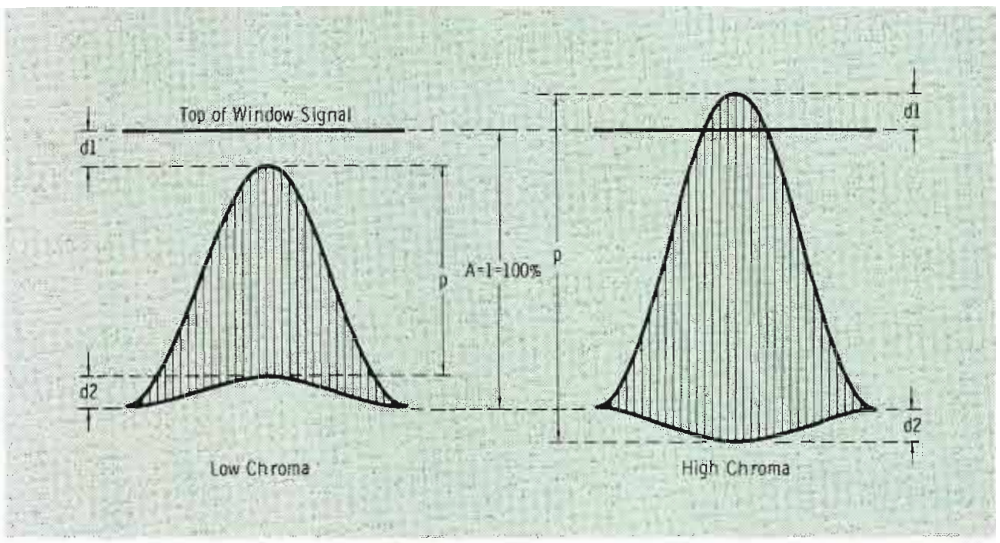


Fig. 28 RCL only, no phase distortion.

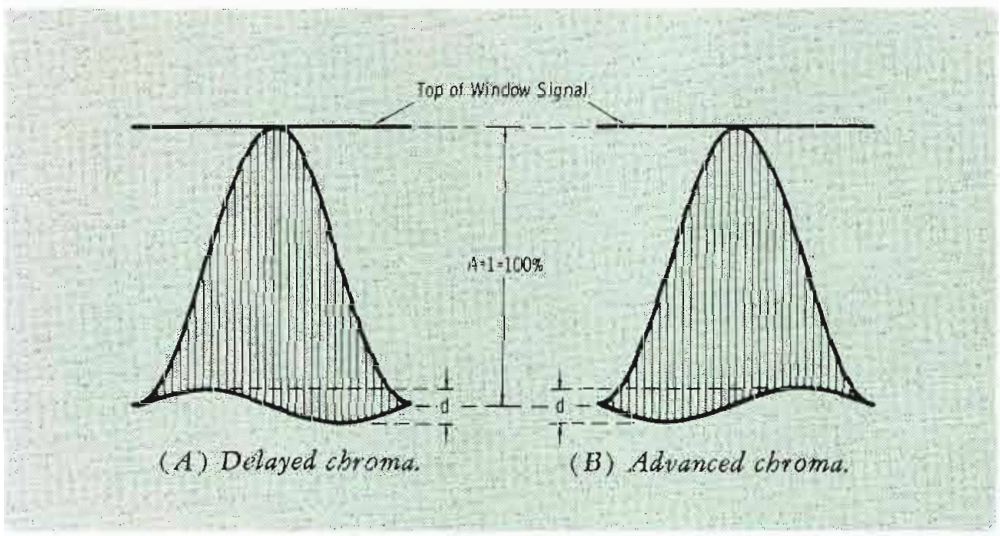


Fig. 29 RCT only, no amplitude distortion.

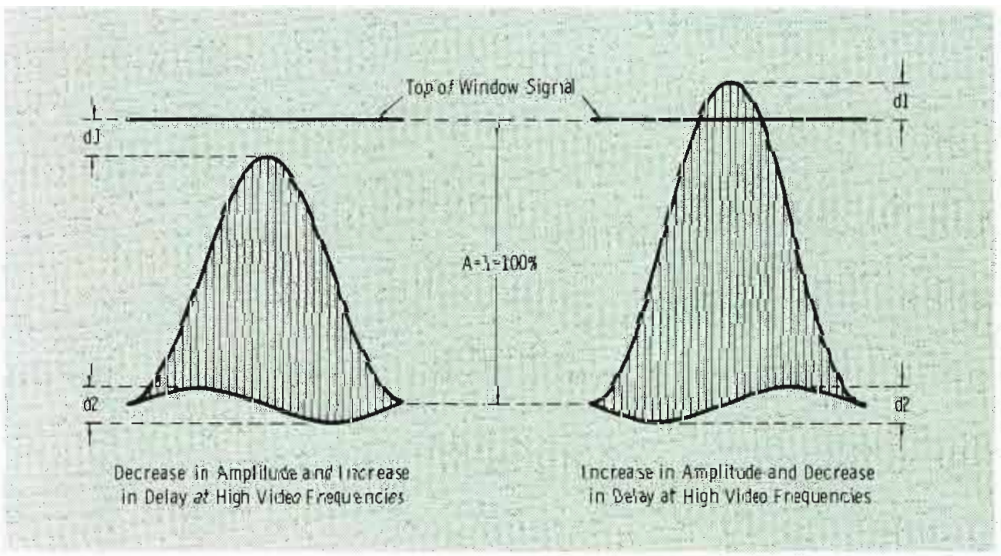


Fig. 30 RCL and RCT simultaneously.

Streaking

Figure 26D shows the vertical-rate cro display of the same signal. The white-going setup between the bottom of the white signal and blanking serves as an accurate indicator of the percentage of the distortion. This defect is the result of excessive gain at low frequencies and causes an increase in setup level, in addition to the streaking effect from the attendent low-frequency phase shift. Such distortion is usually the result of a defective equalizer on long lines, or overcompensation with low-frequency-compensation controls or tilt controls.

Figure 27 illustrates LD resulting in negative streaking (black-after-white). Figure 27A is the horizontal waveform. Figure 27B shows the typical picture monitor presentation for this type of impairment. Figure 27C illustrates how this form of LD impairs the display of lettering. The vertical-rate display (Figure 27D) indicates clearly the loss of setup, which occurs because this type of phase distortion is the result of insufficient gain at low frequencies, up to about the tenth harmonic of the nominal line-scanning frequency of 15,750 Hz. It will usually be found in practice that the loss of gain occurs below the first few harmonics, or approximately 50 kHz.

The modulated 12.5T or 20T pulse is the most convenient method of displaying RCL and RCT. Figure 28 typifies the display when pure amplitude distortion exists (no phase distortion). A change in amplitude of the 3.58 MHz subcarrier results in a cosine-shaped distortion of the base line, and a departure from reference peak level (top of window signal). When the distortion is linear, dimensions d1 and d2 are equal. If these dimensions are unequal, nonlinear distortion (differential gain) is present. In this case, linear distor-

tion normally can be measured by reducing the test-signal input to one-half the normal input level, or about 0.5 Volt peak-to-peak.

