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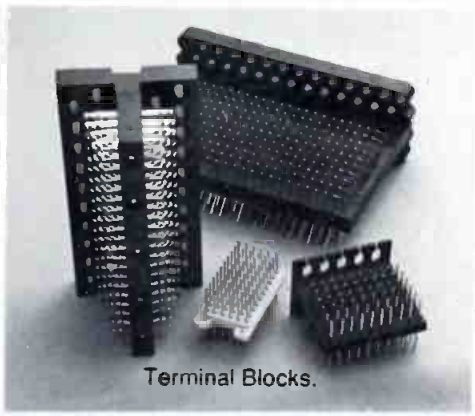
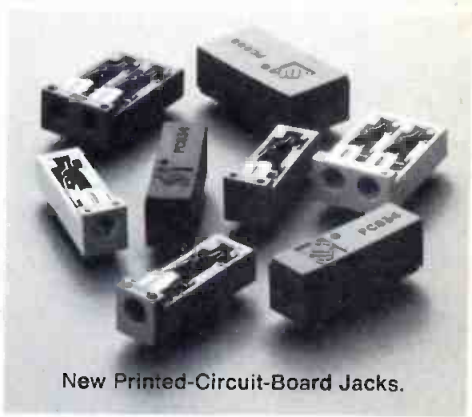

Terminal Blocks.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May, 1978 □ Volume 20 □ No. 5

BROADCAST ENGINEERING

The journal of the broadcast-communications industry

page 34

About the cover

KSL-TV news team, Shelly Osterloh and Skip Erickson, send ENG crews to top of 26-story building by microwav and down to the studio by fiber optic cable. (*Photo courtesy of KSL-TV.*)

Contents

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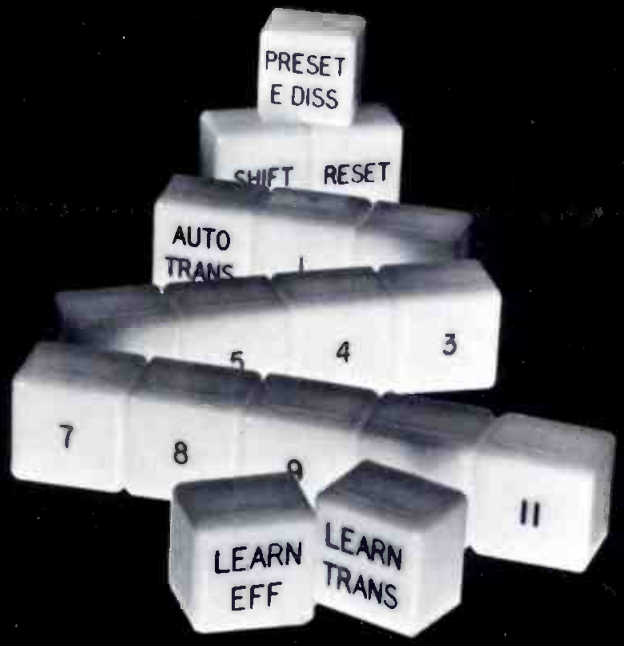

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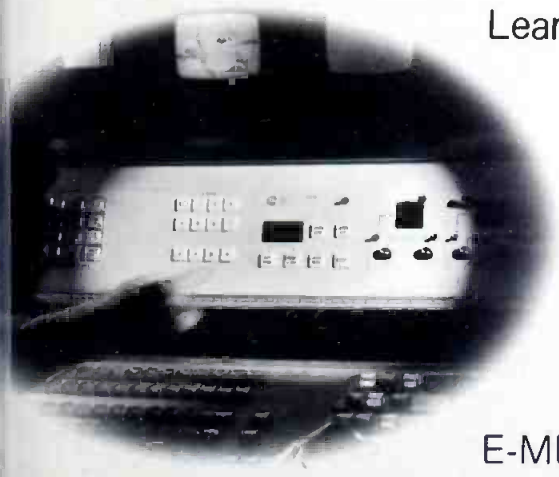

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May 1978/By Howard T. Head & Harold L. Kassen

Loud Commercials Revisited

The Field Operations Bureau of the Federal Communications Commissior has issued a report worth reading. The number is FCC/FOB 78-01 and the title is "Evaluating Loud Commercials (An Experimental Approach) In summary, a study of 178 television commercials indicated that, ir the opinion of the commission's staff, 34.3% of the commercials were loud, 51.1% were moderate, and 14.6% were quiet. The report contair a comprehensive discussion of loudness and its problems and would be a worthwhile addition to any technician's library. The test procedures used are subject to question so that the results may not truly reflect precise answers. Nevertheless, the commission's staff hopes the report will create some incentive on the part of industry to see the correct answers.

Commission Takes Novel Approach to Setting Technical Standards

In a departure from established practice, the commission has called for a debate among technical experts on revising the Technical Standards governing the maximum permissible noise figure of UHF television broadcast receivers. The matter arose as the commission was prepared to act on a petition by the Council for UHF Broadcasting (CUB) asking that the present maximum figure of 18 dB at UHF be lowered to 14 dB.

Ordinarily the commission relies on staff recommendations in adopting rules changes of this sort. In this case, however, the commission felt that more advice should be sought from outside experts and set up a panel discussion which would feature debates between proponents of even further reductions and those who felt that the 14 dB figure was just about right, or maybe a little bit too much.

It remains to be seen whether this approach of stimulating technical development through "forensic engineering" will prove particularly fruitful.

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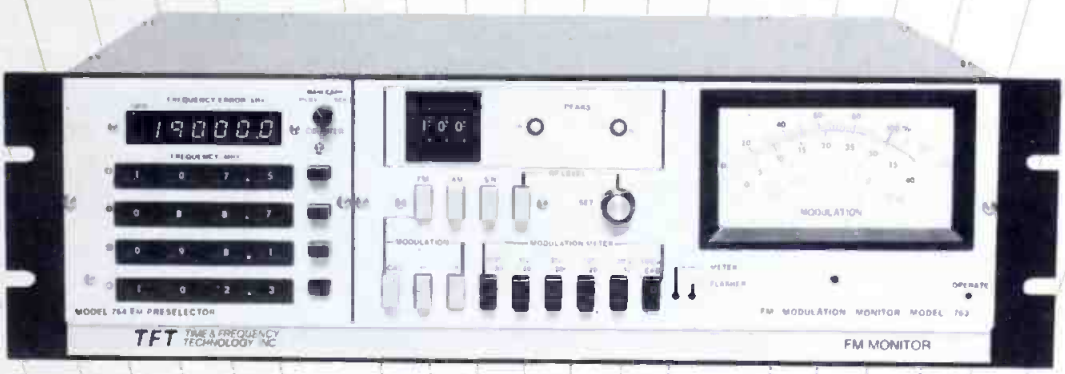
No-Risk High Modulation For FM Stations



Now TFT gives you FM modulation monitoring that's so precise you can modulate your FM transmitter to the absolute legal limit — in absolute confidence. TFT monitors give you fast, unambiguous readings with an accuracy of one percent. And they can be tailored to your needs and budgets.

Our Model 763, for example, is an economical way to get precise measurement and make proof of performance measurements. It connects directly to your transmitter. Or, if you want off-the-air capability, add our optional Model 764 Preselector. It gives you frequency synthesized tuning and digital readout of carrier and sub carrier frequency errors. And, our Model 765 gives you everything the Model 764 does, except frequency readouts.

What's more, both Preselectors give you a fast, precise fix on how your modulation measures up to the competition. With either one, you can tune in other FM stations, one-at-a-time, and monitor their modulation off-the-air.

In addition, the Model 764 gives you the ability to preprogram up to four stations via thumbwheel switches. One of them can even be yours. Then, by simply pushing a button, you can monitor any one of the four off-the-air.

No matter which kind of system you choose, you'll get all the quality features that have made TFT the industry standard.

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DIRECT CURRENT FROM D. C.

continued from page 4

More Restrictive FM Translator Rules Proposed

The commission has proposed to amend the Rules governing FM translators to prohibit any primary FM station from establishing or supporting any FM translator station which would extend primary servic beyond FM stations' 1 MV/M contours. Present Rules permit such extensions, although these are limited to cases where the area to be served by the translator does not receive any other primary (1 MV/M FM service.

The proposed new Rules would involve no change in the present practice of permitting community groups not connected with the FM licen see to establish FM translator stations at any desired location.

Novel Use of FM SCA

The commission has granted an experimental license in Pittsburgh, Pennsylvania, to field test an electric utility load management system under development in that area. Multiple subcarrier transmissions would be employed to effect selective "load shedding" at times when demands on the utility exceed the amount of primary electric power available.

Ordinarily operation of this sort, which is really multiple-address point-to-point rather than broadcasting, would not be permitted by broadcast station. In this case, however, the commission has made an exception because of the importance of energy management to the nation's economy and welfare.

Short Circuits

The commission is proposing a rule to require that broadcast statio respond "promptly and accurately" to FCC correspondence and inquiries...Broadcast and cable forfeitures (fines) may now run as high a $20,000 for each offense compared with the previous limit of $10,00 ...The commission has announced to all concerned that although it type accepts speed measuring radar equipment, such performance does not address the accuracy of indicated measurements.

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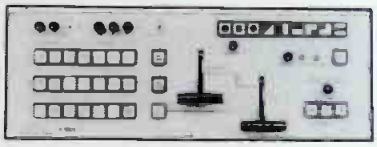
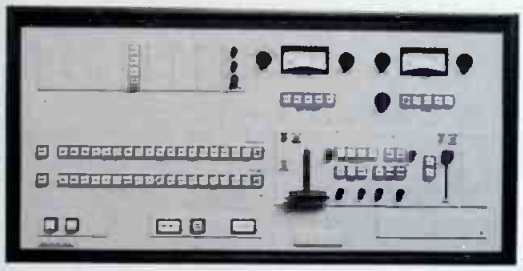
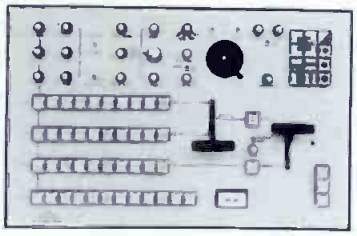
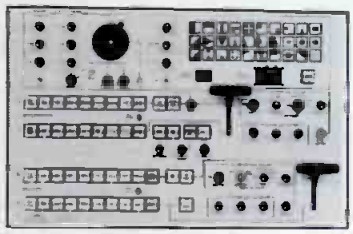
American Data manufactures a complete line of professional production, distribution, and master control switching systems for NTSC, PAL, and PAL-M standards.

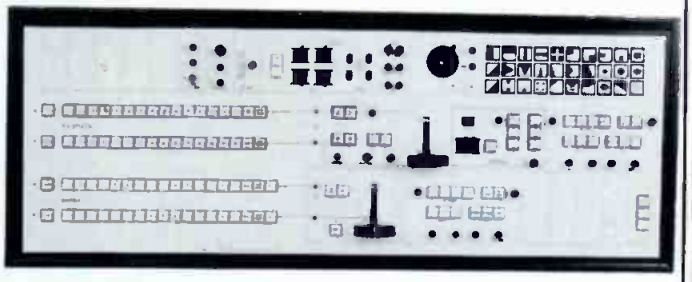
Our flexibility also includes the design manufacture, and integration of custom built systems. We take great pride in uncompromising quality and reliability and welcome an opportunity to discuss your particular needs.

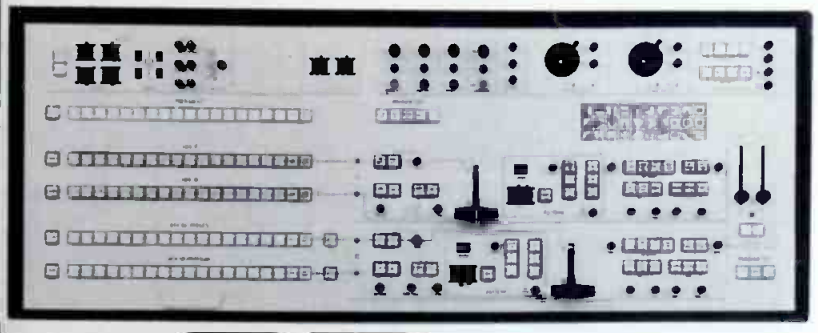












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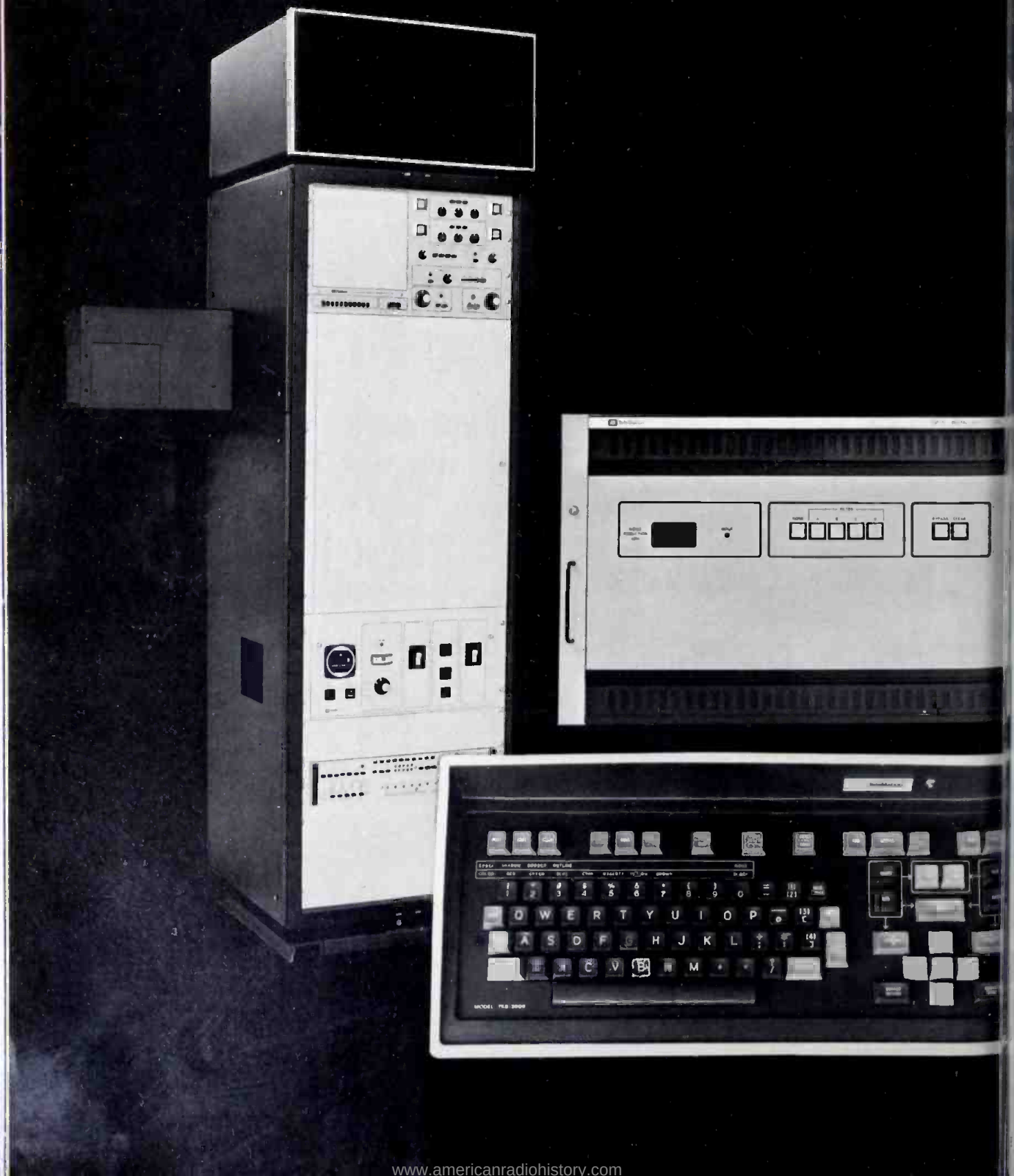

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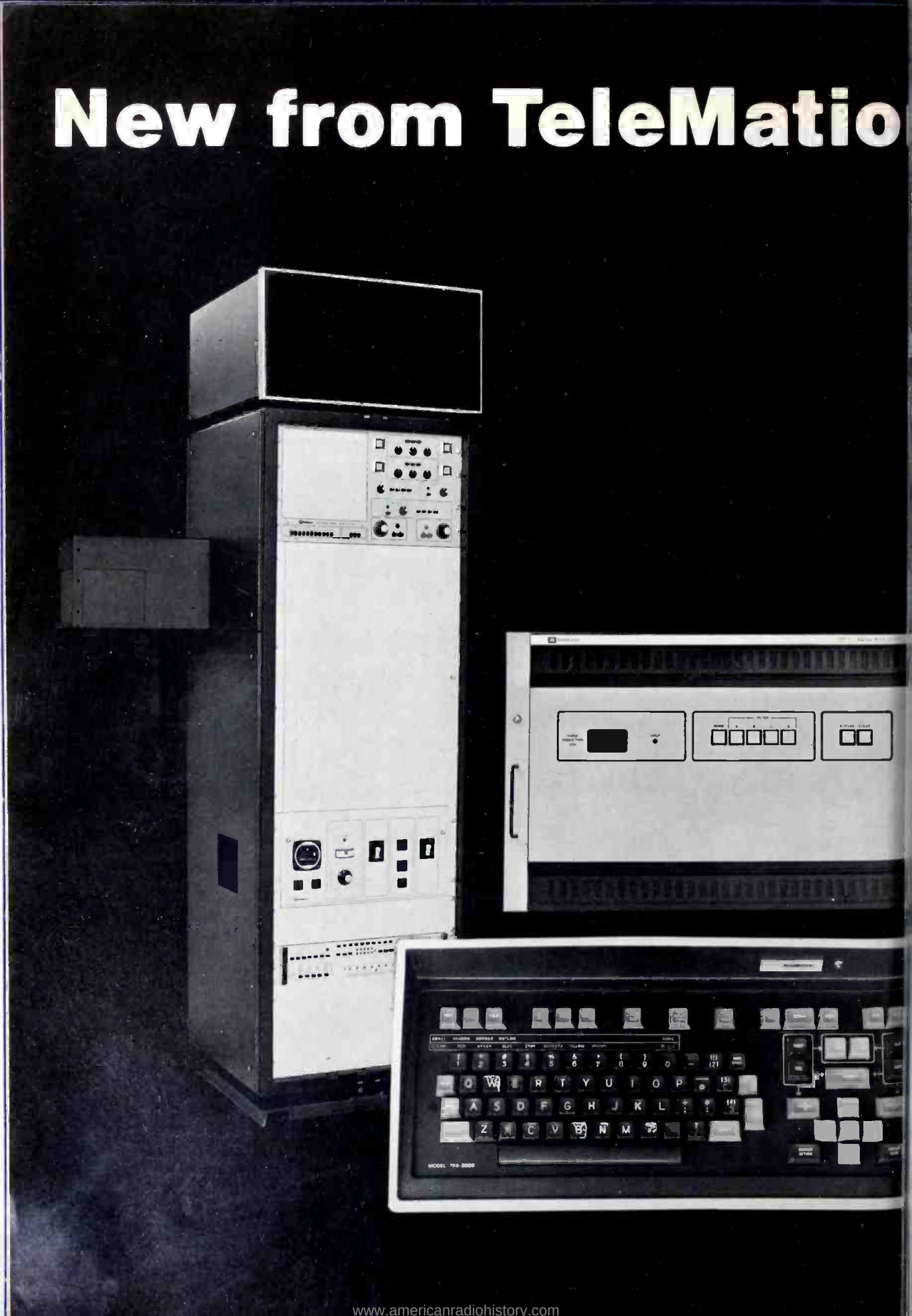

Introducing a state-of-the-art digital noise filter that costs less.

From input to output, the 8-bit TDF-1 represents an entirely new approach to digital noise reduction. At the input, we've included a full, broadcast-quality processing amplifier that completely regenerates incoming sync pulses. The TDF-1's charge-coupled device (CCD) memory offers the same high performance as RAM systems at a significantly lower cost. We've also increased the video sampling rate from three-times-subcarrier to four-times-subcarrier for greater bandwidth and resolution. And maintenance of the TDF-1 is made simple by a built-in diagnostic system.

A graphics system with off-line archival storage.

Everyone who uses an electronic graphics system has their own artistic requirements. With the new Compositor I™ memory system, each of your clients (or departments) can use the fonts they like and logos they need to create up to 999 graphics on a low-cost, removable cartridge disk. At the end of their taping session, they simply take out the cartridge and put it on the shelf. The next user (such as your news department) can then load another cartridge containing different fonts, logos, and pages and be on line in seconds. And, with the new dual disk system, you can copy directly from one cartridge to another.

What else is new with Compositor I? Fonts! More than 40 fonts are now available, including weather symbols, graph characters, and foreign fonts. And Compositor I's are now in use in PAL countries.

A microprocessor-controlled distribution switcher.

The new TVS/TAS-1000 Distribution Switcher microprocessor option can be programmed to perform salvo switches of multiple crosspoints simultaneously. Eight (or more) different salvos can be loaded into the system's memory and previewed by the operator before the live switch is executed, virtually eliminating the possibility of error. Other new control options include X-Y panels, where the source is selected with one button and the destination with another, and category-number selectors, where the input is selected by a name key (such as "VTR," "Camera," "Studio," etc.) and a number key.

A telecine camera that replaces GE units quickly and easily.