Dimension p in Figure 28 represents the peak-to-peak level of the 3.58 MHz signal. Therefore, (assuming d1 and d2 are equal), RCL = p. Thus assuming p is 80 percent, RCL is 80 percent, or simply 0.8.

Figure 29 typifies RCT without amplitude distortion. In Figure 29A, the envelope of the 3.58 MHz subcarrier has a sinusoidal base line distortion indicating a delay. In Figure 29B, the sinusoidal base line distortion indicates an advance. Although dimension d can be expressed as a percentage of A, the scope display does not provide a very convenient method of specifying the actual group delay in nanoseconds. The maintenance technician normally is interested only in the fact that he has a delayed-chroma or advanced-chroma problem, not in the measurement of actual delay. RCT may be specified in terms of whether chroma is delayed or advanced, and the percentage of d to A.

It is often the case that RCL and RCT distortion occur simultaneously. Figure 30 represents typical displays. The figure is self-explanatory if the preceding two figures are understood.

Envelope-Delay Adjustment

Adjustment of color precorrection circuitry can be most conveniently performed with the sine-squared pulse. A standard TV demodulator is required.

1. See Figure 31A. This is a 2T pulse (most convenient to adjust low-frequency delay) with no transmitter compensation. The demodulator sound notch is out, and the receiver-delay equalizer is out. Adjust the low-frequency delay unit to minimize the anticipatory overshoot at the leading edge of the pulse (Figure 31B).

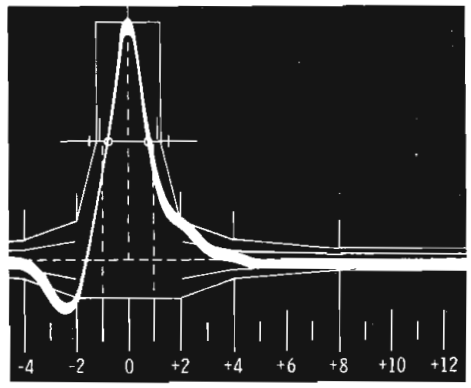
Note: The markings along the bottom of the graticule are in unit intervals of T.

2. The waveform in Figure 31C is the T pulse (twice the frequency spectrum of the 2T pulse) without high-frequency phase equalization. Adjust the high-frequency delay (variable) and switch the fixed unit in and out to obtain minimum amplitudes and best possible distribution of ringing. Figure 31D illustrates satisfactory phase compensation.

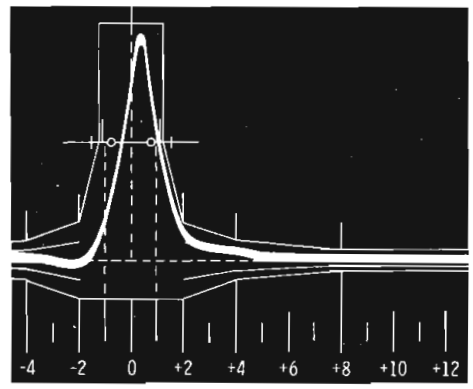
3. Switching the demodulator aural notch back in will result in the waveform of Figure 31E. Now switch the receiver-delay equalizer (fixed) in. Figure 31F shows the result.

4. Repeat the above procedures until satisfactory results are obtained. The transmitter should be properly broadbanded prior to color-equalization (envelope-delay) adjustments.

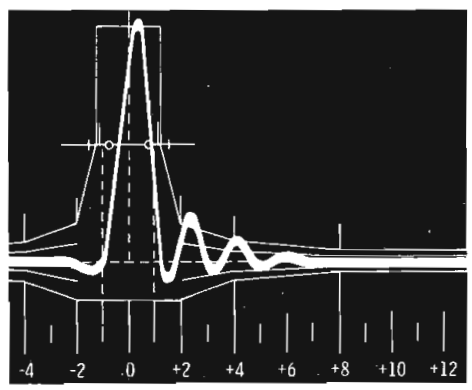
Note: The modulated 12.5T or 20T pulse is a sensitive indicator of envelope delay.



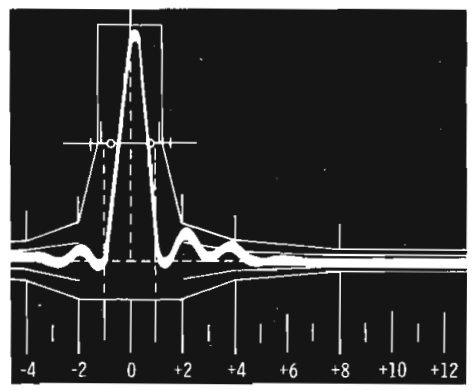
(A) 2T pulse, no phase compensation.



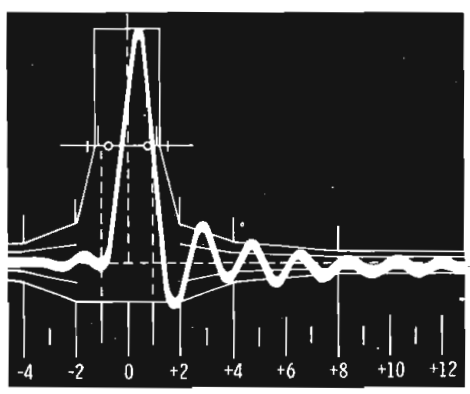
(B) 2T pulse with phase compensation.



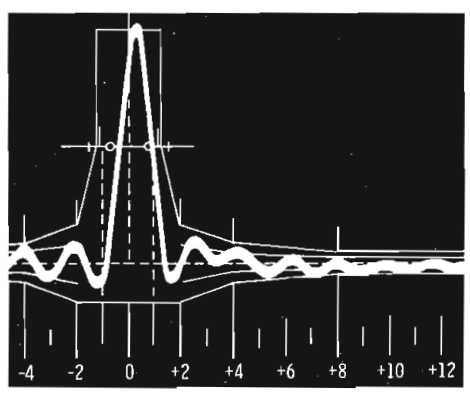
(C) T pulse without phase compensation.



(D) T pulse with phase compensation.



(E) T pulse, demodulator aural trap in.



(F) T pulse, receiver equalizer in.

Fig. 31 Use of $\sin^2$ pulse in envelope delay adjustment.

PEOPLE IN THE NEWS

Ampro Corporation, Willow Grove, Pennsylvania, announced the appointment of **H. N. Larkin** to the newly created position of Vice President for Marketing. In further personnel change, **Edward N. Mullin,** formerly Director of Engineering, has been promoted to Vice President for Engineering.

Masakazu Sekine has been appointed video sales coordinator for TEAC Corporation of America. TEAC also announced the appointment of **Jorge (George) Montero** as sales coordinator for Latin America.

Telemation, Inc. has announced the appointment of **John Borger** as Regional Distributor Sales Manager for the Midwestern United States...**Bernhard Jakobs** and **Donald Patten** of Shure Brothers Inc., have been promoted—Jakobs to Director of Development and Application Engineering and Patten to Manager of Engineering Services.

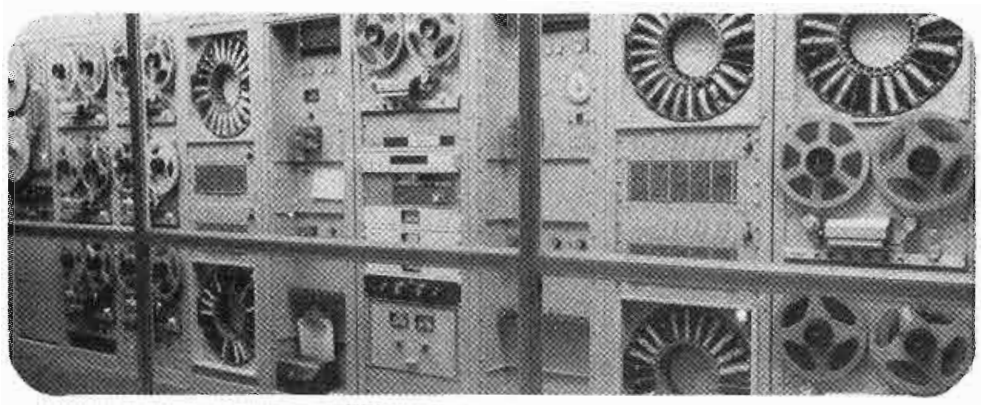
Lynch Circuits Inc. announced the appointment of **William H. Delaney** as Vice President....**Ronald H. Means** has been appointed a regional manager for the midwest area and **Gerhard H. Rilling** will assume a similar position in the mid-Atlantic area for Altec Sound Products Division....**Jack Keyes** has been appointed National Sales Manager for Canon Broadcast Optics. He will work with the Canon Organization in developing sales of the broadcast zoom lenses.... **Charles Link** has been named president of Electro Sound, Inc.

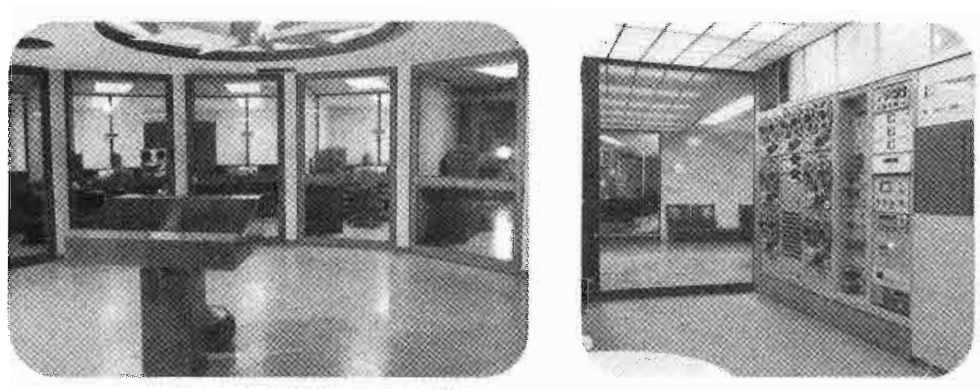
Dolby Laboratories, New York and London has announced recent moves to adapt organization to rapidly developing new markets and areas of activity. **Elmar Stetter,** formerly Technical Sales Manager, takes on new position of European Sales Manager. **Joan Allen,** Marketing Manager, will take on increased responsibilities in the motion picture industry. **Steve Katz,** Applications Engineer, leaves New York to relocate in Hollywood, where he will concentrate on film industry activities.

James M. Lang has been promoted to the position of midwestern district manager for CEI. He was previously a customer services manager for the midwest, southwest, and southeast regions...Cohu, Inc. announced that **Marshall Rice** will assume direct sales responsibilities for the San Diego based Northern Los Angeles sales area....**Niles L. Barlow** has been appointed by RF Communication Division, Harris Corporation, to the position of Vice President/ General Manager, Standard Products.

George W. Sullivan has been appointed vice president and general manager of the Transmission and Switching Systems Division (TSSD) of Collins Radio Group of Rockwell International Corporation... **Ray E. Becker** has been named director of marketing for Raytheon Service Company, Burlington, Massachusetts....Rank Precision Industries, Inc. has an-

(*Continued on page 50*)





Photos of Radio Comerciales S.A., Guadalajara, Jal., Mexico

How to get your share of the Latin American broadcast market.

Right now, there are close to 6,000 radio and television stations in Spanish-speaking areas of the world. Competition among stations is keen. To remain competitive - and keep pace with Latin America's rapidly growing economy - their equipment must be kept in top condition. Clearly, a substantial market exists for all kinds of broadcast equipment and components. New and used.

One publication — RADIO y TELEVISION — serves this vast purchasing potential. It provides saturation coverage among buyers and those who influence purchasing at broadcast facilities throughout Latin America and Spain. Owners, managers, engineers and technicians at commercial and educational radio and TV stations, recording studios, electronic equipment manufacturers and related businesses.

As the Spanish-language counterpart of Broadcast Engineering, RADIO y TELEVISION delivers technically-oriented editorial aimed at helping readers to select, operate and maintain equipment and components for maximum **signal quality.** This unique content provides the precise environment that induces buyer receptivity. It enables advertisers to "sell the broadcaster when his mind is on signal quality."

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PEOPLE IN THE NEWS

(Continued from page 48)

nounced the appointment of **Richard E. Putman** as East Coast Sales Representative for the company's line of optical products for the television and motion picture industry...**C. D. Beintema** has been named to the newly-created position of manager, display device engineering, for Conrac video products.

Television Associates, Inc. has appointed **Steve Michelson** as Producer/Director of ta2, the company's wholly-owned production services subsidiary.... The Board of Directors of the National Association of FM Broadcasters announced the appointment of **Thomas Schattenfield** of the Washington law firm of Arent, Fox, Kintner, Plotkin & Kahn as General Counsel for the Association....**Herman R. Henken** of Cherry Hill, N.J., has received RCA's first Design Advancement Award in recognition of his support of the corporation's design goals and objectives.

CATV

Fred M. Samuel has been appointed Marketing Manager-Broadcast/CATV/CCTV for Calvert Electronics International Inc., New York, New York.... GBC Closed Circuit TV Corp., New York City, has announced the appointment of **Dar Hyatt** as National Sales Manager.

Elizabeth L. Young, Executive Director of the Kansas State Public Television Commission has been newly-elected to the NAEB Board of Directors in a membership-wide election. **Virginia Fox,** Director of Education Programming for the Kentucky Authority for Educational Television (KET), and **Clyde Robinson,** Chief Engineer at KUOP, Stockton, have been re-elected to the Board. Robinson has been serving as vice-chairman of the 16-member board.

The appointment of **Harold A. Sheaks** as western regional sales manager and **Alexander M. Kizyma** as manager of manufacturing has been announced by Blonder-Tongue Laboratories....**James A. Wand** has been named general manager of Continental Cablevision's operations in Illinois and Iowa.