A new optics kit allows the TCF-3000 Broadcast Color Film Camera to replace GE 240 and 240-format cameras without so much as moving a projector or changing a lens. The TCF-3000 also gives you true hands-off color balance and color correction, automatically correcting poor-quality film without disturbing balance or gamma tracking of good film. This long term operational stability is made possible by unique, temperature-compensated sampling and control techniques. The TCF-3000 has several other advantages over competitive units, such as lower noise, more detail in black, and superior color separation. And a fully-remotable six-vector color corrector is available as an option.

For more information about these TeleMation products, circle one of the numbers below or contact:
TeleMation, Inc., P.O. Box 15068, Salt Lake City, Utah 84115. Phone:(801) 972-8000.

For More Details on TDF-1 Circle (24) on Reply Card

For More Details on Compositor 1 Circle (25) on Reply Card

For More Details on TVS TAS-1000 Circle (26) on Reply Card

For More Details on TCF-3000 Circle (27) on Reply Card

TeleMation

industry news

Orrox signs agreement with Vidtronics

Under terms of an exclusive licensing agreement between Orrox Corporation and Vidtronics Company Inc., CMX (a division of Orrox) will manufacture and market Videola™, a system which collects time code and other information from an edit controller and converts it into a CMX-compatible edit decision list. Videola can interface easily with thousands of existing edit controllers such as Convergence, EECO, Sony, TRI, and others.

Vidtronics is a large production and post-production facility whose major output is prime-time television programming; CMX is a manufacturer and supplier of editing systems.

Jack Calaway, Vidtronics' vice president of research and development, developed Videola to fill the need for a low-cost bridge between simple time code or back-space editing and the more versatile computer-assisted CMX editing systems in Vidtronics' own facility.

Videola allows any television operation with any type of edit controller to output a CMX-compatible edit decision list, including wipe, fade, dissolve, and key information. The system allows editing totally by picture (or sound), and the CMX decision list is accumulated accurately and automatically.

Novel filming techniques used in documentary

An extraordinary one-hour documentary was shown in evening prime-time by the CBS TV Network. The documentary featured pictures never before seen of the heart and bloodstream. The unusual film footage was by director/photographer Robert Elfstrom.

Elfstrom is a motion-picture filmmaker whose credentials include several major TV documentary film series. In this documentary, "The Red River," a triple bypass heart operation is seen performed by a famous heart surgeon.

Elfstrom's hand-held and other filming techniques with a "Frezzi-Flex" FR-16 motion picture camera provided TV viewers close-ups of the "operating field," showing detailed procedures only surgical operating teams see in operating rooms.

The FR-16 16mm Frezzolini Electronics Inc. motion-picture camera was "customized" to Elfstrom's particular requirements, as are all FR-16s purchased by other filmmakers.

Television news photography winners announced

Despite a record number of entries at this year's Television News Photography Competition, held recently at Arizona State University, no one went home a winner in the general news category—an outcome which raises the question, Why?

According to the judges, winners in this category were not chosen because many entries featured reporters who were on-camera at a sacrifice to story continuity and content. Perhaps stations now featuring personality-oriented news will take this as a reminder that the purpose of the news is to present the story, not the reporter.

While the producers of general news began pondering next year's competition, however, the judges were awarding KTVY-TV in Oklahoma City, Oklahoma, "Top Television Station of the Year" honors for the excellent use of photography in its day-to-day news coverage.

There were more than 700 entries in this year's contest, with 305 television news photographers participating. All three major networks as well as 183 television stations were represented. In addition, two Canadian stations submitted entries.

Winners in the competition, sponsored by the National Press Photographers Association, Eastman Kodak Co., Cinema Products, the Department of Mass Communications at ASU, and Angenieux Corp. of America, will be honored at the NPPA convention and business meeting scheduled for July 2 in Seattle, Washington.

Winners include (listed in order of finish):

Spot News—"Anti Shah Demonstration," Ken Resnick, WTTG-TV, Washington, D.C.; "Fire Victims Profile," Bob Phillips, WDTN-TV, Dayton, Ohio; and "Hostage," Jack Parker, WTTV, Indianapolis, Indiana. Karl Suchman of WHO-TV, Des Moines, Iowa, received an honorable mention for "Fire Rescue."

Feature—"A Trip to the Bank on Gossamer Wings," Terry Morrison, NBC-News, San Francisco; "Women's Crews," Scott Gibbs, KPIX-TV, San Francisco; and "Mondo Eggo," Henry Kokojan, NBC-News, New York.

Sports—"The Fan," Hunter Bloch, WPLG-TV, Miami, Fla.; "Rainbow High," Paul Fine, WJLA-TV, Washington, D.C.; and "Wrestling," John Baynard, WBTV, Charlotte, N.C.

Minidocumentary—"Marines in Arms," Terry Morrison, NBC-News, San Francisco; "Yosemite Summer," Terry Morrison, NBC-News, San Francisco; and "Flint Hills Women," Larry Hatteberg, KAKE-TV, Wichita, Kan.

Documentary—"Catch A Rising Star," Paul Fine, WJLA-TV, Washington, D.C. There was a tie for second place: "Tutankhamen Live

continued on page 1

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ut a lid on ever-escalating equipment costs with spectacular savings on amera/lens combinations from Cinema Products.

Upgrade your TV-newsfilm operation. Retire your antiquated 16mm ameras and lenses (whatever their condition), and trade up to the standard the industry — CP-16/A news/documentary cameras, with a choice of ur of the finest Angenieux lenses available:

Angenieux 9.5-57mm AV30 zoom lens. The lightweight, tra-fast (T1.9), wide-angle 6×1 zoom lens permits ose focusing at 24" from the film plane.

Angenieux 12-240mm AV30 zoom lens. The ideal 20×1 oom lens for any situation requiring wide-angle as well as elephoto coverage, such as sports events, political gatherings, etc.

Angenieux 12-120mm AV30 DA zoom lens. The outstanding 10×1 zoom lens with utomatic Iris Control.

Angenieux 12-120mm AV30 zoom lens. The "workhorse" of the television news gathering industry.

ree 3XL-IAZ Magnetic Head

CP-16/A cameras (with built-in Crystasound amplifier) included in this offer are supplied with a 3XL-IAZ magnetic cord head — featuring individual record and playback azimuth adjustment — *at no extra charge.*

Trade-in *any* 16mm camera and lens for the following CP-16/A camera/zoom lens packages:

1 CP-16/A (Code 1C272) with 3XL-IAZ Magnetic Head *and* Angenieux 9.5-57mm AV30 Zoom Lens

LIST: **$9695**
SAVE: **2295**
PAY: **$7400**

2 CP-16/A (Code 1C272) with 3XL-IAZ Magnetic Head *and* Angenieux 12-240mm AV30 Zoom Lens

LIST: **$13665**
SAVE: **3065**
PAY: **$10600**

3 CP-16/A (Code 1C272) with 3XL-IAZ Magnetic Head *and* Angenieux 12-120mm AV30 DA Zoom Lens (Automatic Iris Control)

LIST: **$10810**
SAVE: **3160**
PAY: **$ 7650**

4 CP-16/A (Code 1C272) with 3XL-IAZ Magnetic Head *and* Angenieux 12-120mm AV30 Zoom Lens

LIST: **$9110**
SAVE: **1660**
PAY: **$7450**

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Please call your local CP-16 dealer for special ade-in prices and savings on standard CP-16 amera/zoom lens combinations.

Special Two-Year Warranty and Free "Loaner"

This special offer is covered by an extended two-year factory warranty on all mechanical and electronic components when you purchase your camera from your authorized local CP-16 dealer.

Your local dealer will also provide you with a free CP-16 "loaner" for any down time on a warranty-covered repair.

Offer Good Through June 30, 1978

So, don't wait. See your local CP-16 dealer now. And save!

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news

continued from page 10

Forever," Jim Tolhurst, WWL-TV, New Orleans; and "Africa's Defiant White Tribe," Richard Norling, NBC News, New York.

"Catch A Rising Star" and "Yosemite Summer" received special awards for editing excellence. In addition, the Angenieux Award for Creative Cinematography went to "Catch A Rising Star."

Larry Hatteberg, KAKE-TV, Wichita, Kan., was named "Television News Photographer of the Year."

World's largest routing switcher goes to NBC

In 1979 the world's largest routing switcher will be delivered to NBC by NEC America Broadcast Equipment Division.

How large is the largest commercial service switcher? The TKA105 will incorporate 40,500 cross points configured as 150 inputs by 270 outputs.

A 120-inputs by 60-outputs section of the switcher will be used for distribution of NBC's 1980 Summer Olympics coverage in Moscow. When the equipment is returned from the Olympics, the complete switcher will be installed at the NBC Burbank studios.

According to NEC's R. Dennis Fraser, the switcher is valued at $3 million. Bumping the technology, the TKA105 uses newly developed LSI cross-point technology and four discrete digital audio channels.

The purchase agreement was signed by Jack Kennedy, NBC's operations and engineering vice president.

Fiber optics exposition

The first fiber optics and communications exposition to be held in the United States is scheduled for September 6-8 at Chicago's Hyatt Regency O'Hare Hotel.

FOC '78, sponsored by Information Gatekeepers Inc., is being held to meet the needs of the producers, innovators, designers, and users of fiber optic systems, components, and materials.

The exposition will include exhibits, technical sessions and panels, financial sessions, intensive short courses, and live demonstrations.

For more information, contact: Information Gatekeepers Inc., 167 Corey Road, Suite 212, Brookline, MA 02146.

Ampex named supplier for XXII Olympics

Ampex Corporation has been granted the exclusive right to supply videotape records, slow-motion disc recorders, and magnetic recording tape for the XXII Olympic Games to be held in Moscow in 1980.

The decision resulted from an agreement between the organizing committee for the 1980 Olympics and the Soviet State Committee for Radio and Television, which also gives Ampex the right to use the official emblem of the games in conjunction with the designation "Official Supplier."

State broadcasters get tips on fighting taxes

State broadcaster associations can now obtain a primer to help them prevent state and local taxation of their revenue and property.

The booklet, compiled by the NAB, is designed to familiarize broadcasters with the growing trend by states and localities to view broadcast stations as an answer to their fiscal problems. It reviews various taxes and Constitutional issues, offers policy arguments urging rejection, and presents

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log entries

June 6-9—More than 80 delegates from Asian and Pacific countries, the U.S., and Canada are expected to attend the *Third Asian-Pacific Television Conference*, to be held at San Francisco State University. The theme of the conference is "Satellite Communication for the Asian Pacific Region: Effective Message Formulation and Message Distribution Through Television." For more information, contact: Dr. Herbert Zettl, Broadcast Communication Arts Department, San Francisco State University, 1600 Holloway Avenue, San Francisco, CA 94132.

June 8-11—The spring meeting of the *Missouri Association of Broadcasters* will be held at the Kansas City Marriott, located at KCI airport. The meeting is being held in conjunction with the Kansas Association of Broadcasters.

June 15-16—The *Oregon Association of Broadcasters* will hold its 37th annual spring conference at Salishan Lodge in Gleneden Beach. Registration fee is $65 for OAB members and $75 for nonmembers. This fee includes all business sessions and meetings, as well as some meals. For more information, contact: OAB, P.O. Box 3236, Eugene, OR 97403.

June 20-22—Discussion of the latest technology, devices, and system applications for modulators will be the highlight of the *13th Pulse Power Modulator Symposium*. It is being held at the Statler Hilton, Buffalo, New York.

June 21-24—The 43rd annual convention of the *Florida Association of Broadcasters* will be held at the Colony Beach & Tennis Resort, Longboat Key, Sarasota, Florida.

June 23-24—The *Radio Television News Directors Association* is conducting a board meeting at the Atlanta Hilton, Atlanta.

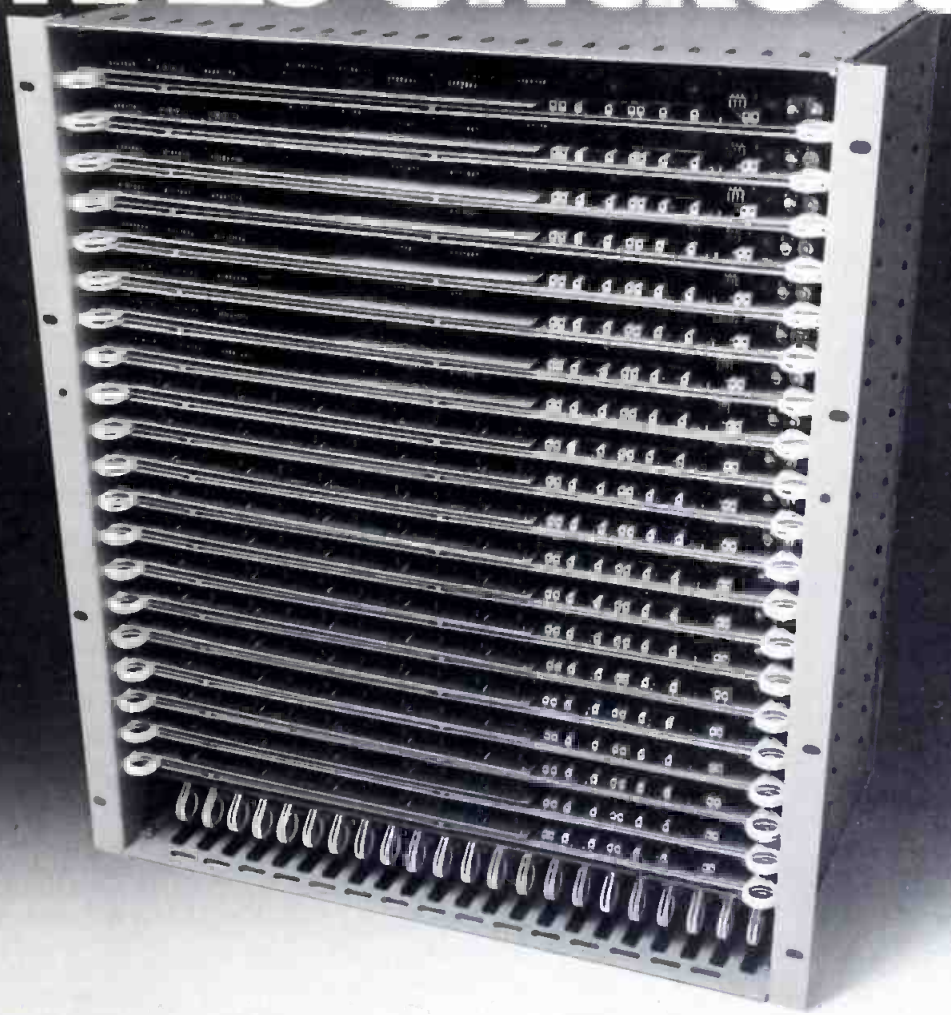
June 26-28—The University of California, Santa Barbara, is the site of the 36th annual *Device Research Conference*, sponsored by the IEEE Electron Devices Society. The conference is a forum for work of a basic or exploratory nature in all areas of device research and technology. Areas of emphasis include the various optoelectronic disciplines (e.g., semiconductor lasers and devices for optical communications), imaging, high-speed devices, etc.

July 14-15—The 21st annual *Motion Picture Laboratories (MPL) Seminar*, produced in conjunction with the Nashville Section of the SMPTE, is being held in Memphis, Tennessee. For further information, contact: Barbara Holley, MPL Inc., Box 1758, Memphis, TN 38101.

July 16-21—All subjects in the electric power area will be covered at the summer meeting of the *IEEE Power Engineering Society*, scheduled for Los Angeles.

July 16-28—The NAB's 11th *management development seminar for broadcast executives*, to be conducted at the Harvard Business School, will focus largely on the role of the general manager: emphasis will be placed on management leadership and decision making.

GET YOUR SIGNALS UNCROSSED.



No matter how complicated your dio operation is, we can unsnarl your signals l send them on their way, with one of our e off-the-shelf Switcher series.

For example, many broadcasters use our er cost 15X or RX Series Switchers to switch ut signals to their VTR machines. By providing ant access to signals at the touch of a ton, difficult editing jobs are accomplished the spot and, during the Vertical Interval.

And to minimize system downtime ve designed our Series 20X and 40X Switchers optimum reliability and capability. Most s have a microprocessor in every channel to inate total system failure if the logic system functions. And you can replace a channel module without shutting down the entire system.

For audio use, our solid-state Series AX Switchers make the old fashioned patch panel a thing of the past.

All 3M Routing Switchers can be built to nearly any input/output capability, with vertical interval switching and can be operated by many types of controls.

Studio operation is getting more complex every day. You can't fight it, so why not switch? Switch to 3M Routing Systems.

Circle the reader service card number at the back of the book for more information or call 205-883-7370 for system design assistance. 3M Video Systems. Watch us in action.

3M COMPANY

Circle (5) on Reply Card

news

continued from page 12

status report on broadcast-related taxes.

Erwin Krasnow, NAB senior vice president and general counsel, said recently, "Taxes on the sale and/or purchase of broadcast advertising have already been enacted in several states, and similar bills are being considered elsewhere. Many states and municipalities have begun to interpret their existing tax laws in new ways so as to include previously exempt broadcast-related activities. In short, the chances are better than ever that radio and television stations soon may be liable for substantial new tax levies. This trend is expected to continue, but it is not inevitable."

IEEE offers microprocessor seminars

The educational activities board of the Institute of Electrical and Electronics Engineers (IEEE) is offering several seminars on microprocessors this summer. Three-day seminars are scheduled for June 8-10, Princeton; June 15-17, Chicago; June 22-24, Washington, D.C.; June 28-30, Montgomery, W. Va.; and July 20-21, Nashville, Tenn.

Mutual to open regional headquarters in Dallas

The Mutual Broadcasting System is establishing a Southwest regional headquarters in Dallas, it has been announced by C. Edward Little, Mutual president.

This marks the first time Mutual has established network facilities outside of Washington, D.C., location of Mutual's world headquarters. The Dallas operation will be fully manned and equipped, and be able to feed the full Mutual network as easily as the Washington studios, according to Little.

The new regional headquarters, which Little calls a "mini network," will include a sales department, station relations, accounting, engineering, traffic, production, continuity, as well as fully-staffed news and sports departments.

"The Mutual Dallas operation will be equipped to handle every aspect of network programming—everything needed to take care of network broadcasts from Dallas on a regular basis," Little said.

The opening of the Dallas headquarters comes shortly after Mutual signed a four-year agreement with the Dallas Cowboys to broadcast the Cowboys' games over a nine-state network, to be called the Dallas Cowboys Radio Network.

Thomson-CSF to equip Iranian TV

The National Iranian Radio and Television (NIRT) authority has awarded Thomson-CSF a contract to supply the color TV equipment for several regional stations.

Thomson-CSF has worked in close collaboration with Iranian administrations for more than 12 years, equipping most of the Iranian network of high-power transmitting stations and virtually all of Iran's TV channels.

A contract for the turnkey supply of the entire radio system for Teheran's shortwave station was awarded to Thomson-CSF earlier.

FCC studies reasonable access provision

The reasonable access provision—Section 312(a)(7) of the Communications Act—providing the FCC with the power to revoke a station license for willful or repeated failure to allow reasonable access to or permit purchase of reasonable amounts of air time by a legally qualified candidate for federal office on behalf of his candidacy, has been opened to inquiry.

Adoption of guidelines or rules to ensure that political candidates for federal elective office receive reasonable access on radio and TV will result if it is determined that the policy is inadequate, and new specific requirements are necessary to aid stations in complying with the policy.

The FCC said its general policy is to defer to the reasonable, good faith judgement of stations in determining what constitutes reasonable access. The commission has attempted to strike a balance between the rights of federal candidates and the obligations of broadcasters to present political as well as other types of programming.

Although it reviews individual complaints to determine whether the station has used reasonable good faith, the commission has developed some basic guidelines as to what Section 312(a)(7) requires. For instance, federal candidates are entitled to program time during prime time in the absence of specia

continued on page

Cetec Sparta Showcase:

First-quality broadcast components joined in a first-quality studio system

That's a Centurion II 12-mixer stereo console up front, the centerpiece of a custom Sparta grouping that's handsome, functional, and compact.

Start with Centurion II — more than 200 stations have already. One great reason is that when AM stereo arrives, you're ready right now. If 12 mixers and 36 inputs aren't enough, you can add one or two extender panels of 6 mixers each — to a maximum of 24 mixers and 72 inputs! You can have either rotary or slide pot controls — or even some of each. And of course Centurion is solid state all the way.

Put it in its place — along with Sparta's fine family of turntables, tape cart and remote control equipment — and complement it with sleek, low-profile furniture designed just for broadcast operations. And there you have it — a custom studio system at less than custom prices.

Of course, you can mix and match. That's the beauty of the big Cetec Sparta line — multiple choices in equipment and studio layout.

Outstanding full-color Sparta catalogs are just off the press. Write for them today, or telephone Andy McClure (805) 968-1561.

Cetec Broadcast Group
The Broadcast Divisions of Cetec Corporation
75 Castilian Drive, Goleta, California 93017

continued from page 14

circumstances, such as a large number of candidates.

The commission also indicated that a station has the option of offering either free or paid time, or a combination of the two, and that the reasonable access provision applies to noncommercial as well as commercial stations. However, the FCC said it had declined to recognize a candidate's right to a particular length of program time or a specific air time.

Ivey purchases Bogner antennas

Bogner Broadcast Equipment Corporation has announced the sale of three UHF and two VHF high-power antennas to Ivey Communications Corporation. The antennas will be installed in the U.S. and in Latin America, where Ivey Communications is supplying major components of television systems.

Broadcasters challenge government restraint

A cry for an enlightened era of government encouragement rather than restriction in the broadcast industry was voiced by Donald P. Zeifang, senior vice president for government relations of the National Association of Broadcasters.