Radio/TV

The Chairman of the Board of the Meilink Steel Safe Company has announced the appointment of **R. Randolph Hippler** as President of General Television Network, Ferndale, Michigan (Detroit)....**Mark London** has been named Chief of Development for New Jersey Public Broadcasting of Trenton. London is responsible for the planning and directing of all activities related to funding, from both the private and public sector of programs broadcast by the Authority....**Larry G. Alt** has been named Assistant Station Manager of WSJV, Channel 28 television, Elkhart, Indiana....**William J. Knittle, Jr.,** former Director of News and Media Services for Loyola Marymount University in Los Angeles, has joined Dave Bell Associates in Hollywood as Promotion Director for Media Five, DBA's educational film distribution arm.

bookreview

IC Op-Amp Cookbook, by Walter G. Jung, covers not only the basic theory of the device in great detail, but also includes over 250 practical circuit applications, liberally illustrated and with all discussions written in an informal, easy-to-read style. The book is organized into three basic parts: Part I introduces the IC op-amp and discusses general considerations. Part II covers practical circuit applications, and Part III consists of two appendixes of manufacturers' reference material.

The book covers the ideal and nonideal op amp, with detailed analyses of error sources and dynamic characteristics. The trend-setting early innovations are described and the circuitry of such general-purpose types as the 709, 101 and 741 are also discussed. The specialized groups are then introduced and their general uses. Also covered are general operating procedures, such as offset nulling, frequency compensation, and protection against abuses and failures.

The book is available from Howard W. Sams & Co., Inc., Indianapolis, Indiana.

For More Details Circle (62) on Reply Card

Linear IC Principles, Experiments, and Projects, by Edward M. Noll was written to introduce the principles of operation of the integrated circuit.

Chapter 1 covers basic semiconductor principles: basic IC structures, the pn junction, the bipolor transistor, transistor fabrication, the field-effect transistor (FET), and more are discussed.

The succeeding chapters explain integrated-circuit structures, basic circuits, operational amplifiers, multipurpose and special IC's and special IC systems. Included is a broad coverage of how linear IC's are used in commercial, industrial, and test equipment. Home entertainment audio, AM, FM, and television applications are also stressed. Ham radio and short wave enthusiasts will find the projects in the last two chapters good examples of the many opportunities for the use of IC's in the two-way radio field.

Linear IC Principles, Experiments, And Projects is available from Howard W. Sams & Co., Inc., Indianapolis, Indiana.

For More Details Circle (63) on Reply Card

LED Circuits & Projects, by Forrest M. Mims, III, contains a brief introduction to the theory of LEDs and then progresses to cover circuits and their applications. Installing LEDs, operating hints, LED detector circuits, multiple-color LEDs and much more are discussed.

Source/sensor pairs, indicator and displays, communication systems, intrusion alarms and ranging systems are some of the circuits covered in other chapters.

The book is available from Howard W. Sams & Co., Inc., Indianapolis, Indiana.

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NEW PRODUCTS

Portable Stereo Mixing System

Portable Stereo Mixing System from **Richmond Sound Design Ltd.**, is based on an 8 input mainframe and expandable at any time without recalibration.

A portable version of their studio consoles, it features foldback and echo send channels; echo return; illuminated VU meters; and a separate monitoring system with CUE buttons, capable of driving headphones or stereo power amplifier.

Each input channel includes XLR type input; 5 position input attenuator; pre-EQ foldback level; 3 frequency EQ; echo send level; pan pot; sealed straight line fader; and monitor CUE button.

An internal regulated power supply allows operation directly from the power line. The chassis is constructed of 14ga. steel for absolute rigidity, with all labelling permanently etched on an attractive anodized aluminum skin; end pieces are of genuine oil-finished hardwood. Active circuitry employs highest grade components and plug-in type integrated circuits exclusively for all amplification functions.

The 8 input Master Chassis is 24" wide, 13" deep, and 4" high and is priced at $1,600; a 4 input extender chassis is $600; immediate delivery from stock.

For More Details Circle (65) on Reply Card

Video Tape Cleaner

NOVA Corporation has introduced an inexpensive approach to video tape cleaning, using what the company calls the NOVA block.

This device is installed on the video tape recorder, and will work on two-inch, one-inch, three-quarter U-matic, half-inch, or one-quarter-inch size formats. The NOVA block does its cleaning job in the normal play mode or the shuttle mode of operation. The company says the device gives a gentle surface treatment that will not aggrevate edge damage.

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In-line Soft Keyer

Technicolor has announced a completely new in-line soft Chroma-Keyer for use with VTR's and off-the-air

signals. This device combines the functions of Technicolor's well known Chromatech with a decoder. Therefore, the user can still reproduce shadows, look through glass or smoke, and retain all of the benefits of having a linear Chroma-Keyer.

System timing problems are virtually eliminated with this NTSC keyer, which like the original Chromatech, contains its own linear mixer.

The new unit accepts 2 composite or non-composite NTSC signals, and provides a combined composite or non-composite output.

A remote control panel which can be used to operate the unit up to 500-feet away is furnished with the unit.

For More Details Circle (67) on Reply Card

TV Film Color Corrector

A new Rank Cintel Automatic Color Correction unit for rectifying color errors in film reproduced by telecine techniques has been introduced to the American market by **Rank Precision Industries, Inc.**

A red-green-blue processing system, the Rank color corrector automatically makes continuous frame-by-frame corrections of lift, color balance and gain errors to the output signal of color telecine equipment.

According to Rank, color errors common to most films become exaggerated when used with telecine equipment. Resulting from unequal color layer densities in the film, such errors may also be due to mistracking between dye layers during processing as well as to inadequate exposure control during initial production. Films not originally intended for TV may have been processed for projection from light sources having a color temperature different from that used in telecine apparatus. This can cause an apparently consistent bias throughout the film.

With the Rank equipment, automatic and continuous correction is achieved, and local or remote control is possible.

For More Details Circle (68) on Reply Card

Portable Video Relay

The **Farinon Electric** FV portable microwave-for-video series is a family of turnable, all-solid-state, dual-conversion heterodyne systems for point-to-point video and subcarrier transmission in remote pickups, closed circuit TV networks, and other temporary transmission situations.

The FV series is designed for

(*Continued on page 55*)

Sports Remote

(*Continued from page 30*)

This is especially helpful if you get behind and find yourself working right up to air time with the set-up.

By all means carry at least a basic set of tools to every remote. An absolute minimum is a screwdriver, long-nose pliers, and a wire cutter. The new cordless soldering irons make that tool worth adding to your remote package, too. Even with proper care of the equipment before and after remotes, you can never guarantee how much bouncing around the remote package will receive and what kind of emergency maintenance will be needed. It's better to be prepared than to try to explain later why you weren't.

If your station is to be the anchor station for a network feed of a sports remote, the responsibility of your station's performance has increased by the number of stations in the network. This means accurate and detailed formating of start times, cutaway cues, ID cues, spot cues from the remote, how to handle local sale spots (as opposed to network sale spots), what, exactly, to do for rainouts, rain delays, weather or news bulletins (i.e., do they just affect your station or the area covered by the whole network?), or how to react to other emergencies such as service interruption of the remote feed. Technically, the network stations can receive their program feeds from any of the links previously mentioned.