Speaking at the Indiana Broadcasters Association's spring conference, Zeifang cited the broadcast industry as the object of stifling government regulation, frustrating competitive use of the billion-dollar technology created, ironically, by the "best broadcasting system in the world."

He added that "while more and more Americans rely upon the broadcast media for news and information, the government steadfastly refuses to abandon its position of discrimination against the broadcast media in the application of full First Amendment freedoms." Zeifang called for government to "keep up with the times," which are dictating a trend away from "regulation and reliance upon the judgment of bureaucrats."

He indicated it is wrongly assumed that the media not only is the bearer of bad news, but is responsible for it; rather, the growing mistrust of government is the fault of government as usual. In conclusion

continued on page

For you, the new breed of video professional, the new breed of professional video from JVC.

If you're a video professional today, you're a tougher customer than ever. So JVC's rugged professional line delivers the quality and features you demand at prices you want to pay.

We know you've got a lean new attitude about the video equipment you buy, no matter how long you've been in the business. Or whether you're in broadcasting...a sophisticated corporate A/V operation...a top production house...or building your first video capability.

And that attitude is, with all the people vying for your video dollar, you want more state-of-the-art technology in equipment that costs you less to own and maintain.

JVC's attitude is basic too. We build in engineering innovations—we don't add them on later. And we do it first. Which means you enjoy better picture and sound quality, easier operation, and sophisticated features you may not even find in equipment selling for twice the price.

For instance:

You wanted faster performance and greater accuracy in 3/4-Inch video editing.

And JVC's new CR-8500LU Recorder/Editor System offers bi-directional fast/slow search from approximately 10 times to 1/20 time, with editing accuracy to ±2 frames.

It's a new generation of ¾-inch VCR editing— the fastest, surest way to get the frame-by-frame accuracy you need.

But JVC's CR-8500LU is still priced well below its closest performing competition.

With a single unit, you can edit with full functions and broadcast quality. Even if you don't happen to have special technical knowledge.

With a complete editing system of two CR-8500LU units and the new RM-85U Control Unit, you can perform the most advanced editing feats at approximately 10 times actual speed, then stop **on a single frame.**

Here's how the CR-8500LU gives you that kind of precision.

- **Frame to frame editing** is made possible with the capstan servo/built-in rotary erase head/blanking switcher frame servo design. A design that also ensures true assemble and insert editing with no distortion at the edit points. Plus horizontal sync phase compensation to minimize timing error at the editing points.
- **Variable speed auto-search** lets you perform both high speed and low speed search. You can search at approximately 10 times in fast forward or reverse to find edit points faster. Or slow speed search at 2 times, 1 time, 1/5 time and 1/20 time. Or use the special auto-speed shift feature to automatically slow you down from 2 times, real time, 1/5 time, 1/20 time.
- **Automatic pre-roll** enables you to pre-roll tape between edits, with an automatic on/off switch. Which can come in especially handy during successive assemble edits using camera signals.
- **Self-illuminated control buttons,** allowing easy identification of the operation mode.
- **Full logic control** for direct mode change without pressing the stop button.
- **Remote control** of all operations, with the optional remote control unit RM-85U.
- **Audio level control with meters,** preventing over-level recording without audible distortion, with attenuator. Also, manual audio level controls let you adjust the audio recording level by checking the level meters.
- **Auto/Manual selection for video recording level control,** adjustable by the automatic gain control circuit or manually by referring to an independent video level meter.
- **RF output** to connect an external drop-out compensator.
- **Patented color dubbing switch** for stable color multi-generation dupes.
- **S.C./sync input connector** allows connection of time base corrector and allows for two second pre-roll.
- **Chroma level** can be controlled manually for convenient connection to an external system.
- **Built-in comb-filter** for playback (switchable on-off).
- **Servo-lock indicator** to check the t transport condition.
- **Counter search mechanism,** permitting Auto-Search of a particu section of the tape.
- **Solid construction fo easy maintenance:** bot side panels, top and bottom panels are detachable for easy access to the inside.
- **Tracking control meter** for maximum tracking adjustment.
- **Heavy fan motor** for better circulation.

All that with one editing unit. But when you combine two editing units with our new RM-85U automatic editing control unit, you'll enjoy all the benefits of a total-performance system.

Starting with the kind of control JVC's RM-85U can give you:

- **Independent LED time counters** player and recorder, read out edit poin minutes, seconds and frames.
- **Edit-in and edit-out automatic control.** Four built-in memories let yo control edit-in and edit-out points of t the player and recorder. And once star and ending points are determined, ac curate editing is memory-controlled automatically.
- **Edit shift control** allows frame-to-fr edit point correction.

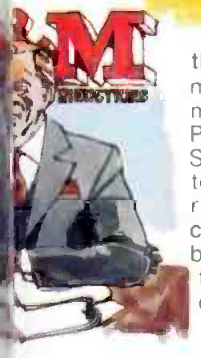
p time indicated for each insert edit
th by LED display.
it preview mode available, for
earsals" of actual edits.
it-in point search mechanism. After
edit, a Return button rewinds the
automatically to the edit-in point, so
asier to check edit conditions.
to-shift search mechanism to step
n the tape speed automatically, and
re quick and accurate location of the
g point.
e safety guard circuit. Because
ng the unit in the still-frame mode can
tually cause damage to tape or video
s, a tape safety guard circuit places
nit into the stop mode automatically
if it is left in the still-frame mode for more than 10 minutes.
• **Selective editing modes**—assemble editing, insert editing for audio channel-1, audio channel-2 or video.
• **Versatile editing capability** offering techniques like "edit-in/out," pre-roll, and automatic pre-roll.

You'll find that nothing in its price class performs anywhere near the CR-8500LU/RM-85U videocassette editing system. And that you'd have to spend a *lot* more on the competitive unit that offers many of the same features.

That's what we mean by giving video people more of what they want, for less than they expect to pay.

demanded more versatility in a moderate-priced, broadcast-quality camera.
nd JVC's value-packed CY-8800U goes with you from studio to location.

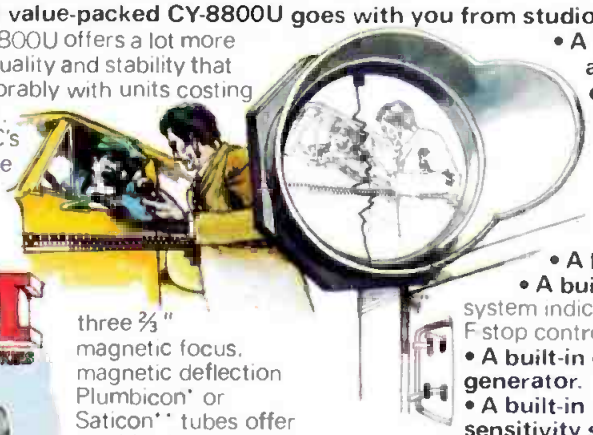
Our CY-8800U offers a lot more picture quality and stability that pares favorably with units costing e as much. ks to JVC's nology, the 800U era, ing

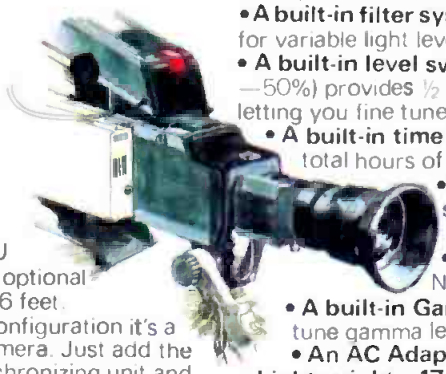


three ⅔" magnetic focus, magnetic deflection Plumbicon* or Saticon** tubes offer total flexibility. And a rugged die cast chassis in front and back to hold up under the toughest conditions.

With the **Basic** guration, it's a pact ENG/EFP era that's com- ly self-contained CCU required. sy to operate, y to plug into our 400LU/CR-4400U ble recorder, with optional s available up to 66 feet.

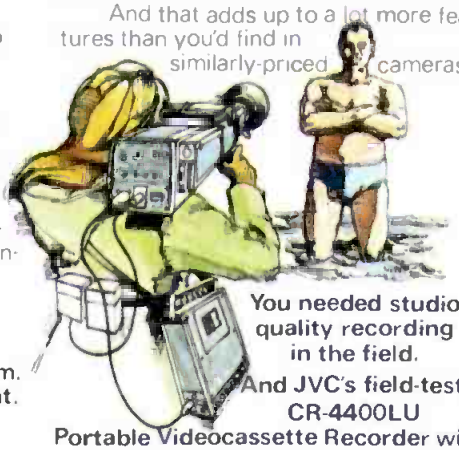
With the **Studio** configuration it's a working studio camera. Just add the 800U remote Synchronizing unit and rge screen, top mounted viewfinder. And as for big-ticket features, we've n what the others would let you add er.





• **A built-in 1.5 inch adjustable electronic viewfinder** for the convenience of the operator.
• **A built-in battery warning system.**
• **A built-in tally light.**
• **A built-in VSI**—video system indicator for precision F-stop control.
• **A built-in color bar generator.**
• **A built-in +6dB, +12dB sensitivity switch** for low light level applications.
• **A built-in auto white balance.**
• **A built-in fast warm-up capability.**
• **A built-in electrical color temperature adjustment** for different applications (variable from 3000°K to 10,000°K).
• **A built-in filter system** (neutral density) for variable light levels.
• **A built-in level switch** (+50%, 0, —50%) provides ½ F-stop adjustment, letting you fine tune for added contrast.
• **A built-in time lapse meter** to show total hours of camera use.
• **A built-in intercom system** for studio applications.
• **An RGB output,** and NTSC encoding (Y, I, Q).
• **A built-in Gamma control** to fine tune gamma level.
• **An AC Adaptor**—standard.
• **Lightweight—17.4 lbs.—portability.**
• **Optional 12-to-1 zoom lens** with automatic iris and power zoom.
• **Built-in horizontal and vertical contour correction circuits.**
• **Signal-to-noise ratio of 49dB,** F 4/3000 lux.
• **Resolution of 500 lines at center.**
• **Return video** in the viewfinder.
• **A built-in -G circuit** for registration.
• **Minimum illumination** F 1.9/300 lux (+6dB switch on).
• **A comfortable hand grip** to stop and start the recorder. With a switch to operate iris control and a switch for return video.
• **A built-in CCU.**

And that adds up to a lot more features than you'd find in similarly-priced cameras.



You needed studio quality recording in the field.

And JVC's field-tested CR-4400LU Portable Videocassette Recorder with automatic editing lets you bring your recording/editing capability wherever you need to shoot.

If you spend time on location in either ENG or EFP applications, you need a portable video system that can shoot, edit, and give you something to show in no time flat. Without awkward equipment hassles.

JVC's CR-4400LU is the one to take along when you can't bring a studio.

Because it's the lightweight machine with heavyweight features.

• **Weighs in under 27 lbs.** So you can take it anywhere, and assemble edit on the spot. You enjoy total flexibility. Complete freedom. Fast results.
• **AEF (Automatic Editing Function)** gives you clean assemble edits.
• **Built-in, full color recording and playback circuitry.** No need to buy an adaptor.
• **Low-power consumption** that lets you operate on a miserly 13.5 watts, for longer battery life. A multi-purpose meter checks battery, audio, video and servo levels for precise control of all functions.
• **Flexibility to record with the CY-8800U** or other high quality color cameras.

So if you need a field-tested recording system with the features you want at a price you can afford, check out our CR-4400LU Portable Videocassette Recorder.

*registered trademark of North American Philips Corporation.
**registered trademark of Hitachi Corp.

JVC's new breed of professional video. Backed by an old tradition of JVC quality and reliability.

For the past fifty years, more and more professionals have turned to JVC for innovative equipment they can count on to perform.

Isn't it time you discovered why?

Call your JVC representative for a demonstration. Or write to your nearest JVC office:

58-75 Queens Midtown Expressway
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Compton, Ca. 90220
(213) 537-8230

3400 South Loop East
Houston, Texas 77021
(713) 741-3741

TV reception simulated

JVC Professional Video. The tough new breed.

JVC

JVC INDUSTRIES COMPANY
DIVISION OF US JVC CORP.

ntinued from page 16

declared, "It will only be a scious, positive initiative by the iness community in general and adcasters in particular that will g about a change in government udes and policies."

A Americom handles yager mission

CA Americom will provide com- ications service for the inter- etary Voyager mission, giving intists and the public a new look he outer solar system. The rd by the National Aeronautics Space Administration calls for band data satellite communica- s links to support the decade- Voyager mission.

wo 56 kilobits-per-second simplex channels and a duplex (two-) 56 kilobits-per-second channel carry full time transmissions veen the Goddard Space Flight er in Greenbelt, Maryland, and Jet Propulsion Laboratories in dena, California. Telemetry and r data from the Voyager space- t will be picked up in Madrid, n, and transmitted to Goddard. high-speed data will then be arded to TPL via RCA satellite computer analysis. The system mes operable beginning May .

B urges adoption of l stereo standards

ne National Association of adcasters has urged the FCC to t AM stereo standards as soon possible, based in part on the arent widespread interest in a system.

its filing with the FCC, the NAB d that the Office of Telecom- ications also recognizes that stereo "could potentially increase the attractiveness of the AM service to the general public, stimulate the production and sales of receiving equipment for use in motor vehicles and homes, and generally increase competition in the aural service."

The NAB pointed out that tests have shown no significant technical difficulties in AM stereo. In addition, the FCC was reminded that additional AM channels are not required because AM stereo "does not require additional spectrum space, but takes advantage of an existing redundancy in the present AM transmissions."

However, the NAB said the effect of skywave propagation on AM stereo reception may require special study, and suggested that the commission consider retaining a consultant to make theoretical and engineering studies of the proposed systems.

Easier filing for royalties needed

The Copyright Royal Tribunal has been requested to make it as simple as possible for broadcasters to receive royalty fees from cable television systems.

The request from the National Association of Broadcasters pertains to the new copyright law that became effective January 1, requiring cable systems using broadcast programs to pay royalties.

The request for clarification of the actual payment procedure included suggestions to require stations to retain affidavits at the station stating the programs for which they claim royalties recorded; to devise a standardized form requiring minimal information; and to require initial short claim form (call letters, city of license and licensee) for the July 31 deadline, with full form due November 27 since broadcasters will not have access to cable systems' accounting statements prior to the July date.

Introducing two hours o Omnivision II™ VHS

An important message from top management will soon be seen by all employees, whether they're in the home office, the branch offices or offices overseas. At the same time, a manufacturer decides his 450,000 volt generators, a bit too large to take along to sales demonstrations, are small enough to take along on tape. A large retailer trains the staff at four branch stores simultaneously. A real estate investor takes a tour of prospective California property from his office in New York. And a couple watch a new boat take the waves from a showroom miles away from water.

This is what industry can do through video communications. It's also why Panasonic brings you Omnivision II™ VHS,™ the world's first two-hour ½" video cassette system with industrial strength.

What is "industrial strength"?
The answer is simple: Durability, reliability, global adaptability and the kind of meaningful performance features and options industry requires. But industry also requires economy. That's why Omnivision II decks are available in two cost-efficient models. The NV-8300 player/recorder with VHF and UHF tuners.

And for situations that require only playback, there's the even more economical NV-8150 player. Both with a combination of features not found in any other ½" industrial system.

Industrial strength performance.
For outstanding picture quality, both Omnivision II decks have direct-drive video head cylinders for low jitter and excellent stability. And for precise and steady tape speed, both use a capstan servo system. Combine this with patented HPF™ video heads and the results are what you'd expect from Panasonic: Horizontal resolution of 300 lines in black and white, 240 lines color and a superb S/N of 45 dB. There's als the kind of durability and strength you expect from Panasonic. That's why all the critical components an mechanical parts of both decks are mounted on an annealed aluminum die-cast chassis.

Tape economy.
Omnivision II tape cassettes are less expensive, smaller, easier to store and more economical to mail than ¾" tapes. They also give you twice the playing time on a video cassette half the size of a ¾" cassette

NV-8300 player/recorder.

ndustrial strength video. rom Panasonic.

o not only can you spend more time recording nd playing, you'll also spend less money on tape. mnivision II cassettes are also compatible with all ther VHS systems.

uplication and global adaptability.

ecording one video tape with Omnivision II is simple nough. Making as many copies as you need is just bout as easy, with independent duplication facilities certain key areas in the U.S.

For multinational corporations, both Omnivision II ecks will operate anywhere in the world where ere's a power supply of 120 volts and AC frequency either 60 or 50 Hz.

And for even greater international flexibility, no odification is required when Omnivision II decks e used in countries with other AC line voltages. mply add an inexpensive step-down transformer. nd wherever Omnivision II decks are used, fluctuations in AC line frequency won't affect them, ecause both use DC motors.

Both decks also have a VTR/TV antenna switch, utomatic shutoff at the end of the tape, BNC and pin output connectors and more. With the NV-8300 you also get a built in digital clock timer for recording when you're not there.

Industrial strength options.

Omnivision II decks are available with the kind of options you require for your special communications needs. Like an RF modulator for playback on most TV receivers. A remote pause control. Black and white and color cameras. Monitors. And Panasonic 30, 60 and 120 minute VHS cassettes.

So no matter what your industrial communications needs are, take a look at Omnivision II VHS from Panasonic. The system with industrial strength.

For more information write: Panasonic Company, Video Systems Division, One Panasonic Way, Secaucus, N.J. 07094.

In Canada, contact Panasonic Video Systems Department, 40 Ronson Drive, Rexdale, Ontario M9W 1B5.

CAUTION: Unauthorized recording of copyrighted television programs, films, video tapes and other materials may infringe the rights of copyright owners and be contrary to copyright laws.

Panasonic
Omnivision II™ VHS™

NV-8150 player.

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people in the news

Manufacturers/Distributors

The promotions of **Peter Waldeck** to vice president of international marketing at Cinema Products Corp., and **Gary Gross** to vice president of national marketing, was announced by **Ed DiGiulio**, president. With Cinema Products since 1971, Waldeck was responsible for developing the worldwide network of distributors and dealers of the firm's 16mm and 35mm professional motion picture equipment line. Prior to joining the firm in 1975, Gross served in the U.S. Navy for 20 years, gaining extensive experience in all phases of motion picture production.

Nicholas G. Makris has been appointed director of business affairs at Imero Fiorentino Associates Inc. He comes to the firm with extensive experience, having served as production controller for the Children's Television Workshop in New York, in addition to prior business endeavors.

Jay Kuca, now sales engineer of the Grass Valley Group, was formerly chief engineer in the telecommunications department of Wright State University. **John White** is the new South Central sales manager of the Grass Valley Group. Prior to this position, White was sales representative for RCA in Minneapolis.

David H. Buckler was named director of sales for th Telesystems division of Chyron Corp. Buckler has bee involved in sales for the corporation since 1973, ar became Eastern region sales manager for Chyron 1974.

MAKRIS

KUCA

BUCKLER

Steve Brant joined Tektronix as a video sale engineer, based in the Indianapolis, Indiana, fie office.

CCA Electronics Corp. announced the appointment **Carroll Ogle** as the firm's broadcast products ma ager. Ogle was district sales manager for broadca products at RCA for six years.

Also announced at CCA was the promotion of **James Ehrmann** to the position of controller. And, **Anthony**

continued on page

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The Philips TV Demodulator.

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If you are determined to maintain maximum control of the quality of the signal you transmit, this laboratory-quality demodulator is an essential piece of equipment. With the proper video and audio measuring set-up to monitor not only the quality of the transmitted signal, but even the modulation depth.

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Circle (12) on Reply Card

people in the news

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Tierno assumes additional responsibilities as assista treasurer in the areas of systems, controls, a procedures.

Alan K. Jensen, instrumental in the development CEI's CEI-310 field production television came system, was recently appointed as the firm president. Previously, Jensen served as executive vi president for CEI.

E. L. Persons was appointed as Telemation's custom service manager, retaining his previous responsibilti as quality assurance manager. Prior to joini Telemation, Persons was with Beehive International

Randy Wilson assumed the position of director technical marketing for KLH Research and Develo ment Corp. Wilson was a manager at Federat Electronics.

The appointment of **Joseph T. Consalvi** as vi president of finance and treasurer of CCA Electroni Corp. was announced by **Jason S. Fox,** president.

As manager of planning for California Microwa Inc., **Nick Peterson** will be responsible for coor nating the annual profit planning process and assist developing the company's strategic and long-ran plans. Prior to joining California Microwave, Peters was with Memorex as manager of financial analysis

Coyle Dillon, vice president of sales at United Med Corporation, joined ADDA Corp. recently as a sal representative for the nonbroadcasting video applic tions.

Ampex International announced the appointment **Ronald Ballintine** as general manager, based Redwood City, California. Ballintine is succeeded his former position as area manager of Europ Africa, and the Middle East by **Richard Sirinsky.**

Paul H. Fletcher, who joined Micro Consultants la fall, is now the manager of the firm's new Southea branch office in Atlanta.

Grant M. Smith was named assistant vice preside and general manager of the Sony Technology Cente Also, **Barnett E. Guisinger** was appointed director technology for the technology center.

Radio/Television

Kryn Peter Westhoven, 20, was recently selected WBJB-FM public relations director for the 1978 wint semester at Brookdale Community College in Linco N.J. Westhoven, a broadcast major at Brookdale, h worked at WBJB-FM for more than a year.

Norman J. Avery is the new chief engineer WENE/WMRV in Endicott, New York. Avery pre ously was the chief engineer at WEJL/WEZK Scranton, Pa.

continued on page

THE BETTER WAY

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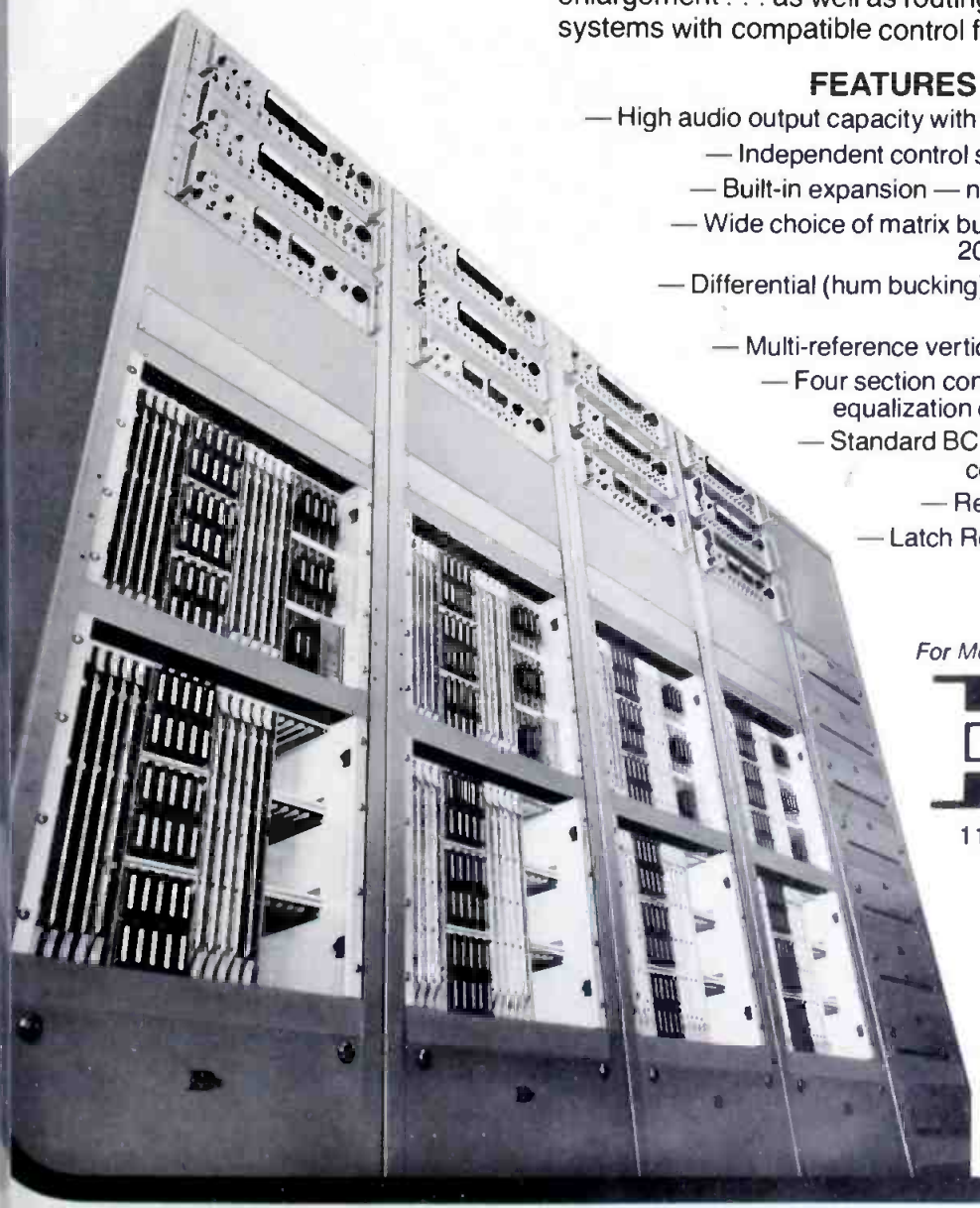

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The Sony BVH series. Consider the accomplishment.

Two years ago, 1" helical-scan recording was just a gleam on the broadcast horizon.

Now, there's the new SMPTE Type C Standard.

We're kind of proud of that. From the start, Sony Broadcast was a leader in the 1" revolution. We pioneered many of the technical innovations incorporated into the 1" helical-scan VTR. And it's good to be part of a movement so beneficial to the broadcast industry.

How does our new SMPTE Type C machine differ from the more than one hundred BVH-1000's already in use across the nation? Frankly, very little.

And we're proud to be able to offer you SMPTE-standard 1" machines that maintain all the unique advantages of the Sony Broadcast equipment already in the field.

Consider the advantages. Advantages like BIDIREX, which gives you full bi-directional search capability in both shuttle and jog modes. And that means 100% post-production creative freedom, with all the ease and flexibility of 35mm film techniques.

Advantages like the incredible economy of the 1" tape format. Far lower acquisition costs. Smaller size, so you save valuable studio space. Lower maintenance costs. Plus major savings in 1" videotape alone.

Advantages like three high fidelity audio tracks. Color framing, to maintain perfect timing continuity during editing and animation sequences. And more.

Consider the possibilities. Think about the local programming capabilities that open up with the BVH-1000 and portable BVH-500. Capabilities quad can't match. With an economy that leaves film far behind.

Think about creating your own documentaries. Taping your own commercials. Think about taking 1" tape out into the field, then bringing it home and going directly on the air without the need for converting to another format.

Think about the kind of panoramic production once possible only on film. And think about what single-camera film editing techniques will mean to your creative effort.

Consider the source. There's one more thing you should think about as you consider the move to 1".

The source of your equipment.

And when you consider Sony Broadcast, you'll find benefits no other source can give you.

Like our years of experience in research, engineering, and production of advanced video systems.

And access to a complete family of professional video equipment from a single manufacturer. With the kind of reliability and performance only a single manufacturer system can guarantee.

The BVH Series, from Sony Broadcast.

All things considered, it's quite an accomplishment.

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people in the news

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Richard W. Osborne, station manager at WKXL Concord, N.H., since 1969, has been named genera manager. Also, **James J. Jeannotte**, a veteran of 1 years at WKXL, has been appointed to the newl created position of assistant manager and operation director.

Robert Hauck joined KORK, Las Vegas, as chie engineer for both the AM and FM stations. He wa employed as assistant chief engineer at KORK-TV KORK is owned by the Donrey Media Group.

Tampa Bay Area Broadcasters Inc. has elected **Larr Whitney**, general sales manager at WTVT-TV, a president. In addition, **Tom Watson**, WLCY Radio, i vice president; **Ted Moore**, WRBQ Radio, is the ne secretary; and **Jim Tomlin**, WTOG-TV, was electe treasurer. The new board of directors includes **Do Boyles**, WSUN Radio; **Ed Winton**, WWBA-AM/FM **Gene Danzey**, WRXB Radio; **Frank Celebre**, WDAE WJYW; and **Stan Raymond, Jr.**, WTAN/WOKF.

18 Elected to NAB radio and television boards

Eighteen prominent broadcasters throughout the nation have been elected to the National Association of Broadcaster's board of directors. Those elected will serve on either the radio board or the television board for two-year terms effective June 1978.

Elected to the radio board are **William O'Shaughnessy**, president, WVOX/WRTN, New Rochelle, N.Y.; **Carl V. Venters**, president, WPTF/WQDR, Raleigh, N.C.; **Adrian L. White**, owner-general manager, KPOC-AM/FM, Pocahontas, Ark.; **Michael O. Lareau**, executive vice president-general manager, WOOD-AM/FM, Grand Rapids, Mich.; **Rober M. McKune**, president-general manager, KTTR/KZNN, Rolla, Mo.; **Pat Murphy**, vice president-general manager, KCRC/KNID, Enid, Okla.; **Roy A. Mapel**, general manager-secretary/treasurer, KIML, Gillette, Wyo.; **Jack Willis**, vice president-general manager, KHEP-AM/FM, Phoenix, Ariz.; **Cullie M. Tarleton**, vice president-general manager, WBT-AM/FM, Charlotte, N.C.; **Herbert W. Hobler**, president, WHWH/WPST, Princeton, N.J.; **Walter L. Rubens**, president-general manager, KOBE/KOPE, Las Cruces, N.M.; and **J. T. Whitlock**, general manager, WLBN, Lebanon, Ky.

Elected to the television board are **Forest W. Amsden**, vice president-general manager, KGW-TV, Portland, Ore.; **W. Frank Harden**, president, State Telecasting Company, Columbia, S.C.; **Robert King**, executive vice president, Capital Cities Communications, Philadelphia, Pa.; **Mark Smith**, general manager, KLAS-TV, Las Vegas, Nev.; **Leonard A. Swanson**, vice president-general manager, WIIC-TV, Pittsburgh, Pa.; and **Walter M. Windsor**, general manager, WFTV, Orlando, Fla.

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Scotch Master Broadcast 479.

When you come to that new format, you'll have an old friend.

news feature

FCC cuts base meter requirements

By Bob Jones

Strange as it may sound, the FCC has now officially gone on record saying that all directional AM stations who have met the new Section 73.68 (b) requirements with an approved directional antenna sampling system can remove the RF meters from the base of each tower.

As most readers of **Broadcast Engineering** will recall from my May 1976 article on an "approved sampling system," those licensees who installed such a system were excused from the routine observation and logging of base-current meters. Up to now, the FCC had not stated that the meters could be physically removed from the tower bases.

In his letter of February 27, 1978, Rosco E. Long, chief of Policy and Rules Division of the Broadcast Bureau, pointed out to my associate Doug C. McDonell:

"By virtue of Section 73.68(b) of the Commission's Rules, stations with approved directional antenna sampling systems complying with Section 74.68(a) are no longer required to routinely observe and log the individual base currents in the array elements. However, paragraph 64 of the Report and Order released February 12, 1976, in Docket No. 19692 states in part that 'the capability for measuring base currents should be retained to facilitate the measurement of base currents for test purposes or to permit the reading of these currents during any period the antenna monitor system is inoperative.' "

Removal and storage

Each chief can now remove all his base current meters and store them in a warm, dry transmitter room. Hopefully, they will be far removed from lightning damage. It has been my experience that unused meters hold their calibration much better when stored indoors, than when left at a tower base.

At one station that was utilizing an approved sampling system, we found the number three tower base meter half full of water. It seems as if nobody had read base currents in six or seven months. The roof began to leak, and the leak just happened to be directly over the meter. Needless to say, we didn't get the correct meter reading at that tower.

Single meter ideas

One suggestion is to just keep a single meter tha can be carried around from tower to tower a necessary. This approach has several distinct advant ages.

First, you need to keep fewer meters in stock. Sec ond, by using a single meter you don't need be cor cerned about comparative calibration with all th other base current meters in your system. If the on meter is off, all the readings will be off by the sam amount.

When using a single meter, you still have to b concerned about compliance with Section 73.1215 the Rules.

Meter jacks needed

Section 73.58 of the Rules sets forth the commission requirements for indicating instruments, including R thermocouple-type ammeters. Part (b) allows a statio to use a suitable jack and plug arrangement.

However, when you do choose to use a jack an plug, the contacts shall be made of silver and capabl of operating without arcing or heating. The contact also are required to be protected against corrosio This means the contacts must fit tight or be cleane regularly.

It is also important that when the meter is inserte into the antenna circuit, or removed, that its presenc does not interrupt the transmission of the station.

The Rules further require that when not in use, th meter(s) be labeled and identified as to the tower the plug into. Obviously the RIs would expect them to b stored in a location that is readily available for use. prudent chief would certainly exercise care handling each meter to prevent damage or impair i accuracy.

Final thoughts

The FCC is continuing in its efforts to catch up wi the state-of-the-art in the field of broadcast enginee ing. This approach to simplifying meter care a maintenance makes a lot of sense. So now you can out and get unplugged.

"The CEI-310 is the best field production camera we looked at."

"And we looked at every 2/3" production camera on the mar- says Don Barros of Southwest lucer's Service, Inc. of Dallas. Southwest Producer's is one of country's newest, best equipped roduction houses.

He adds: "We like everything t the CEI-310 — size, weight, t mobility and range, simple ery operation, stability, and bility.

"And the electronics unit has all eatures we need for the sophis- ed production work we do.

"We also like the modularity of ystem. We were able to buy just we needed — one portable unit, one modified studio setup, and one full studio system with an 8-inch viewfinder. Any time we have to, we can quickly reconfigure any of these cameras from studio to portable and vice versa.

"But after all, a television camera is judged by the pictures it makes,

and the CEI-310 is far superior to everything else we looked at. The colorimetry is superb and it performs beautifully under all kinds of light conditions. Never before have we had so many compliments from our clients on the appearance of their commercials.

"In short, we think we've got the world's best field production camera."

Isn't it time you looked into the new CEI-310, the camera that's changing the look of field production? Call your local CEI representative now. Or get in touch with us directly at 880 Maude Avenue, Mountain View, California 94043, (415) 969-1910.

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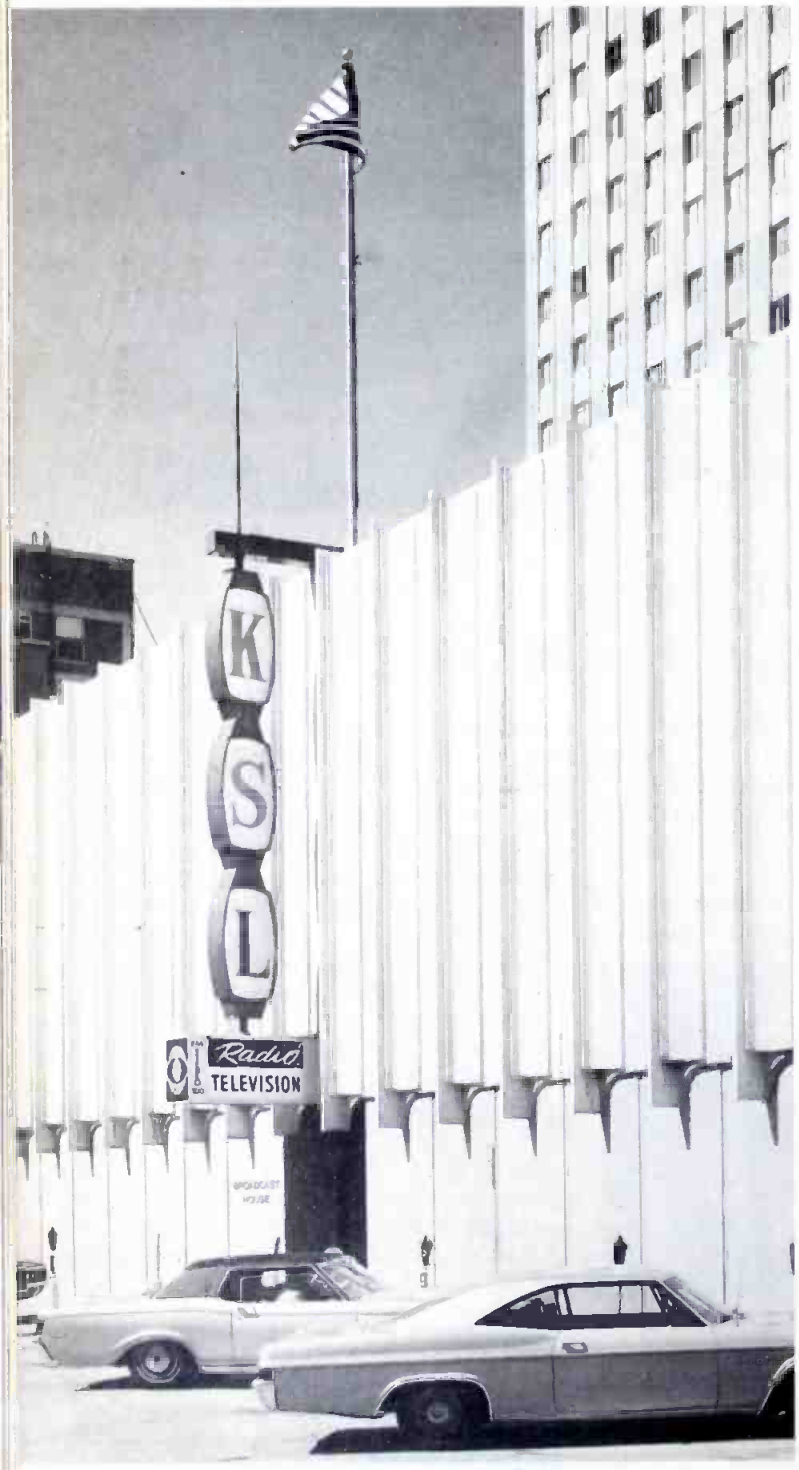
KSL scores ENG first with fiber optic link

By Ron Merrell



On March 8, 1978, KSL-TV (Salt Lake City) began transmitting ENG material from its microwave receiving station atop the Beneficial Building through a 1700-foot fiber optic cable to its studios a block away. This event marked the first commercial broadcast use of a fiber optic video transmission link as an operational part of an ENG system.

Up to now, the word on fiber optics has been only of successful installations in cable TV and telephone systems.

The fiber optic cable carries a modulated light beam, which is reconverted to a video signal in the KSL studios. And as **BE** *has pointed out in previous articles (December issues, 1976 and 1977), the advantages of fiber optics are that it takes up much less cable space, provides high quality because there is no line loss and frequency limitation, and the light beam is not affected by any type of interference. The quality at the receiver is virtually identical with that at the transmitter under all weather and environmental conditions.*

To update our coverage of fiber optics, **BE** *interviewed KSL-TV's director of engineering, William Loveless. Here's how it went:*

BE: *We know that KSL is a pioneer in broadcast applications of new technologies. So, was the KSL involvement with fiber optics strictly a "let's see what it's like" decision, or was fiber optics seen as a definite answer to an old problem?*

WL: Early in the spring of 1977, the engineers at KSL-TV became aware of the many advantages of fiber optic cables over metallic cables. These advantages included the complete immunity from crosstalk and common mode ground potential between buildings; the very wide transmission bandwidth and resulting lack of equalization required; the fact that the fiber optic cables' attenuation is insensitive to temperature changes; and, the small cable size and weight compared to metallic cables.

About this time, our KSL studio microwave path was being blocked by new building construction and we had to relocate a number of remote pickup, STL and intercity relay stations from one building to another. We made the decision that spring to include a fiber optic cable in the 1700-foot run of metallic video, audio and control cables, based up on the promise of this future technology, as video fiber optic links were not then available.

BE: *Why fiber optics over conventional links?*

continued on page 3

How to get a three-motor, direct-drive, isolated-loop deck. And save $5,500.

Ingenuity of design can be fascinating for its own ke, but when it results in a product of demonstrable xcellence, as with this tape recorder, one can only plaud..."

The review is from *Modern Recording*. The tape eck is Technics RS-1500US. And the ingenuity of sign that *Modern Recording* and *Audio* have praised recent issues is Technics' advanced "Isolated Loop" pe transport with a quartz-locked, phase-control, rect-drive capstan.

By isolating the tape from external influences, chnics has minimized tape tension to an precedented 80gms. Eliminating virtually all signal opout. While reducing modulation and wow and tter to a point where conventional laboratory easurement is seriously challenged. A considerable hievement when you realize Technics RS-1500US is iced substantially below its professional counterpart. 5,500 below.

Electronically, too, Technics has provided the ultimate in professional control and performance. A separate microphone amplifier. Record amplifier. Mixing amplifier. And three-way bias/equalization. While IC full-logic function controls permit absolute freedom in switching modes.

Compare specifications and prices. Then you'll realize there's no comparison. TRACK SYSTEM: 2-track, 2-channel recording, playback and erase. 4-track, 2-channel playback. FREQ. RESPONSE: 30-30,000Hz, ± 3dB (−10dB rec. level) at 15ips. WOW & FLUTTER: 0.018% WRMS at 15ips. S/N RATIO: 60dB (NAB weighted) at 15ips. SEPARATION: Greater than 50dB. RISE TIME: 0.7 secs. SPEED DEVIATION: ± 0.1% with 1.0 or 1.5mil tape at 15ips. SPEED FLUCTUATION: 0.05% with 1.0 or 1.5mil tape at 15ips. PITCH CONTROL: ± 6%. SUGGESTED RETAIL PRICE: $1,500.*

Technics RS-1500US. A rare combination of audio technology. A new standard of audio excellence.

*Technics recommended price, but actual retail price will be set by dealers.

Technics *Professional Series*
by Panasonic

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Fiber optic link

continued from page 34

WL: The fiber portion of the system provides almos unlimited bandwidth with no equalization require The electronics portion of the system limits th bandwidth to 10 MHz with a signal-to-noise ratio of 6 dB. The fiber system greatly exceeds the NTC7 T network specification provided by metallic cab systems.

BE: *I understand there are four fiber lines in th cable at KSL. How will the other lines be used?*

WL: We ordered a two-strand fiber optic cable fro Times Wire & Cable Company, but because of delivery schedule problem at Times, a six-strand cabl was substituted. At present only two of the six strand have optical links attached. One of these is used t connect the KSL ENG microwave receiver to th studio.

The optical and metallic links are all interchange able by patching the video signals at each end.

BE: *Is fiber optic line splicing still a problem?*

WL: Yes! At KSL, each end of the .00055-inch diameter cable fiber and the end of the link fibe optic pigtail were inserted into opposite ends, dow the center of a three-drill-rod-splice and clampe These splices may be replaced with fiber opti connectors when they become available.

BE: *Are there minimum and maximum input signa levels for video signals?*

WL: The Telemet 4210 fiber optic link system wa designed to handle a cable loss of up to 15 dB. With 62 dB signal-to-noise ratio, our 1700-foot fiber cabl represents 5.2 dB loss. The optical receiver vide output level is adjusted for standard 1-volt outpu while feeding 1 volt into the optical transmitter. Th optical fiber is not sensitive to signal level or tempera ture.