Summary

This article was written with the intention of providing a broad, basic knowledge of what is involved in audio remotes, emphasizing radio sports. Since radio does not provide a visual image to complement the audio, the radio sports remote broadcast must convey the sports information as well as a feeling of the excitement of the sporting event. Each of the three major areas of concern in a sports remote—the remote site, the link, and the studio facilities—must have been planned and checked thoroughly prior to the time of the remote to reduce operational problems at the time of the remote. Since every remote can be considered something special and a little bit out of the ordinary to the normal broadcast format, special care must be given to the smooth operation of the remote so as not to compromise your station's broadcast integrity.

References

[1]Shifrin, Arthur. "Rx for 78's—Tape Them." **Audio,** 58:4 (April, 1974), pp. 22-42.

[2]Burroughs, Lou. **Microphones: Design and Application,** Plainview, New York, Sagamore Publishing Company, Inc., 1974. (Chapter 9, "Microphones Electrically Out of Phase," pp. 99-108).

[3]The TACT unit was introduced by the Wisconsin Telephone Company in July, 1971. Should your local telephone company not have these units available, inquiry can be made of their availability to the Wisconsin Telephone Company; 722 North Broadway; Milwaukee, Wisconsin 53202.

NEW PRODUCTS

(Continued from page 53)

broadcasters, CATV, ETC, common carriers and industry, with a specific system for each band from 1.99 to 13.25 GHz. Each system may be dial-tuned across the appropriate band without preselecting filters. Features include direct frequency generation, ±.002 percent frequency stability, 60 dB signal-to-hum ratio, 70 dB signal-to-noise ratio, 5-Watt output in the 2 GHz band, and 1-Watt output in the 7 to 13 GHz bands.

For More Details Circle (69) on Reply Card

Linear Attenuator For Consoles

A unique, noise-free linear attenuator, has been developed by **Audio Designs and Manufacturing, Inc.,** Roseville, Michigan, as another contribution toward audio problem solving.

The device, called Slidex, provides an attenuator with the freedom from noise and maintenance of a quality rotary control, combined with the high visibility of a linear slide attenuator.

The unit converts rotary control to smooth linear motion with an ingenious Spiralinear actuator. Slidex uses sealed elements, and is impervious to the dirt and moisture which can plague ordinary controls. There are no contacts to clean, and the unit is virtually maintenance-free. Quiet, dependable performance is assured.

Slidex attenuators are available in Audio Designs' studio consoles as plug-in modules, or can be ordered as separate components. They provide a direct replacement for many other conventional slide units, often at lower cost than the originals.

For More Details Circle (70) on Reply Card

Tape/Phone Amplifiers

Two new Impac Amplifiers for tape and phone applications are now available from **Modular Audio Products,** a unit of Modular Devices, Inc., Bohemia, New York.

The two new PC card amplifiers are the Models AT-27 and AP-27. Both are special purpose, low noise equalized preamplifiers designed for conventional magnetic tape heads or phone cartridges.

Model AT-27 provides the standard

NEW PRODUCTS

(*Continued*)

NAB tape reproduce head equalization for tape machine speeds of 3-3/4, 7-1/2, 15 and 30 ips by adjustment of its low high frequency trimmer controls. An adjustable gain trimmer control sets the desired operating level.

The Model AP-27 provides the standard RIAA phono reproduce equalization. High frequency and gain adjustment trimmers compensate for losses due to stylus wear and to set the desired operating level.

The MAP Model 1731A audio operational amplifier is utilized as the active element in the AT-27 and AP-27 and provides the circuitry with an equivalent input noise of -125dBm, low distortion, short circuit protection and high reliability. Delivery is stock to 30 days.

For More Details Circle (71) on Reply Card

U-Matic Videocassette

Sony Corporation of America has introduced a dual standard U-Matic Videocassette Player and a Trinitron Monitor that are giving companies in the United States a complete trans-Atlantic communication system with their European offices or affiliates while reducing expenses.

The combined units, with a price of $2,800, are the dual standard (NTSC and PAL) U-Matic Videocassette Player, Model VP-1210S, and the Trinitron Monitor, Model PVM-1810E.

While serving the business community, the player-monitor combination also will benefit the educational market, a Sony spokesman said. Video tape programs can now be exchanged between universities in the Unites States and Europe, with immediate viewing on either side of the Atlantic. Users of the units will eliminate the cost of a standards conversion.

For More Details Circle (72) on Reply Card

Mini-TV Transmitter

A new data and specification sheet on the TT-210V (MTV) Television Transmitter is available from **Acrodyne Industries, Inc.** The unit was specifically designed for use in the Alaskan mini-TV program and operates under special waivers granted by the FCC. The two-color data sheet includes information on the new unit's features, a photograph of the unit, warranty and complete specifications.

For More Details Circle (73) on Reply Card

(*Continued on page 60*)