BE: *Will the line losses limit the use of fiber optics i broadcasting?*

WL: Our Times fiber optical cable is rated at 10 d per KM, and we have 0.52 KM length. I understan future optic cables with only 2 dB per KM loss an possible.

BE: *How good is the video signal on the fiber opti cable when it arrives at the studio?*

WL: With out standard video test equipment, w cannot measure the difference between the test signa generator output and the fiber link output.

BE: *Are the advantages of fiber optics strictl technical? Or are costs a major consideration?*

WL: In our prototype fiber optic system, the cos were less than metallic cable systems, with superio performance from the fiber system.

BE: *What support equipment is needed for vide transmission via fiber optic lines?*

continued on page

Introducing a monitor with beauty and brains.

Behind the beautiful image, there's cool, calculating logic.

Logic circuits built into Conrac's new 6100 monitor represent a breakthrough in video performance.

They make it possible to enjoy all the significant advantages of a Comb Filter Separator* which provides full bandwidth capability. Even a non-professional could see the difference this state-of-the-art development makes. But to the professional, it's obvious.

So are the results of our Beam Current Feedback System. It samples each gun in the CRT and corrects color temperature to a set reference, and maintains stability for long periods of time.

Another important feature is fully active convergence, even in corners. And there's a pullout drawer plus front access to all circuit modules.

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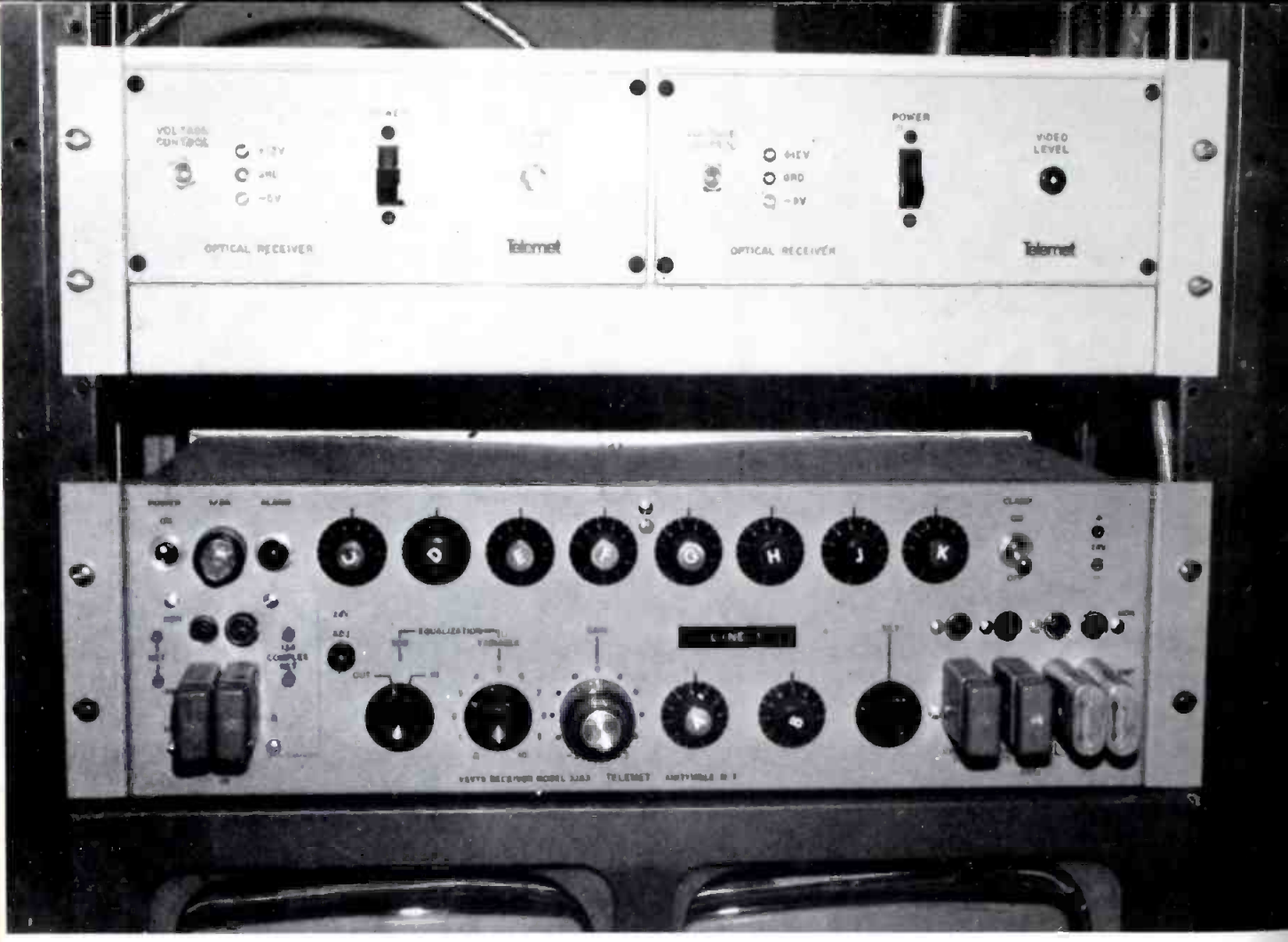
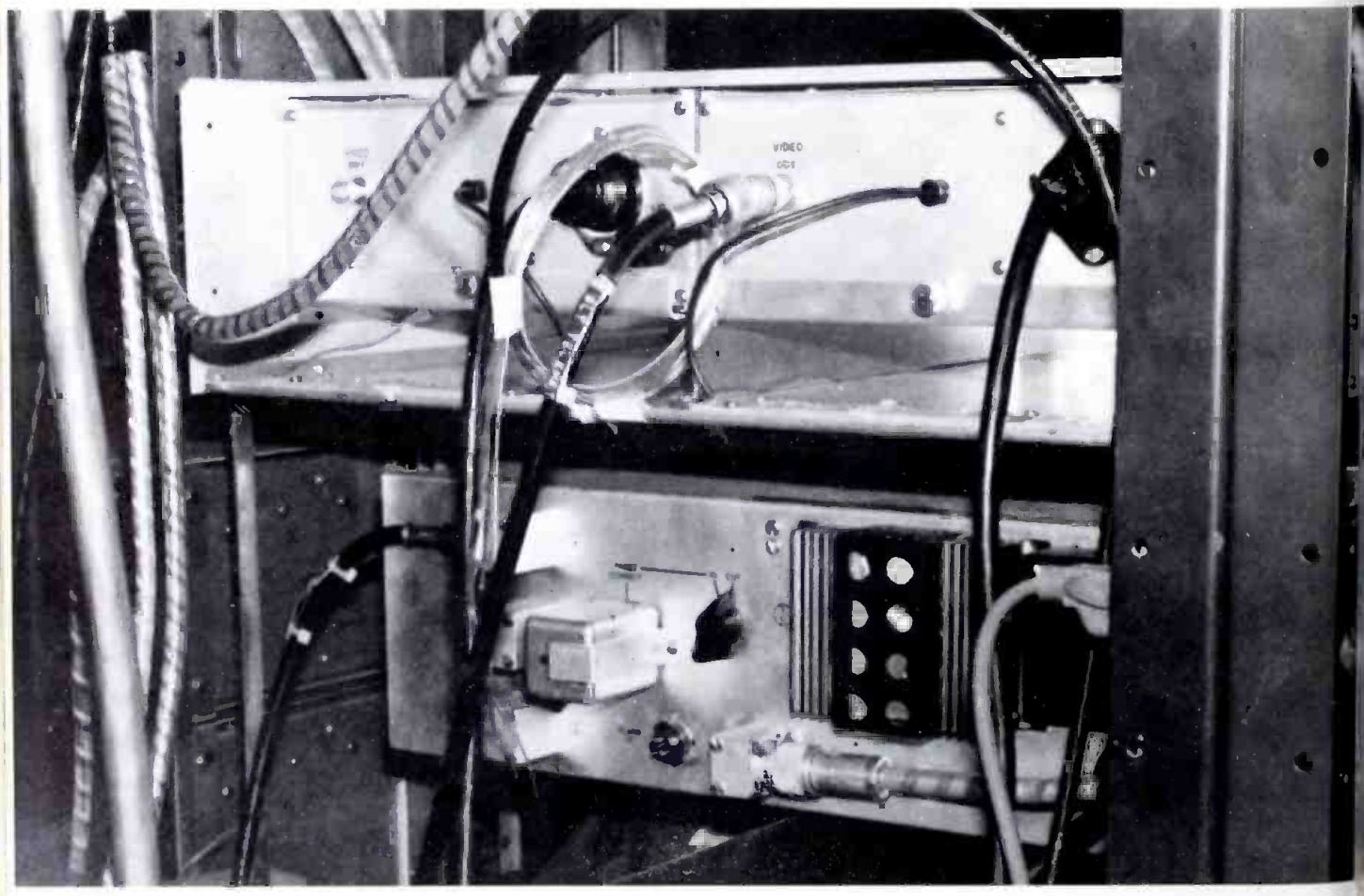




upper left photo shows the optic receiver mounted above the metallic cable re- r. The optic receiver was shown at the convention by Telemet. The lower left o shows the back side of the rack with pigtailed to cable splices. They are ped to the back edge of the chassis. os courtesy of KSL-TV)

iber optic link

ontinued from page 36

L: The same as metallic—a standard video test gnal generator and waveform monitor or scope for tting levels.

E: *Are there any plans for fiber optics inside the udio? And can fiber optics be used for audio?*

L: Until future studio equipment has optical connec- rs as standard items, the conventional metallic bles will continue to be used for short runs in the udio. Audio is no problem on optic cables, but it ems to me to be a mismatch on signal audio circuits interface costs and bandwidth. Thousands of audio annels can be carried on one optical fiber if the ultiplexing equipment was used.

The Times Wire & Cable fiber optic cable installed the KSL-TV link is about the diameter of RG-58U. hile the fibers are the thickness of a human hair. ey ride in an acrylate sheath. In the cable used at KSL-TV, the six fibers are placed around an aramid nter strength member, and then covered by a nder and a polyethylene jacket.

Aside from the advantages we've already covered, er optics offers complete ground isolation and otection against ground loops, no short-circuit ading, and the elimination of crosstalk. While it may t be important to broadcast uses, it does eliminate signal tapping possibilities.

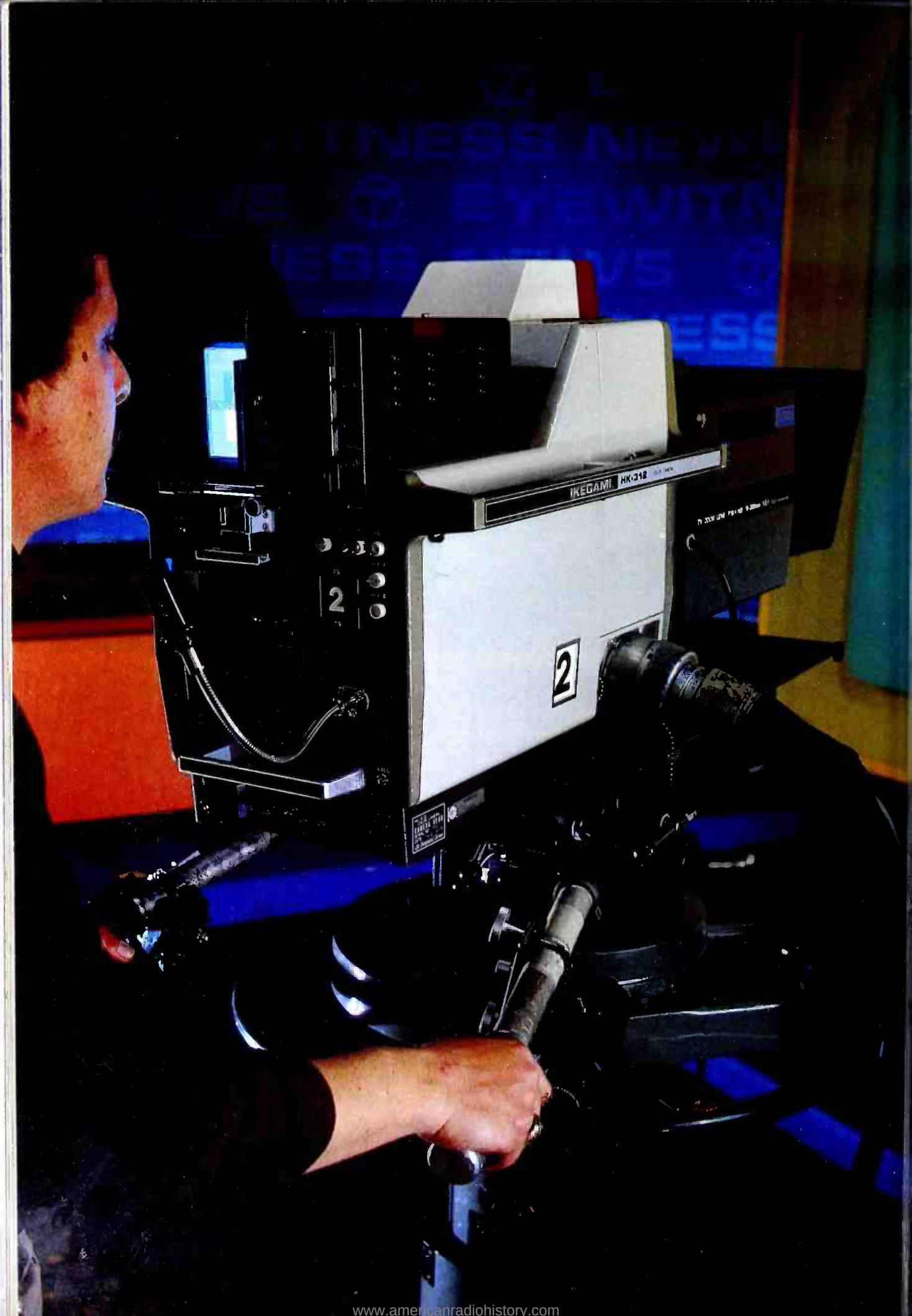
FO system at NAB

The Telemet video transmission system Loveless ntions (model 4210) was exhibited at the recent AB convention in Las Vegas. It consists of an optical nsmitter and receiver. No complex amplifiers, ualizers, phase correctors, pre-correctors or post- rrectors are needed. Surprisingly, only when cable gths run into thousands of feet is amplification cessary.

The Telemet system is specified as a 10 dB loss stem, meaning that with 10 dB cable attenuation tween transmitter and receiver there would be volt peak-to-peak video output from the optical ceiver with 1-volt peak-to-peak to the optical nsmitter. Output impedance from the receiver is 74 ms. The 60 Hz tilt is adjustable to zero, and the velope delay is less than 10 nanoseconds.

Who needs fiber optics?

Undoubtedly, fiber optics will make further inva- ns of the video market. But don't forget that its dio potentials are equally impressive. Meanwhile, is new product area will not fall into the category of e more thing that solves a problem we didn't know had. It's an intriguing alternative for manufactur- s and broadcasters. But for a station such as SL-TV (who already is using infrared for site-to-van ks), it was a natural way to go. □



What others promise, the Ikegami HK-312 has been delivering for 2 years.

The Ikegami HK-312 is a high-quality broadcast studio color television camera with unusual capability. In addition to delivering superb pictures, it can be easily interfaced with a microprocessor-computer control unit that automatically performs a complete camera set-up in 45 seconds or less. This is not a vague promise, it's what the HK-312 computer has been doing at leading stations such as WABC, WGBH, WLS, KABC, and KGO. They've put the HK-312 and its computer through the testing and evaluation wringer– the HK-312 cameras you buy today are based on two years of on-air field experience and incorporate the suggestions of a variety of users.

By itself the HK-312 is a state-of-the-art camera with Ikegami performance, quality and reliability.

Performance designed-in by the engineering group responsible for the well-known Ikegami HL-33, HL-35, HL-37, and HL-77.

Quality assured by 30-mm Plumbicon® tubes, preamps furnishing a signal-to-noise ratio of –53 dB minimum, precise video signal processing, and an excellent detail corrector. For the very cleanest first-generation VTR masters a –3 dB gain control delivers pictures with virtually invisible noise.

Reliability built into every HK-312 and verified by complete testing before delivery.

The computer is available for instant integration and operation. Plug it in and the HK-312 camera can be automatically interrogated and set-up to produce an essentially perfect picture: aligned, registered, skew-gamma-flare-corrected, black-balanced, color-balanced, set-up completely and double-checked in about 45 seconds. A single computer can sequentially serve up to six HK-312 cameras. A single push-button starts the entire sequence; the computer can be programmed to skip any camera or any function.

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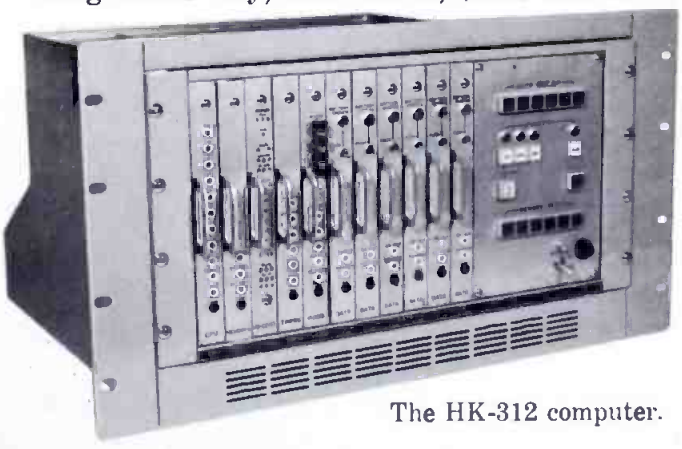

The HK-312 computer.

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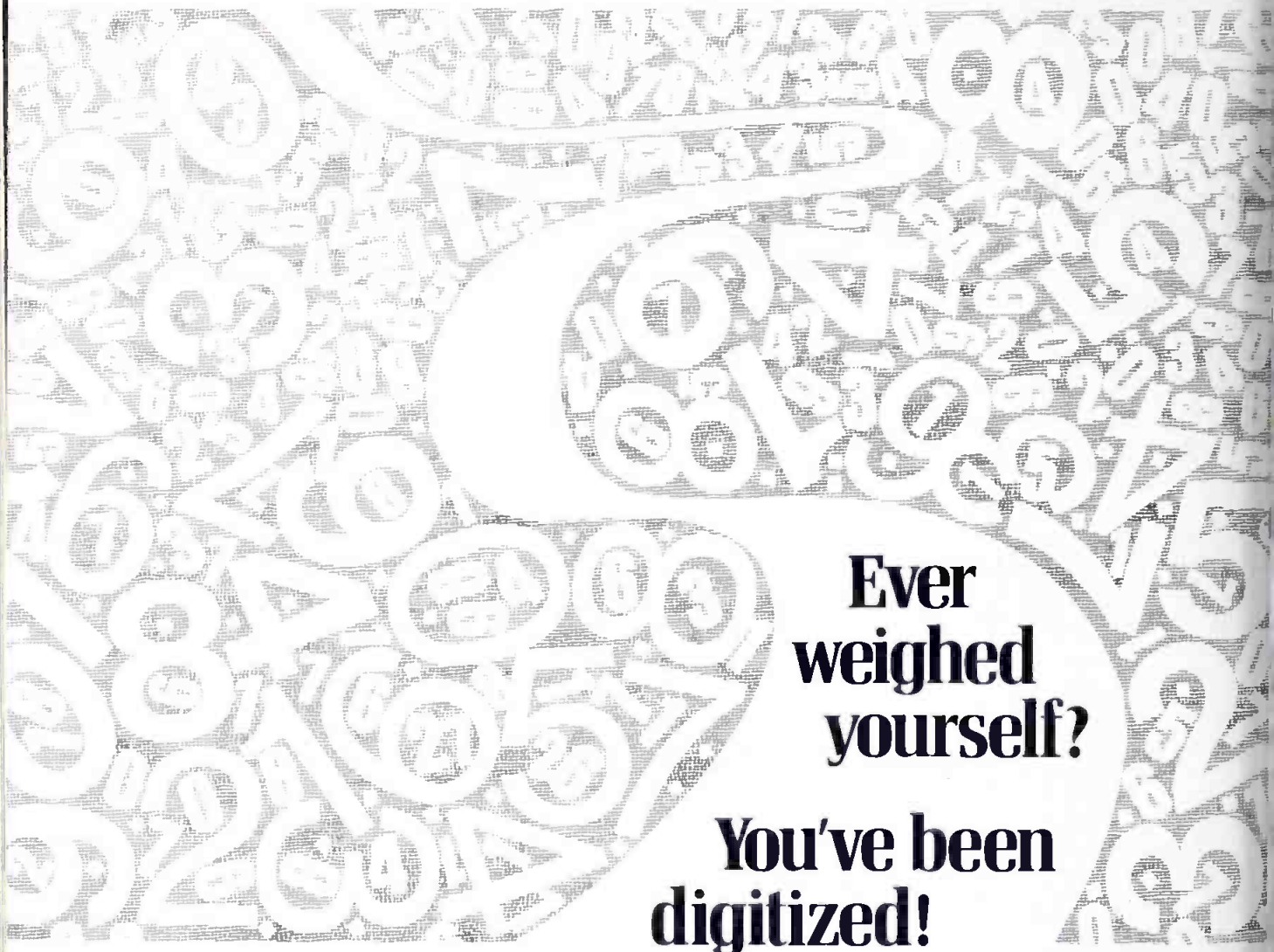
ENTERING AND LEAVING NUMBERLAND



Ever weighed yourself?

You've been digitized!