Station to Station

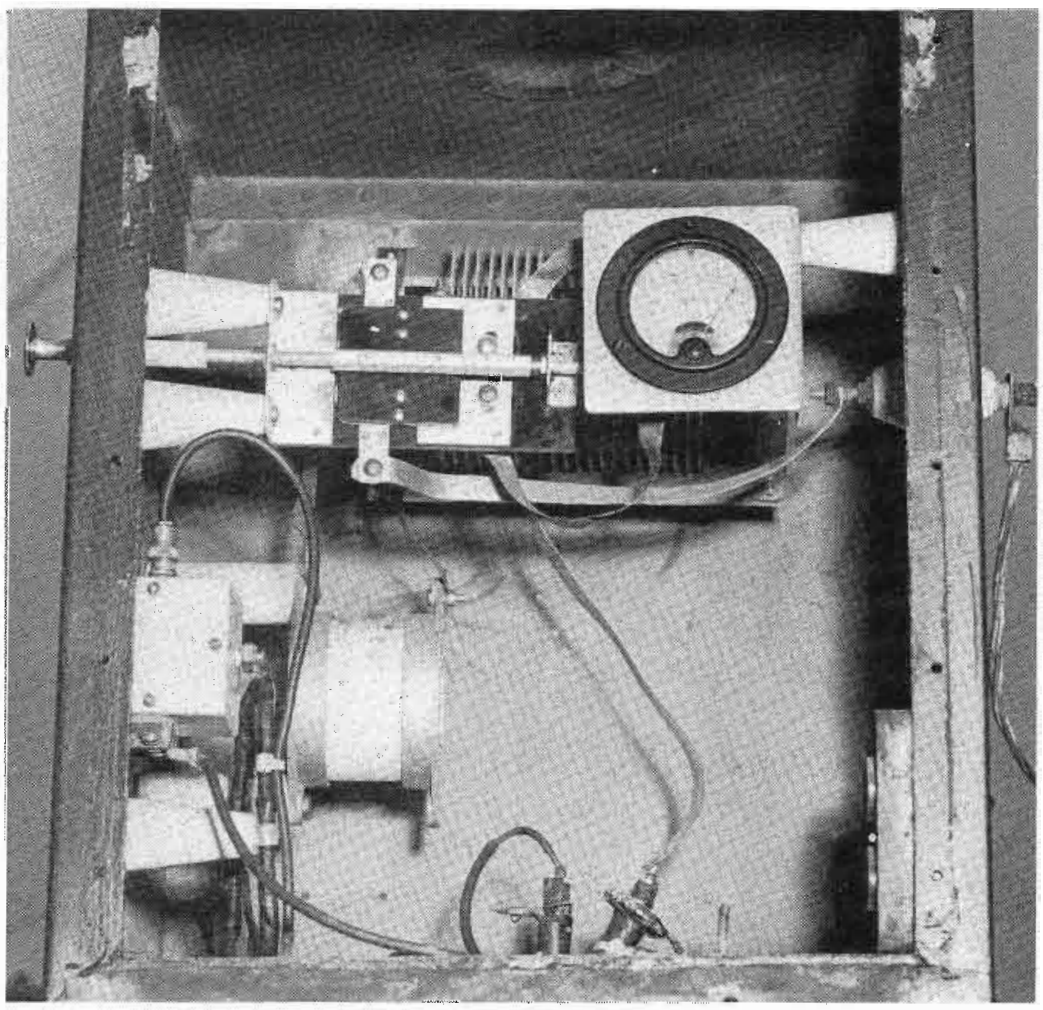
In the dog house

WPRC recently replaced the AM station's antiquated antenna tuning unit components, which were part of its initial installation back in the late 40's. We went from 250 Watts AM daytime to 1 kW AM daytime and 3 kW at our FM station.

I wish to cover two areas with helpful hints from a pro, not me, in replacing such a unit and the advantages of a shunt fed antenna system for nondirectional stations. Credit for most of the knowledge exchanged here must be given to Fred Hannel of the Midwest Engineering Association.

First of the advantages of a shunt fed system is all of the money which you save compared to the isolated tower, fed from the bottom. Again, this is advised only for nondirectional stations. To list some of the savings: (1) you don't pay for a base insulator and associated equipment, plus more concrete to get it up in the air; (2) the FM station feed line is simply run up the tower, no iso-coupler required; (3) additional savings come in when you do the same with power for lighting and antenna heaters for the FM, at about $1400 minimum for small towers. Fewer problems in the future from lightning damage because of the grounded base is something else to consider. A further check was made on this type of system with Collins Radio and Ron Nelson, sales manager of Utility Tower and they could offer no objections from their experience.

One characteristic of the system is the slightly directional pattern caused by the slant feed wire. However, Fred Hannel commented that he has observed that many nearby metal buildings have had as much effect on the pattern. In every respect that I've been able to determine, this type of system is most superior to that in standard use today, at least from the consumer



viewpoint.

In The Dog House

Fortunately, it was a very nice evening and didn't rain, as had been promised. Starting at nine PM, and noting at eleven that the clouds are darker, along with a few degrees increase can put the fear into you. With about five hours of work, we ended up with a product which we looked upon with confidence. In the past, lightning, even with a grounded tower had been an occasional problem. This is attributed mainly to the air dielectric loading capacitor which had arced together a few times at the edges. This led to me appearing at the scene during a storm, which isn't safe, dry, or fun.

Speaking of safe, Fred mentioned that the field created by a heavy hit on the tower can cook you if you happen to be nearby. And my experience with RF burns shows that they take a year or so to heal, if they aren't serious.

That old variable in the tuning unit had done a lot of varying on its own, with changes in humidity and temperature. Thus, the output power levels would vary. A fixed, high voltage, sealed capacitor was installed with a series coil for tuning. Since the coil doesn't arc over or change its inductance with the weather, we have a much more stable system.

You can see the wide straps, instead of #12 wire between the former components. Skin effect at these frequencies is sufficient to make this a good practice. The insulators are more than strong and long enough for this work; but, as I said, it gives you a secure feeling. Looking at the meter switch, the handle is extended to the outside of the box and deletes the need for opening it up to take a reading. Our door has standard rubber sealing for water-proofing and the window is plastic. It does fog up a bit, but not bad enough to hide the meter. Fred made one other comment which I thought most useful. Even though you have that huge ground for the AM, there are times during the dry seasons when a grounding rod at the tuning unit would get rid of that charge a lot faster and safer.

C. Dave Copeland
WPRC
Lincoln, Ill.

Substitute for Freon 116

Engineers using high power television equipment, making use of Freon 116, should take note of the fact that this gas is no longer available from Dupont.

A suitable substitute is Freon 115, which has slightly greater dielectric strength, but has a boiling point of only -10°F. Preliminary investigations have shown it may be possible to slightly dilute the gas with nitrogen and lower the boiling point. However, we have found no adverse effects as the transmission line center conductor normally operates in the neighborhood of 180°F at our installation, which precludes any problems.

The transmitter operators have been advised on extremely cold mornings to commence operation at half power (we normally operate for one-half hour with test pattern) and slowly increase power to the line, to enable the liquid to boil off.

Further information on the Freon family of gases can be obtained from Dupont.

Edwin T. Carl
WSNL-TV

Your Comments and Ideas Are Welcome At Broadcast Engineering

TV cameramen unite!

Fade up and cue.....

Hello from the membership and staff of ASTVC! Thanks to **Broadcast Engineering,** and with the encouragement and guidance provided by Editorial Director Ron Merrell, we'll be providing coverage of the activities of The American Society of TV Cameramen in this column.

The American Society of TV Cameramen is priviliged to be able to share space with our cousins in the SBE and hope to touch upon areas of mutual interest. From time to time, we hope to be able to publish news regarding our British friends in the Guild of Television Cameramen with whom we are corresponding relative to a possible affiliation. Any other industry news relating to our profession will also be covered in this column.

There has been an unusually large volume of mail to our Radio City box, due to the February issue of **Broadcast Engineering.** The article on us and the British Guild evoked quite a response. In most cases, the writer requested information on membership application and the possibilities of local chapter formation. In other letters there were questions regarding the aims of ASTVC. In regard to that, and while not presenting at this time an all-inclusive list of our goals, let us print, here-and-now, and extract from our Articles of Incorporation:

The Society was organized (in part) to "...bring together, on a **fraternal** basis members of the industry with similar occupational interests and experiences." And further "... dedicated to endeavor to promote...the standards of **professionalism** within this segment of the TV industry."....

More on that in later issues.....

Also, in future issues we shall cover such things as the TV cameraman's role in "Electronic Journalism", technological innovations and their impact, EMMY winners in our ASTVC, Miss TV Centerfold of 1975, and Associate membership (for other than cameramen).

Keep tuned and keep your letters coming to: ASTVC, Box 1189, Radio City Station, New York, N.Y. 10019.

Fade to black.....

Editor's Note: While Broadcast Engineering essentially is a technical journal, we long ago sought to fill an even greater need: offering a station journal. The crossroads of this magazine have brought better than 30,000 people together in this country as well as thousands in well over 100 countries.

The appearance of the ASTVC in these pages should bring a new dimension to the magazine and a new input that will keep us all better informed.

SOCIETY OF BROADCAST ENGINEERS, INC.
P.O. Box 88123 Indianapolis, Indiana 46208

(*Continued from page 15*)

Chapter 15: New York City, N.Y.
Chairman: John M. Lyons
Woodside, N.Y. 11377

The February meeting of New York's Chapter 15 was scheduled for the 13th at 7:30 pm, with dinner preceding, in the WQXR Presentation Theater on West 43rd Street. Speakers were Irv Joel, from LaSalle Audio, and Howie Lieberman, Audio Concepts. Their subject was "The Recorder As A System", including live demonstrations of the system, with transport, tape heads, the magnetic tape and the electronics. Problems discussed on the system were wow and flutter, dynamic range, frequency response, phase error and distortion. No word yet on the scheduling of a meeting in March.