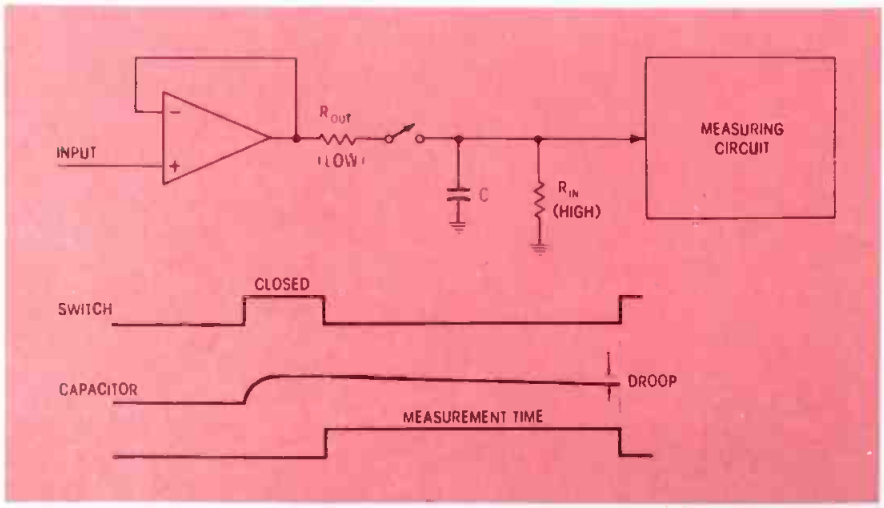


Figure 1 Basic Sampling Circuit.

by E. Stanley Busby, Jr.

There are two kinds of things i this world: things you can count an things you can't.

Counting things, like the pages o this magazine, is exact. It is pages; not one less nor one more The weight of this magazine i another matter. Let's say it *actuall* weighs 314.159625 grams. It's doubt ful anyone could determine this an be sure he's right. You coul probably find out that it is surel greater than 314.159 and less tha 314.160, but who cares? Even th Swiss post office is happy knowin to the nearest gram.

continued on page

INTRODUCING
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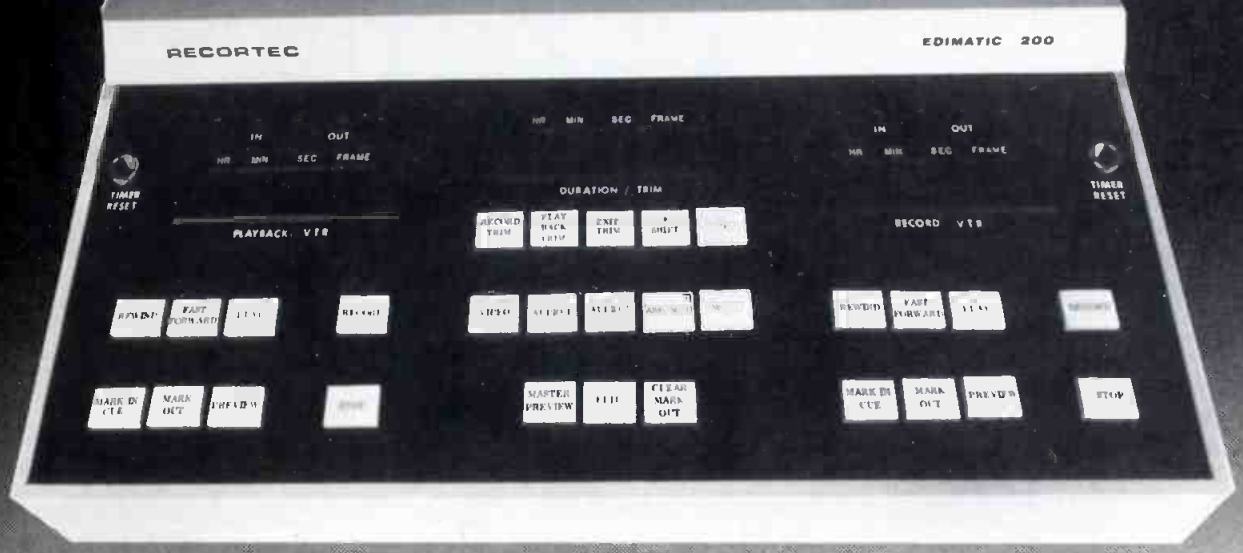

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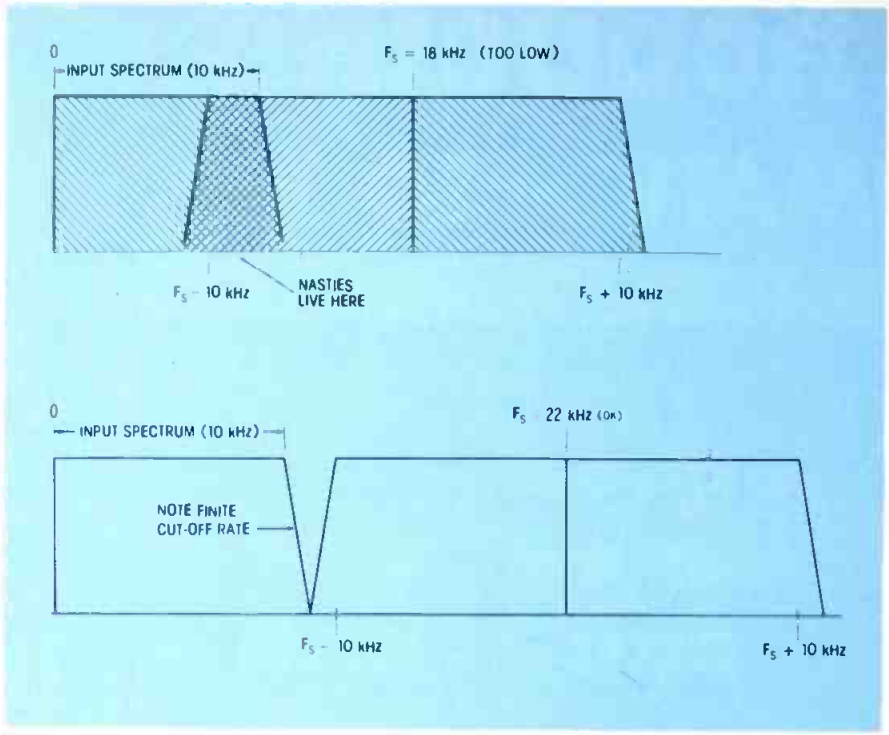

Figure 2 Upper diagram shows what happens if sampling rate is too low.

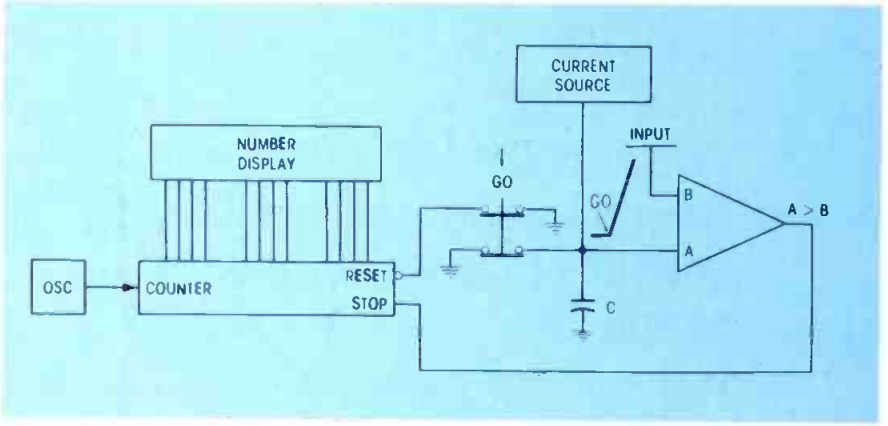

Figure 3 Indirect A/D digitizes the time needed to charge C to exceed input voltage.

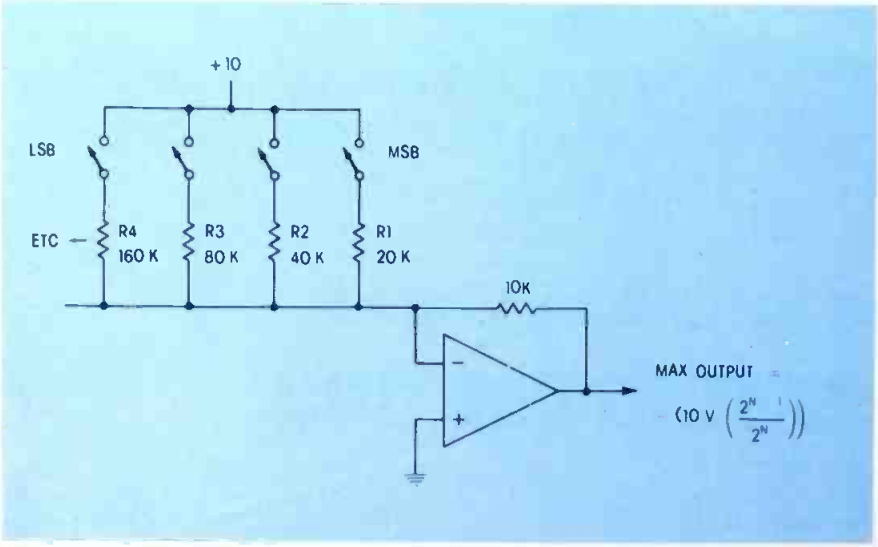

Figure 4 Simple D/A uses binary-weighted resistors.

Numberland

continued from page 42

Sometimes the extent to whic you can describe a value with number is limited by the accurac of the instrument used to measur it. More often, as in the case of th post office, it is limited by practical consideration: the need t know.

How close, how quick, how often?

If you wanted to record fo history the weight of **Broadcas Engineering** each month, you mus consider two things: to what ac curacy and over what range. If th weight is always less than 1,00 grams and you are only concerne with the nearest gram, then thre digits will do. To record to th nearest tenth gram, four digits ar needed. To a hundredth gram, fiv digits. Using binary numbers, te bits will do for up to 1,024 grams, a one gram resolution. Eleven bits ca resolve to ½ gram, 12 bits to ¼ gram, etc.

To measure anything takes time If the thing being measured is unde your control and will hold still lon enough (like a bag of flour), there i no problem. If it varies, and you ar interested in recording the vari ations, two new considerations ap pear. If you wait too long betwee measurements, you might mis something, and if the variation i fast enough that it changes whil the measurement proceeds, th measurement will be wrong.

Figure 1 shows how an electrica signal can be made to hold stil while being measured. The pro cedure goes: close the switch lon enough for the capacitor to charg up, then open the switch to preven further change, and measure th voltage across the capacitor.

The time constant of the capacito and the total of the amplifier outpu and switch resistances must b small enough that the capacitor ca follow a rapid change withou lagging too far behind. And, th capacitor must be large enough tha its charge does not significantl dribble away through the inpu impedance of the measuring circuit This calls for amplifiers with ver low output impedances, measurin circuits with a very high inpu impedance, and a compromis capacitor.

How fast to repeat the measure ment? Figure 2 shows the samplin rate as if it were a modulate

continued on page 4

when cost is more important than price

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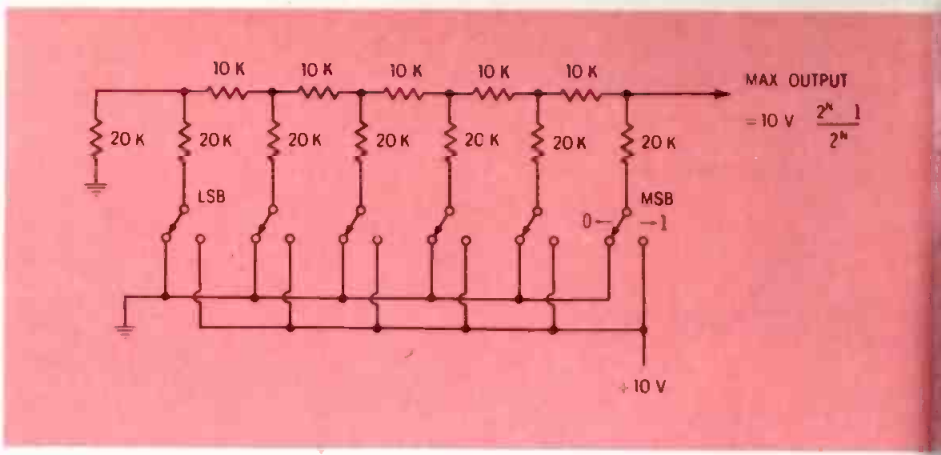

Figure 5
Ladder attenuator requires only 2/1 resistor range.

Numberland

continued from page 44

carrier. If a frequency of more than $F_S/2$ were to be sampled, the lower sideband would land down amongst the signal frequencies. Audio people would hear a "birdie," video people would see "moire," and to others, it's an "aliasing component."

In theory, if a "brick wall" filter having infinitely steep cut-off was used to limit the modulating frequencies to $F_S/2$, you could sample at exactly twice the signal bandwidth. You can imagine a brick wall filter but you can't build one, so the sampling rate is always chosen to be greater than twice the signal bandwidth. In systems with analog input and output, and digital in the middle, bandwidth-restricting filters are used before digitization and after reconstruction. (For those who know about "sub-Nyquist" sampling, please note the phrase "signal bandwidth" as opposed to "signal frequency.")

How far is it to the airport?
Answer: 30 minutes.

Probably the simplest method of converting a voltage to a number (analog-to-digital or "A/D") is th indirect method used in most digita voltmeters. Figure 3 shows one ele mentary approach. To measure, short circuit is removed from th capacitor, and at the same time, counter (usually a BCD counter i bench instruments) is started fron zero. The capacitor charges linearl until its voltage exceeds the voltag to be measured. The counter is the stopped and its contents displayed.

This requires that the curren source, capacitor, and countin

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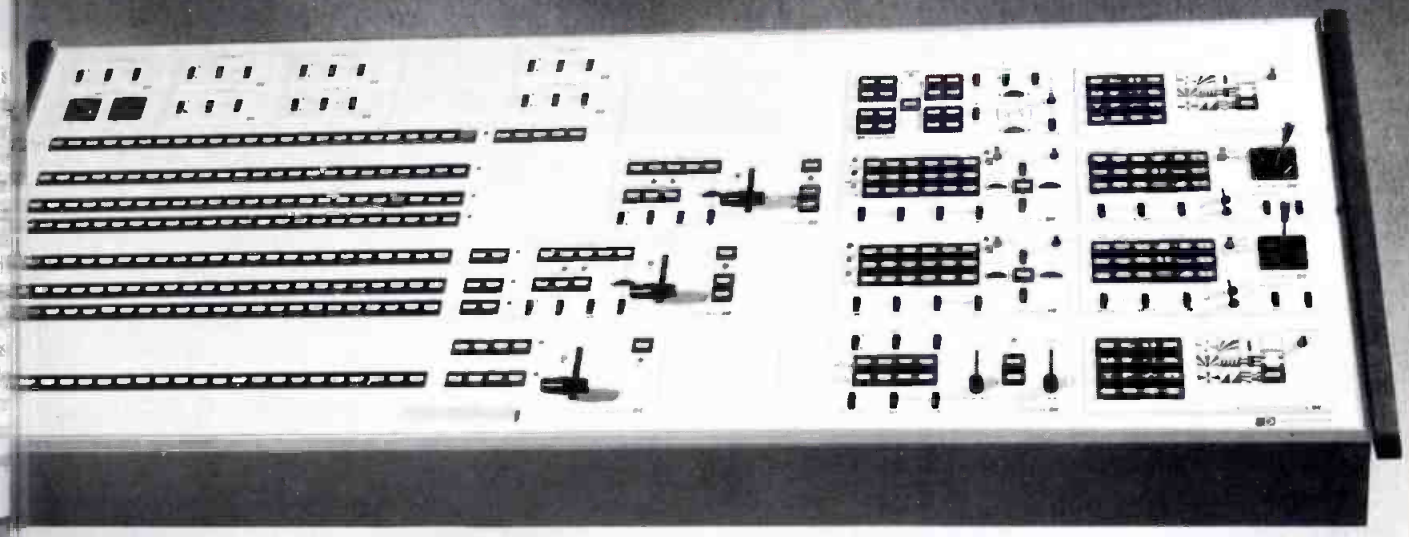

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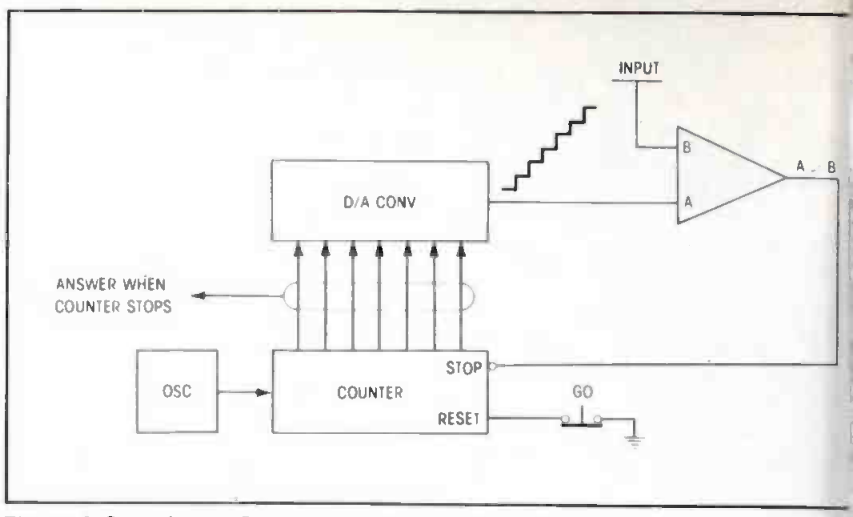

Figure 6 Counting A/D stumbles along until it trips over the answer.

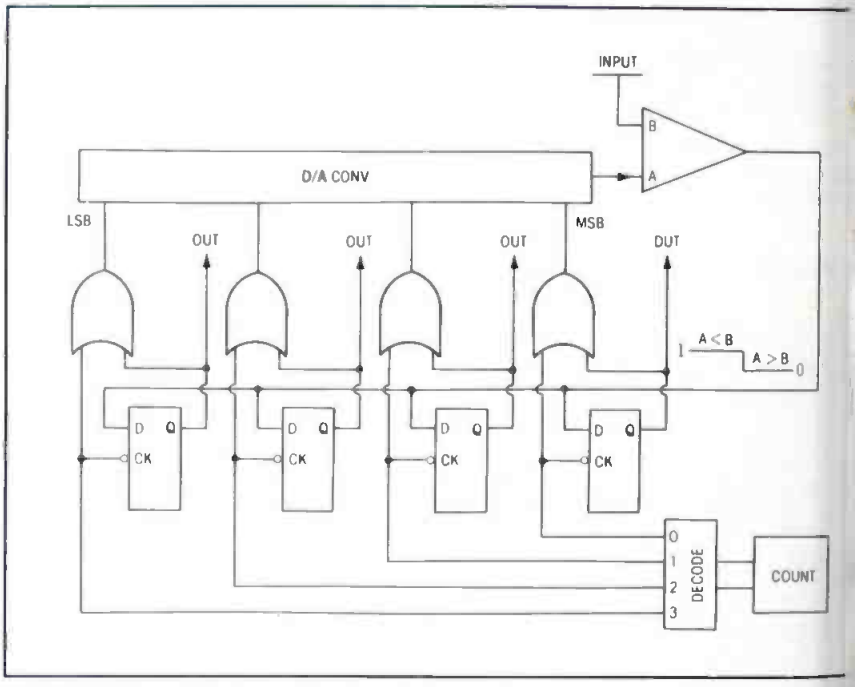

Figure 7 Successive approximation A/D employs memory to good advantage

Numberland

continued from page 46

frequency have good long-term stability. There are a number of schemes used to reduce these stringent demands, some of them ramping the capacitor up and down as many as four times. By doing this, the accuracy requirements are concentrated in the reference current source and the instrument can be caused to "zero" itself before each measurement. For digitizing audio or video signals to any usable resolution, this method is too slow.

Let's start at the output

A/D conversion is often accomplished with the same circuit used to convert a number to a volt (digital-to-analog or "D/A"). Fig 4 shows the simplest D/A circ R_1, when connected, furnishes current into the amplifier which responsible for ½ full-scale outp R_2 is responsible for ¼ full-sc R_3 for 1/8 and so on.

Adding one more resistor doub the resolution. It has a probl even with moderate resolution, resistor values cover an enorm range.

This makes it very difficult maintain their two-to-one ratio o a range of temperatures, even wl

continued on page

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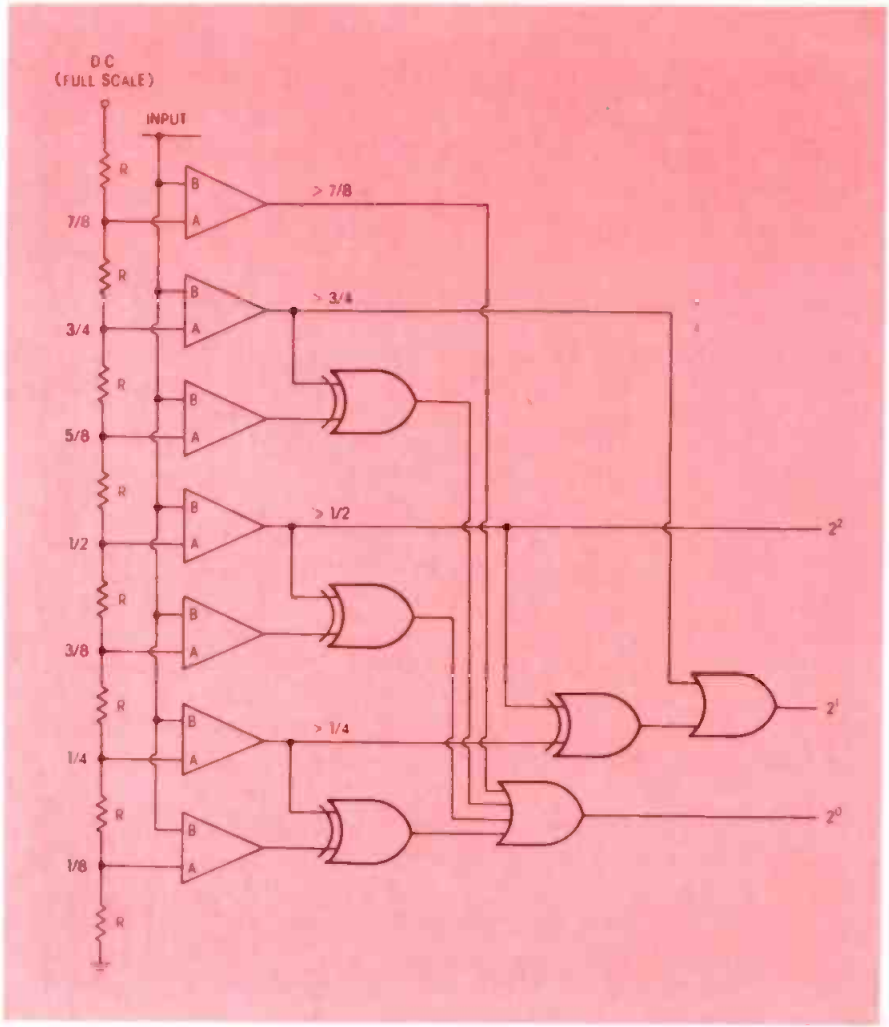

Figure 8 "One-look" A/D uses many comparators. Logic develops binary output number.

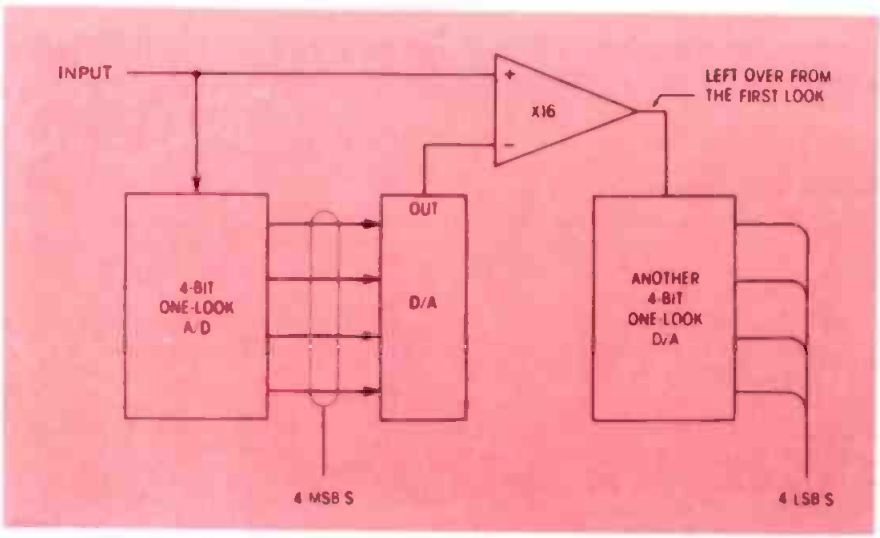

Figure 9 Compromise A/D, used for video and other high-speed applications.

they are encapsulated into the sa package.

Figure 5 shows how a ladd attenuator can be used. The le significant switch produces a sm output, not because it is a t current supplied through a hu resistor, but because it has traverse the entire attenuator a loses half of itself at each step.

Try it on for size

Figure 6 shows how a D/A can used as an A/D. A counter whi starts at zero drives a D/A whc output is compared to the inp being measured. The D/A outp increases one step at a time. Wh it exceeds the input, the counter stopped and the number read fr it. In the worst case (full scale) it slow, because it must step throu each intermediate value in turn.

A very popular method is illu trated in Figure 7. The most sign cant bit (responsible for ½ fu scale) is turned on and the D output compared with the input. the D/A output is too much, this is turned off and if not is latch on. The next bit (4 full-scale) turned on and tested to see if should be kept or not. In this way is only necessary to make N te for an N bit A/D instead of 2^N te for the counter type. It is adequa ly fast for digitizing audio freque cies, but not for video.

Let's do it all at once

Figure 8 shows the fastest a proach of all. To conserve pape the illustration is for a three-b A/D. One look at the input samp yields an answer. Its problem that it requires 2^N-1 comparato for N bits. An eight-bit digitiz would require 255 comparators. hos been done for digitizing vid where time is very short. There a better ways.

When time is short...

Television video is norma sampled at three or four times t subcarrier frequency. In PAL cou tries this means as little as 56 nan seconds to do a measurement.

The method used in many digi time base correctors is shown Figure 9. Fifteen comparators in "one-look" configuration exami the input sample and split out t four most significant bits of the e product. These four bits are appli to a D/A whose output is subtract

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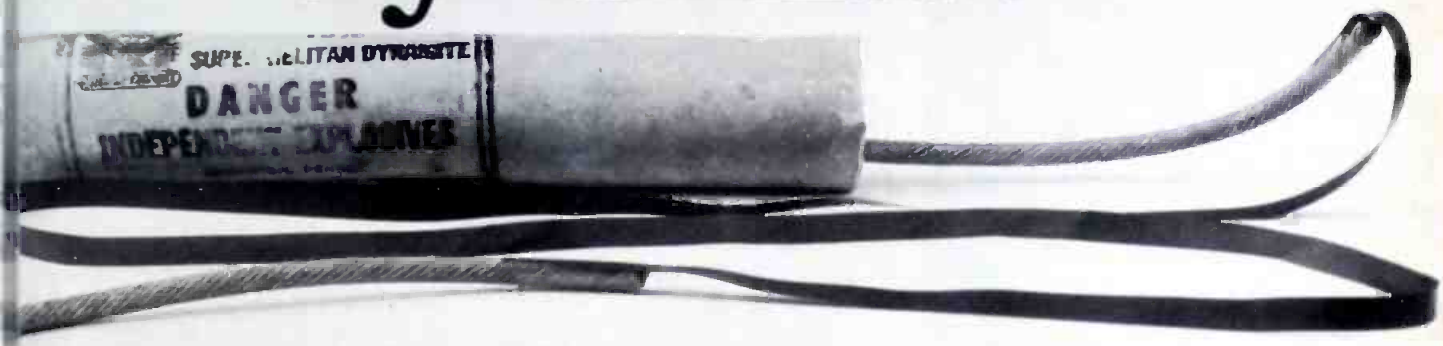
Talk shows can be dynamite!



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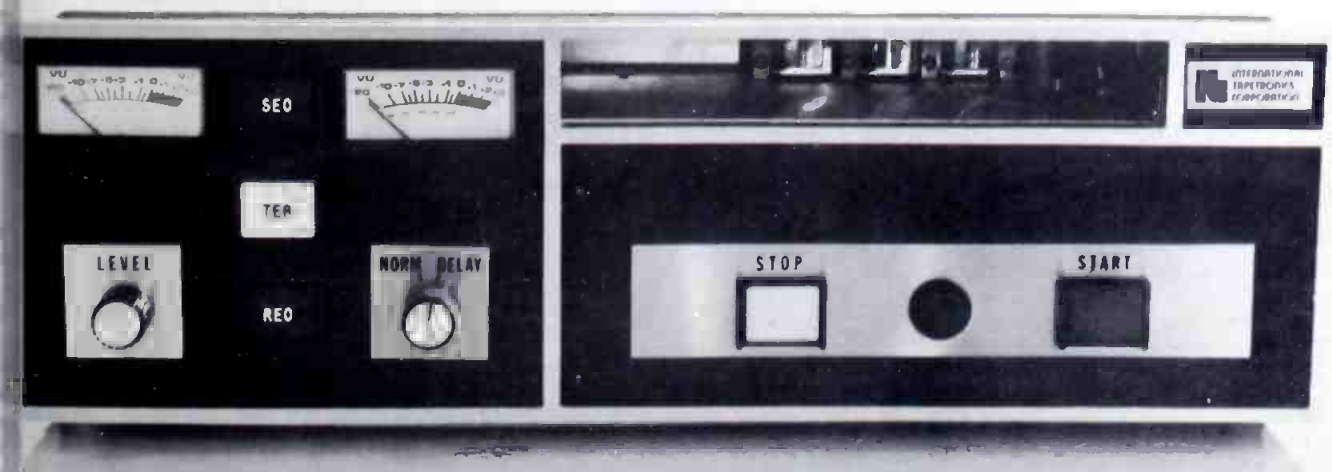

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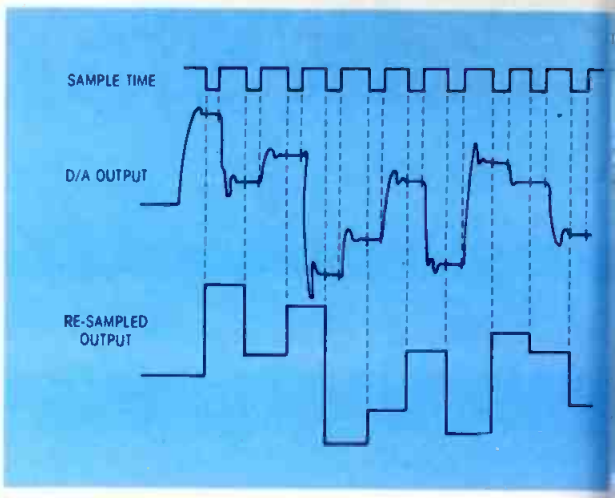

Figure 10
Resampling (as in Figure 1) ignores nasty transients.

Numberland

continued from page 50

from the input sample. The remainder is amplified 16 times and applied to an identical four-bit one-look A/D to yield the four least significant bits.

Stepping over the snit

D/A circuits take time to settle down after the input number is changed. As their output moves from one value to another, they are likely to produce nasty transients. The fast component of the transients will be smoothed by the output low-pass filter, but the average of all these ragged edges does not necessarily equal zero and this can produce undesirable effects in the output analog signal. A solution is to *re-sample* the D/A output as shown in Figure 10, capturing it only after it has become stable. It's like opening the curtains only when the sun is out.

There is a loss of amplitude at high frequencies of the same form as that produced by a playback head gap or an optical scanning slit on a film projector. The loss (in dB) is:

$$20 \log_{10} \sin(x)/x \text{ where } x = \frac{\Pi \times \text{frequency}}{\text{sampling rate}} \text{ radians}$$

In practical systems it is usually less than three dB and easily equalized.

Different kinds of noise

You may hear the term "quantizing noise" bruited around. It is not a noise in the sense that it sizzles in the background when nobody is talking. It stems from the fact that in converting a signal to a number, it is done with deliberately limited accuracy.

The final output is then only approximation to the input. A lar spectrally pure input sine wave v emerge as a large sine wave companied by some low-level tra spread throughout the spectru The magnitude of this trash halved for each added binary bit resolution. It occurs only in t presence of a signal. It is similar the "asperity noise" or "modulati noise" of an audiotape recording.

Idling noise is more like r noise. If an amplifier somewhe has a little DC offset, its outp (with zero input) can present to t A/D converter a voltage midw between step N and step N+1. A to this the inevitable thermal noi in all amplifiers, and the A/D son times says N and sometimes sa N+1. The output varies accordir ly.

The peak amplitude of th garbage is one step. It can minimized by adding to the inp signal a square wave at $F_s/2$ havi an amplitude of ½ step. This ten to concentrate this noise at frequency which will later be moved by the output low-pass filte This added signal is called "dithe

It would seem that adding mo bits of resolution is the answer all ills. It is if you can afford it. F N bits, memory cost is at lea proportional to N and the cost A/D's and D/A's tends to vary 2^N. More accuracy also takes mo time.

Analog systems tend to dist large signals; digital systems many the small ones. There are so peculiarities about video signals a about the way we hear things th allow some tricky exploitation of t advantages of a digital signal sy tem, but that's the subject another article.

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DIRECTIONAL ANTENNA BASICS

Part 5/By Bob Jones, Consulting Engineer, La Grange, Illinois and Facilities Editor for BE.

As is the case with three-tower patterns, there are two basic methods of computing four-tower designs: the addition method and the multiplication method. As you might suspect, there are special cases here, too. One new factor which comes into play with any four-tower pattern is tower placement. You can have all four towers in a straight line (the so-called in-line array), or in the form of a parallelogram.

The general equation (1) for a four-tower pattern is the same as that of a three-tower pattern, plus one more term. This is shown below (Equation 1):

$$E = Kf(\Theta)\,|1.0\ \angle 0 + E_2\ \Psi_2 + S_2 \cos\Theta \cos(\emptyset - \delta) + E_3\ \angle \Psi_3 + S_3 \cos\Theta \cos(\emptyset - \delta) + E_4\ \angle \Psi_4 + S_4 \cos\Theta \cos(\emptyset - \delta)|$$

As with the use of computers in Chapter 3, I have written in the Greek letter to represent the shift from the reference bearing on each tower. If all towers a in a straight line, then $\delta = 0$.

In designing four-tower patterns one usually loo at the end result as being the product of two or thr two-tower patterns or the sum of two two-tow patterns. Because of this I'll first show an example an addition method for an in-line array, then multiplication method for a parallelogram patte Keep in mind both methods apply to each type tower configuration.

Four-tower addition formula

In using this method you first must calculate t pattern of each of the individual two-tower patter to be added. The negative and positive signs a added appropriately to each lobe. These ± signs mu be carefully observed when the two patterns a added. For an example I used the WTAQ nightti

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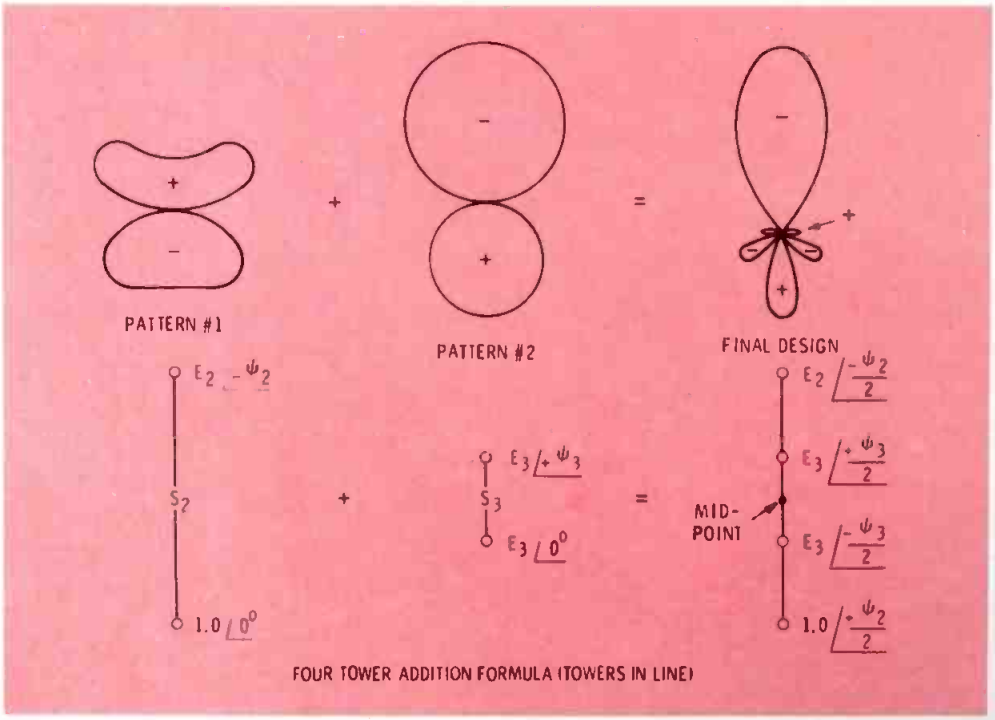

Figure 1

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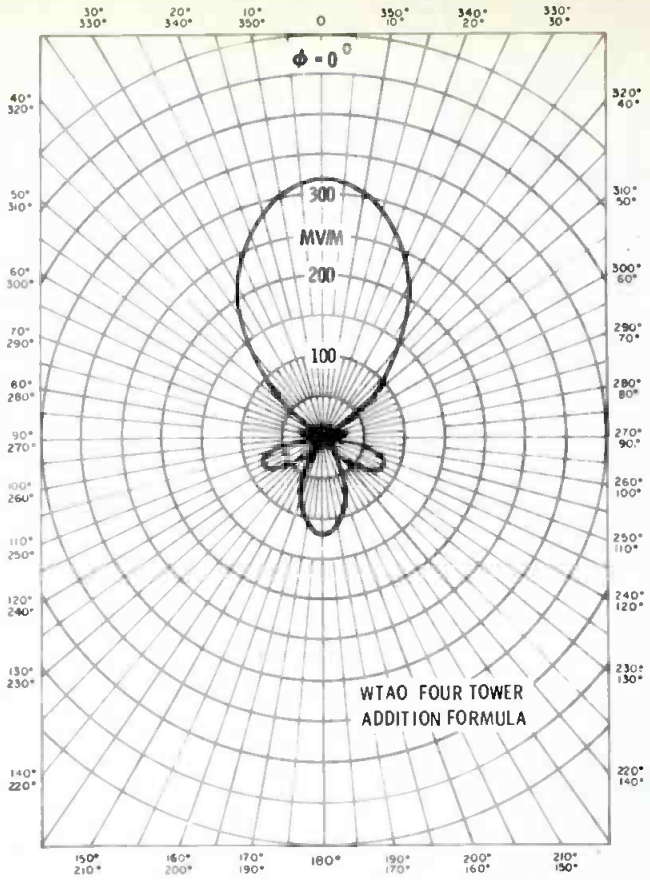

Figure 2

pattern, consisting of a two-tower 90° spaced cardioid and a 270° spaced four-leaf-clover pattern. Figure 1 shows how each pattern looks, as well as the end result. The calculated data is in Table 1.

The lobes to the north on each are (+), so they add. To the sides and the back these lobes are of opposite signs, hence they cancel. Keep in mind that you can vary not only the individual pattern nulls of each two-tower pattern, but also the relative amplitude of each tower, hence the null depth. In the final four-tower design the nulls are determined not by the location of the nulls in the two-tower patterns but by the bearings at which the (+) and (-) lobes are of equal magnitude, for only at those points will cancellation occur. Although this is an awkward method, it is still in common use.

Four-tower multiplication formula—parallelogram

This method is similar to the addition form, except you multiply the two-tower patterns. For this example I've chosen two two-tower patterns that will combine in a parallelogram shape. The close-spaced pattern is a familiar 90° super cardioid. For the wide-spaced array I've chosen a 200° spaced figure eight, with

continued on page 58

TABLE 1
FOUR-TOWER ADDITION FORM

$$E = Kf\Theta\left[E_2\left/\frac{\Psi_2}{2} + \frac{S_2}{2}\cos\emptyset\cos\Theta + E_3\right/\frac{\Psi_3}{2} + \frac{S_3}{2}\cos\emptyset\cos\Theta\right]^*$$

We Substitute: $E_2 = 1.0$, $\frac{\Psi_2}{2} = -76$, $\frac{S_2}{2} = 135$, $E_3 = 2.1$, $\frac{\Psi_3}{2} = 97$, $\frac{S_3}{2} = 45$

$$E_T = K\,[1.0\cos(-76 + 135\cos\emptyset) + 2.1\cos(97 + 45\cos\emptyset)]$$

A	B	C	D	E	F	G	H	I	J
Ø	135 cos Ø	B-76	cos C	45 cos A	97+E	2.1 cos F	D+G	H^2	MV/M
0	135.0	59.0	.515	45.0	142.0	-1.655	1.140	1.2990	321.0
10	132.9	56.9	.546	44.3	141.3	-1.639	1.093	1.1950	306.0
20	126.8	50.8	.632	42.3	139.3	-1.582	.960	.9220	270.0
30	116.9	40.9	.756	38.9	135.9	-1.508	.752	.5660	214.0
40	103.4	27.4	.888	34.5	131.5	-1.392	.504	.2540	141.7
50	86.8	10.8	.982	28.9	125.9	-1.231	.248	.0620	69.6
60	67.5	-8.5	.989	22.5	119.5	-1.034	.045	.0020	6.2
70	46.2	-29.8	.868	15.4	112.4	-.800	-.068	.0050	19.2
80	23.4	-52.6	.607	7.8	104.8	-.536	-.071	0.0050	19.5
90	0.0	-76.0	.242	0.0	97.0	-.256	.014	.0002	4.0
100	-23.4	-99.4	-.163	-7.8	89.2	.029	-.134	.0180	37.5
110	-46.2	-122.2	-.533	-15.4	81.6	.307	-.228	.0510	64.0
120	-67.5	-143.5	-.804	-22.5	74.5	.561	-.243	.0590	68.8
130	-86.8	-162.8	-.955	-28.9	68.1	.783	-.172	.0290	48.2
140	-103.4	-179.4	-1.000	-34.5	62.5	.969	-.031	.0010	8.5
150	-116.9	-192.9	-.975	-38.9	58.1	1.109	.134	.0180	38.6
160	-126.8	-202.8	-.921	-42.3	54.7	1.213	.292	.0850	81.5
170	-132.9	-208.9	-.875	-44.3	52.7	1.273	.398	.1580	111.8
180	-135.0	-211.0	-.857	-45.0	52.0	1.293	.435	.4950	122.0

*Half angle formula added to a second half-angle formula.