Chapter 16: Seattle, Wash.
Chairman: Harry Lewis
Seattle, Wash. 98125

The Seattle Chapter met on the 15th of January at the Norselander Restaurant in Seattle for a luncheon meeting. Those scheduled to give a presentation were two representatives from the John Fluke Company; demonstrations included their digital volt-meters and frequency synthesizers.

Chapter 26: Chicago, Ill.
Society of Broadcast Engineers
Chicago, Ill. 60601

Sonic Services was the host for Chapter 26's January meeting, held at Streeterville Recording Studios. Preston Wakeland of Streeterville Recording headed up a discussion and demonstration of some newer techniques in the audio handling of disc and tape recording.

Chapter 26's meeting in February included a demonstration of the CDL TEC 102 Time Code/Computer VTR Editing System.

A reminder to any members of this chapter who haven't yet, to pay annual dues and to vote in the election for national officers as soon as possible.

Chapter 28: Milwaukee, Wis.
Chairman: Bob Truscott
Milwaukee, Wis. 53209

Milwaukee's Chapter 28 met in January in the WTMJ Auditorium; featured speaker was Morris Hornik of the Heath Company, to discuss and demonstrate some of the company's basic test equipment, as well as to

demonstrate Heathkit's new "digital" equipment.

February's meeting had two guest speakers, Jack Conrath from Fairchild Semiconductor, and Norm Geisenheimer from Semiconductor Specialists. Both spoke on the topic of "New Integrated Circuits And Their Applications".

Chapter 32: Tucson, Ariz.
Chairman: H.J. "Bart" Paine
Tucson, Ariz. 85717

Chapter 32 was another chapter to hear a discussion on a sideband analyzer, this one (Model 3706) made by Telemet, with the presentation given by Richard M. Lawrence of that company.

A new member to the Tucson chapter, Bill Ward of Videomon, was responsible for heading up the February meeting, which included a slide talk on manufacturing video and audio tape, plus high-speed video tape duplication, presented by Arden Thompson of 3-M Technical Services.

The meeting in March was scheduled for the 12th of that month, with no details available at this time.

Chapter 35: Louisville, Ky.
Chairman: Paul Kelly
Louisville, Ky. 40206

January's meeting of the Louisville chapter saw the election of new officers. New Chairman is Paul Kelly; Vice-Chairman is Robert Klien; Secretary-Treasurer, Gilbert Lochner. The rest of the program included a tour of the WHAS AM-FM-TV studios in Louisville. February's meeting was scheduled for the 18th at the KET Studios in Lexington, with no further details available.

The beginning of 1975 saw the forming of two new chapters on either side of the continent: one in San Diego, and another in Alexandria, Virginia/Washington, D.C.

San Diego Chapter
San Diego, Calif. 92111

San Diego's first meeting was held on the 22nd of January at KGT-TV. First order of business was to appoint officers; Chairman-Elect is Bob Boulio of the Video Equipment Corporation, and Secretary/Treasurer is Bill Montgomery of Tektronix.

Thirty eight visitors and members attended the meeting; the guest speaker was Joe Gayer, Western Regional Manager for Tektronix, who presented the new video waveform monitoring qualities of the 1480 solid state waveform monitor.

The meeting in February was scheduled for the 8th, with a presentation by Don King of CETEC, Inc., on the concepts of professional audio recording.

Alexandria, Va./Washington, D.C. Chapter
Acting Head: Charles F. Riley
Alexandria, Va. 22314

Alexandria/Washington's first meeting was on January 15th; their time was spent discussing the chapter itself, what its goals are, and what has to be done for its formal recognition by the SBE. At this time, we have no names of appointed officers; however, credit for the organization of these local meetings goes to Charles Riley, of Tele-Color Productions. Local engineers and other interested persons can call him at (703) 683-3203.

The February meeting was held on the 26th, with a demonstration of Tektronix Vertical Integral Reference System (VIR) by representatives of that company, with the use of Tele-Color video tapes.

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WANTED: 400' to 600' guyed steel tower. I will dismantle and move. Contact Barry Miller, Box 147, Plainview, Texas 79072. (806) 293-2661. 3-75-2t

WANTED: Modulation transformer for RCA BTA-1L AM Transmitter. WBUT, Butler, Pa. 16001. 3-75-2t

WANTED: AMPEX VR1200 Wanted. Reply to D. Zulli, KWHY-TV, 5545 Sunset Blvd. L.A. 90028 - 213-466-5441. 3-75-2t

WANTED: RCA 264C1 tape cartridges; old Scott radios. Pratt, 114 Lakeview, Milwaukee, Wis. 53217. 4-75-1t

COLLEGE F.-M. educational 10 watt station is in desperate need of studio equipment or money to purchase equipment. Tax exemption status. Contact Mark Cash WABR FM, Box 116, Tifton Georgia 31794. 4-75-2t

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TAPECASTER TCM, INC., Box 662
Rockville, Maryland 20851
1-72-tf

STODDART RADIO interference-field intensity meters. Stoddart NM-22A, 150KHZ-32MHZ. Complete - $2,195, less antennas - $1,595. Stoddart NM-30A, 20-400MHZ. Complete - $1,295. Stoddart NM-52A, 375-1000MHZ. Complete - $1,495, less antennas - $1,095. All are in excellent condition and calibrated prior to shipment. Surcom Associates, (213) 382-6985. 12-74-6t

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REELS AND BOXES, 7" and 5" large and small hubs; heavy duty white boxes. W-M Sales Company, 635 Woolsey, Dallas, Texas 75224. (214) 942-3460. 4-75-3t

FOR SALE: CBS Labs Model 444 Audimax III, $175.00. Spotmaster Model 400A cartridge record/reproduce machine, $325.00. McMartin Model TBM2500C RF amplifier (brand new), $500.00. Ball Brothers Model Mark 21 rack mount waveform monitor, $125.00. All items in good to excellent condition. Call or write: G. A. Gilbreath & Associates, 4908 Lunar Drive, Columbus, Ohio 43214, 614-885-2458. 4-75-1t

FM ANTENNA: Collins 37CP-4 with deicers, circularly polarized, 101.7 MHz, 5 years old. 283 ft. Utility type 340FM tower as is. 5 years old, Available April 1; Excellent condition, make best offer to: Mike Hendrickson, WJON Broadcasting Co., P.O. Box 220, St. Cloud, Minn. 56301. 4-75-1t

SURPLUS G.E. black and white Television camera and associated accessories for sale "where-is-as-is". Original acquisition value $6,000.00. Good Condition. To bid on equipment contact Purchasing Department, University of Tennessee, Memphis, Tennessee, 901-528-5594, reference surplus sale S-75-M-17. To see equipment as to find out particulars concerning condition, etc. contact Mr. Tom Hoffman 901-528-5692. 4-75-1t

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FOR SALE IVC-700 & IVC-800 1" Color VTR's Guam Cable TV has switched to ¾" cassettes to save shipping weight. We have several recorders in excellent operating condition for sale at our Los Angeles office. Also, spares and tapes available. Phone (213) 474-2891. 4-75-1t

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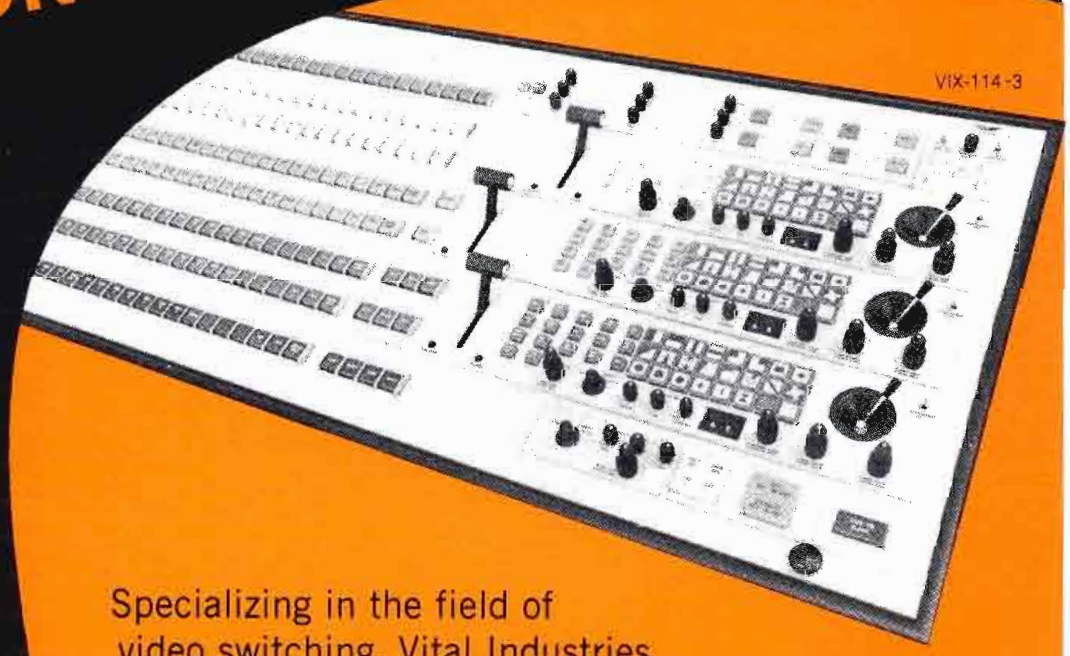

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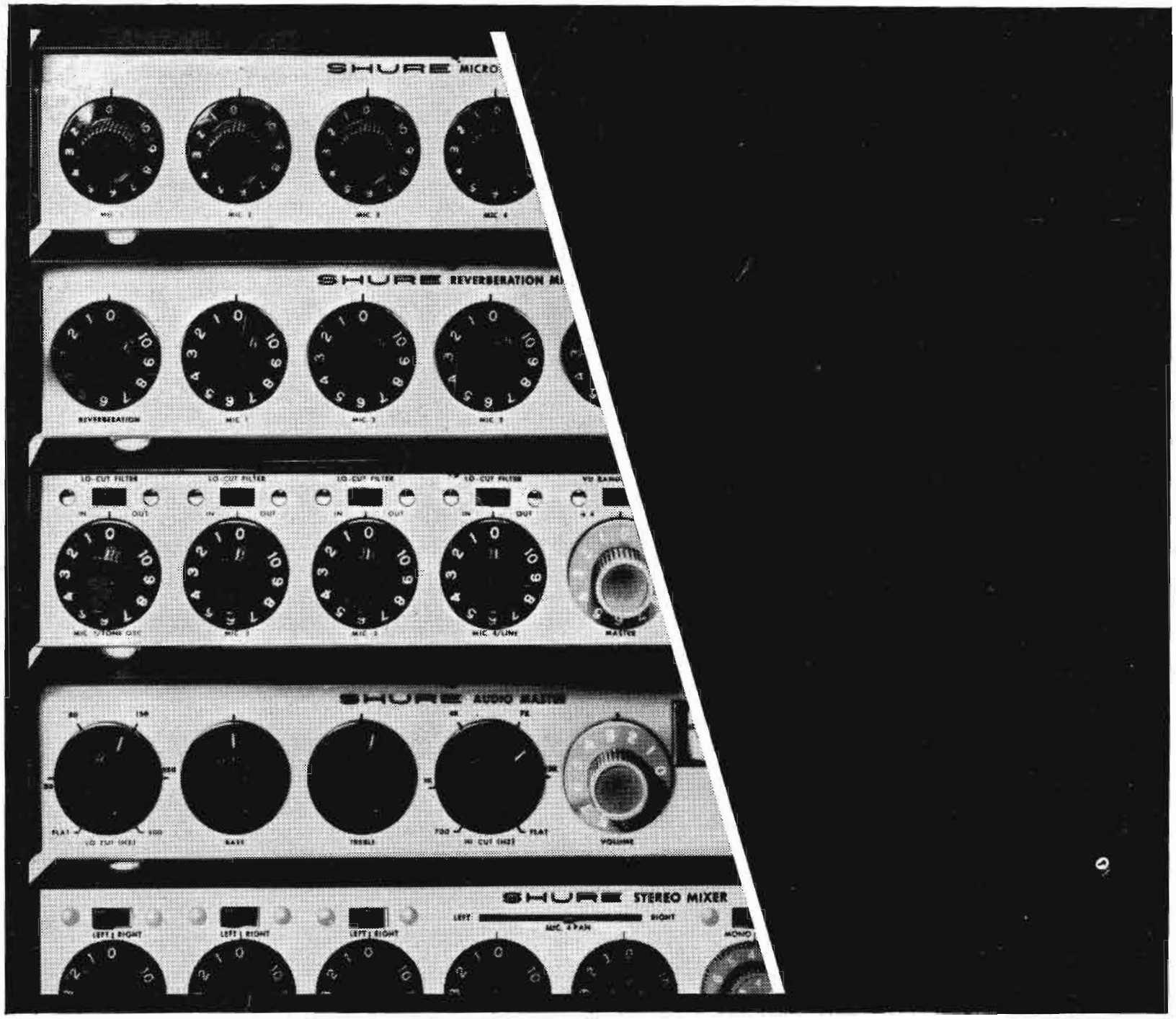

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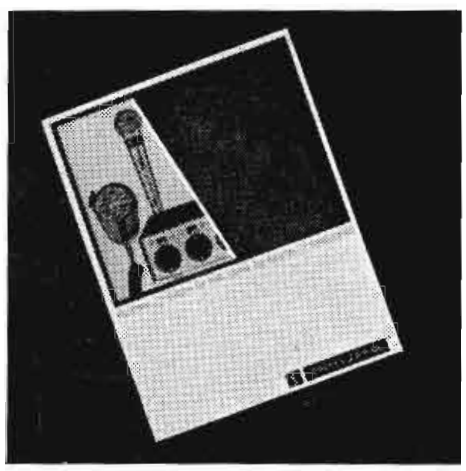

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