K = 281.5, RMS = 136

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small side lobes. These are shown in Figure 3, and the data used to calculate them in Table 2. The question now is, how does one go from the design values of the respective two-tower patterns to the final four-tower values?

If you assume one corner of the parallelogram a the reference tower ($1.000\angle\underline{0}°$), then the nearest towe has the same phase and field ratio as that of th close-spaced (90°) pattern. Likewise, the closes wide-spaced tower has the same values as that of th

continued on page 6

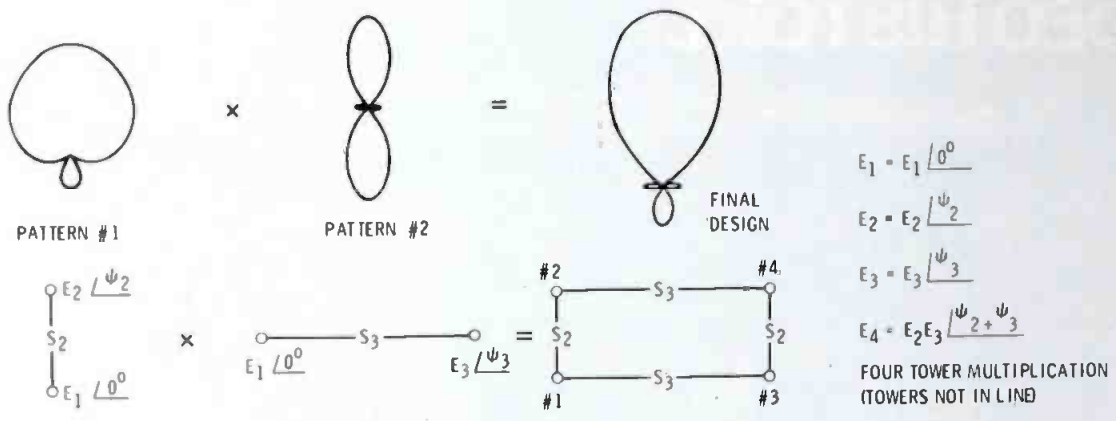

Figure 3

TABLE 2
FOUR-TOWER MULTIPLICATION METHOD, PARALLELOGRAM

$$E_T = Kf(\Theta)$$

$$\left[\left(E_1 + E_2 \angle \Psi_2 + S_2 \cos \emptyset \cos \Theta\right) \cdot \left(E_1 + E_3 \angle \Psi_3 + S_3 \cos \Theta \cos (\emptyset - \delta)\right)\right]$$

Where

$$E_1 = E_2 = E_3 = 1.0,\ \Psi_2 = -116.4,\ S_2 = 90°,\ \Psi_3 = 0°,\ S_3 = 200,\ \delta = -90$$

Substituting

$$E_1 = K\left[\left(1 + \cos (-116.4 + 90 \cos \emptyset)\right) \cdot \left(1 + \cos (0° + 200 \cos (\emptyset - 90))\right)\right]^{1/2}$$

A	B	C	D	E	F	G	H	I	J	K	L
∅	90 cos A	B-116.4	cos C	1 + D	A-90	200 cos F	cos G	1 + H	Eel	$J^{1/2}$	MV/M
0	90.0	-26.4	.896	1.896	-90	0.0	1.000	2.000	3.7920	1.947	497.0
10	88.6	-27.8	.885	1.885	-100	-34.7	.822	1.822	3.4340	1.853	472.0
20	84.5	-31.9	.849	1.849	-110	-68.4	.368	1.368	2.5290	1.590	405.0
30	77.9	-38.5	.783	1.783	-120	-100.0	-.173	.827	1.4740	1.214	309.0
40	68.9	-49.5	.649	1.649	-130	-128.5	-.622	.378	.6230	.789	201.0
50	57.8	-58.6	.521	1.521	-140	-153.2	-.892	.108	.1640	.405	103.0
60	45.0	-71.4	.319	1.319	-150	-173.2	-.993	.007	.0090	.096	24.4
70	30.8	-85.6	.077	1.077	-160	-187.9	-.990	.010	.0110	.104	26.5
80	15.6	-100.8	-.187	.813	-170	-196.9	-.957	.043	.0350	.187	47.7
90	0.0	-116.4	-.445	.555	-180	-200.0	-.939	.061	.0340	.184	46.9
100	-15.6	-132.0	-.669	.331	-190	-196.9	-.957	.043	.0140	.119	30.3
110	-30.8	-147.2	-.841	.159	-200	-187.9	-.990	.010	.0016	.039	9.9
120	-45.0	-161.4	-.948	.052	-210	-173.2	-.993	.007	.....	.019	4.8
130	-57.8	-174.2	-.995	.005	-220	-153.2	-.892	.108	.....	.023	5.9
140	-68.9	-185.3	-.996	.004	-230	-128.5	-.622	.378	.0015	.039	9.9
150	-77.9	-194.3	-.969	.031	-240	-100.0	-.173	.827	.0260	.160	40.8
160	-84.5	-200.9	-.934	.066	-250	-68.4	.368	1.368	.0900	.300	76.5
170	-88.6	-205.0	-.906	.094	-260	-34.7	.822	1.822	.1710	.414	105.6
180	-90.0	-206.4	-.896	.104	-270	0.0	1.000	2.000	.2080	.456	116.3

K = 255, RMS = 196

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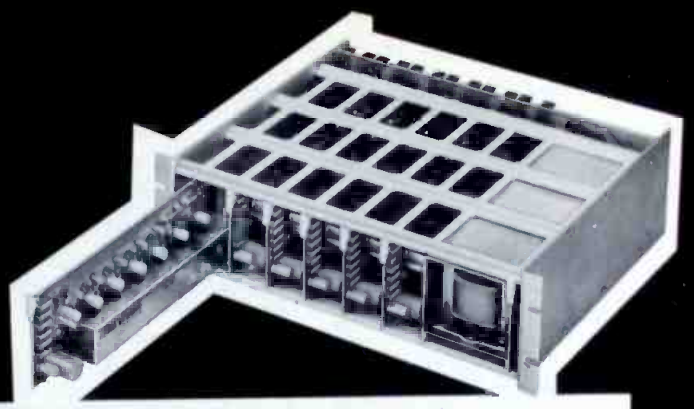

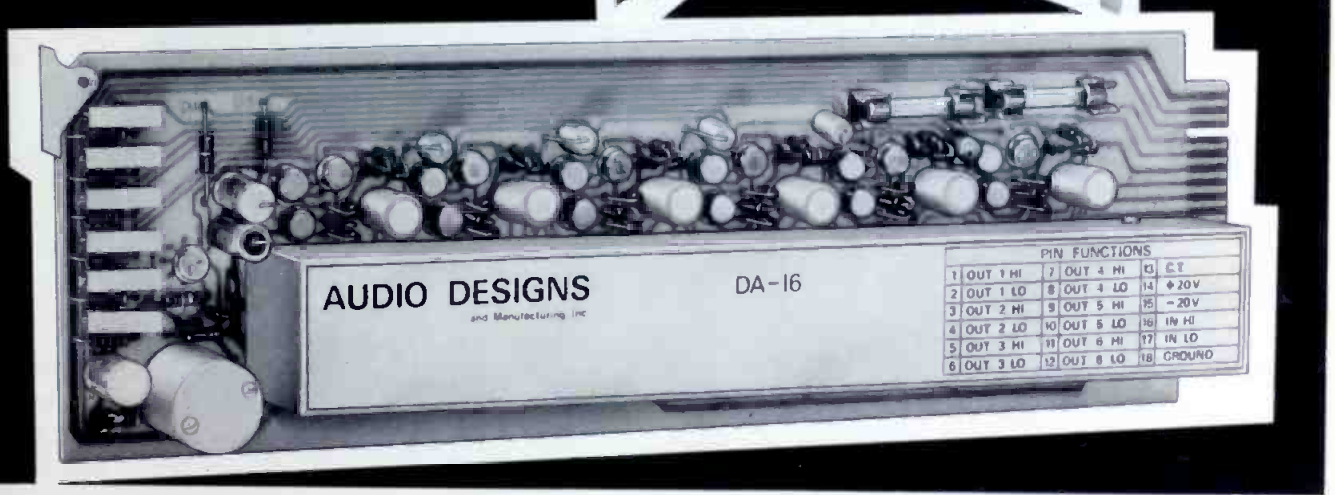

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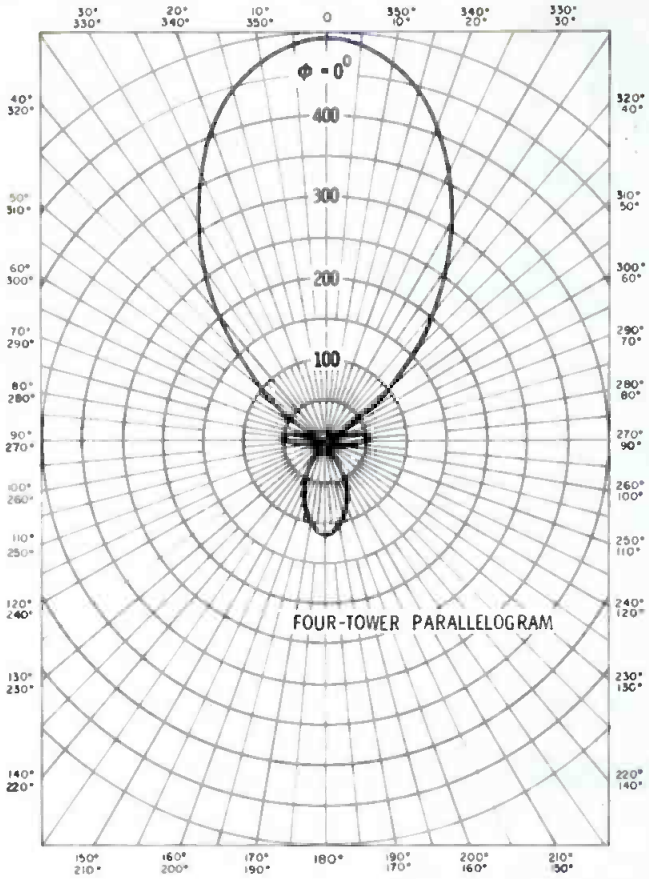

Figure 4

Antenna basics

continued from page 58

200°-spaced pattern. The opposite corner tower has the multiplication of the two-corner tower. Thus we have (Equation 2):

$$2 = E_1 \angle \Psi_1 \qquad 4 = E_1 \times E_2 \angle \Psi_1 + \Psi$$

90°

200°

$$1 \angle 0 \qquad 3 = E_2 \angle \Psi_2$$

Another version of the four-tower multiplication method is that of the in-line array, where one more term is added to Equation 1 of the three-tower formula in Chapter 4. This can be written as (Equation 3):

$$E = Kf(\Theta)\sqrt{\left[\frac{1+M_1^2}{2M_1} + \cos(\Psi_1 + S\cos\Theta\cos\emptyset)\right]} \times$$

$$Kf(\Theta)\sqrt{\left[\frac{1+M_2^2}{2M_2} + \cos(\Psi_2 + S\cos\Theta\cos\emptyset)\right]} \times$$

$$\left[\frac{1+M_3^2}{2M_3} + \cos(\Psi_3 + S\cos\Theta\cos\emptyset)\right]$$

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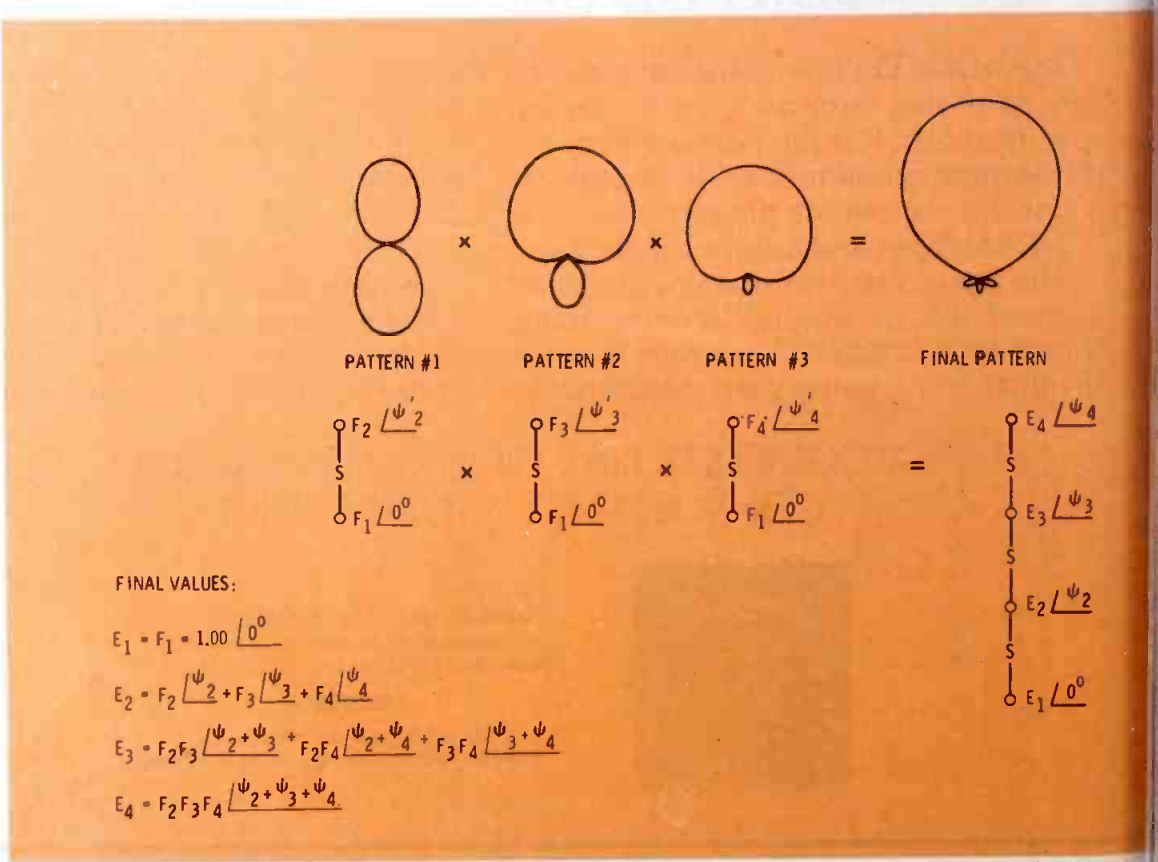

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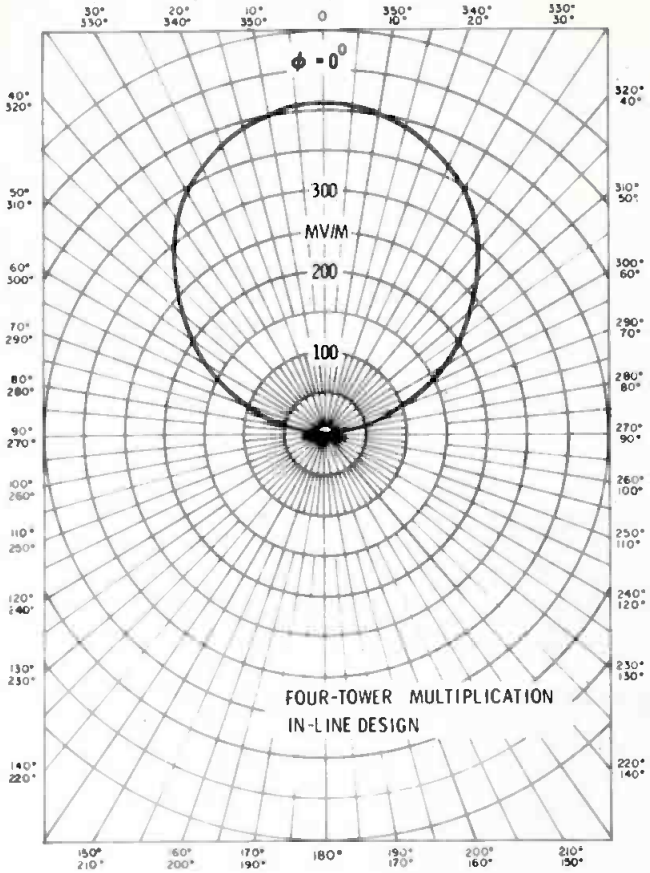


Figure 6

Antenna basics

continued from page 60

Four-tower multiplication in-line

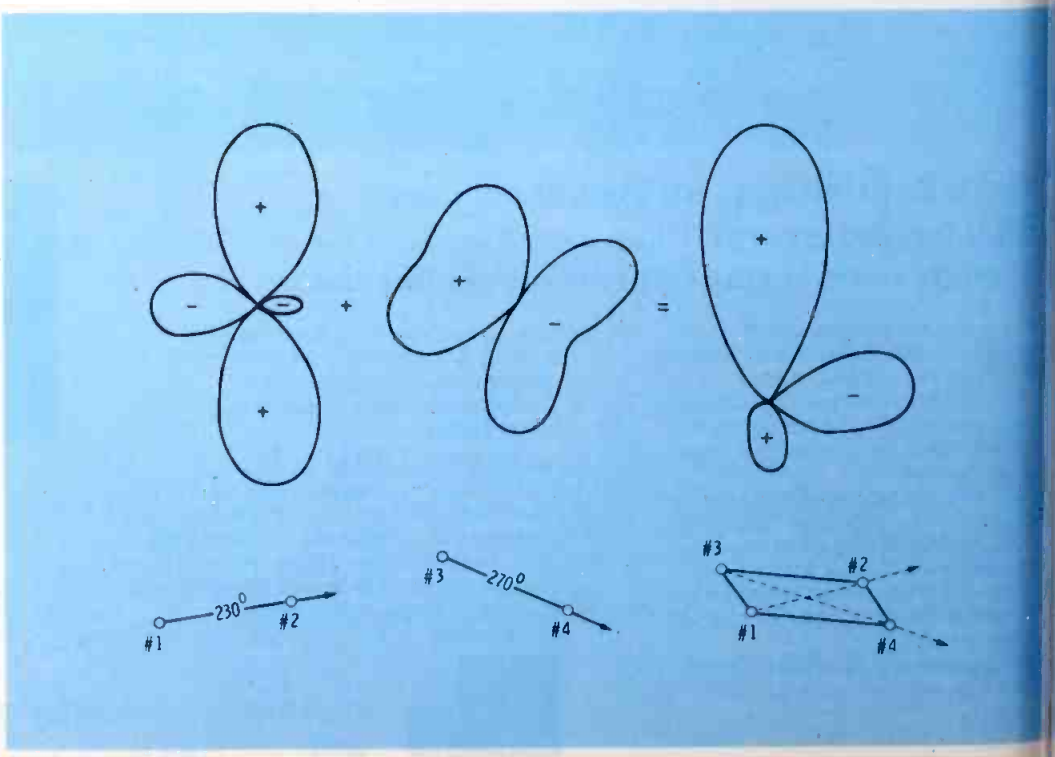
Equation 3, above, shows the formula to be used. Fo an example I've taken Figure 4 of Chapter 4 an added one more two-tower design value, having nul 155° True. This will produce three pairs of nulls the final pattern (shown in Figure 3). The end resu is that both sides as well as the rear arc of th pattern are well suppressed. All useful energy directed into the major lobe.

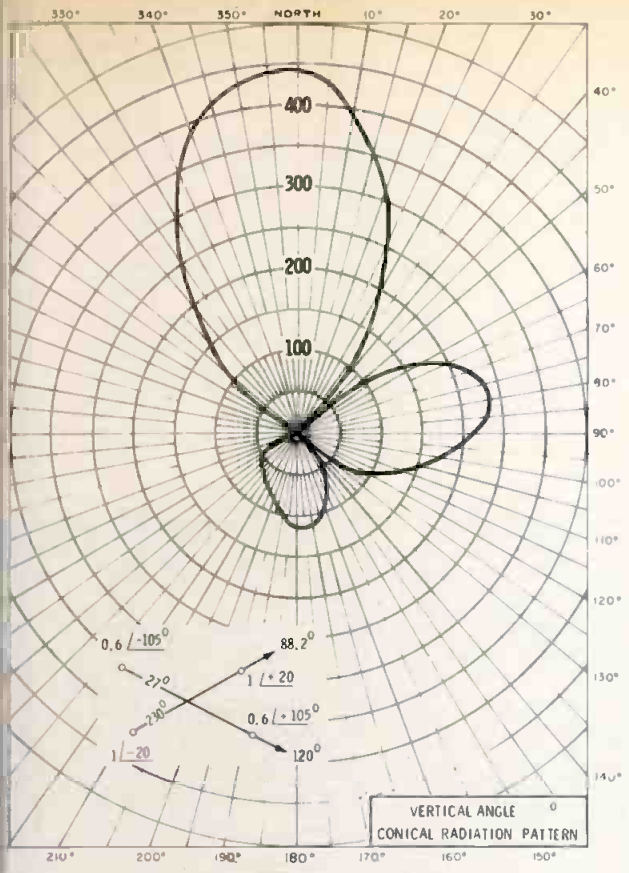
Figure 5, at the bottom, sets forth the method b which the design engineer determines the fin operating current ratios and phase angles of eac individual tower. In this method the letter E represents the "design" values of each of the pai that go to make up the final four-tower pattern. F_1 assumed to be equal to 1.00 with an angle of $\angle\underline{0}°$.

As a final thought I'll show how separate two-tow designs can be added together at about mid-poin WTAC's pattern represents one designed by th approach. Figure 7 shows the two individual shap with assigned values of (+) and (-) for the respecti lobes. Keep in mind that wherever lobes have equ signs the respective magnitudes add, and whe opposite, they subtract. At any bearing where th

continued on page

Figure 7





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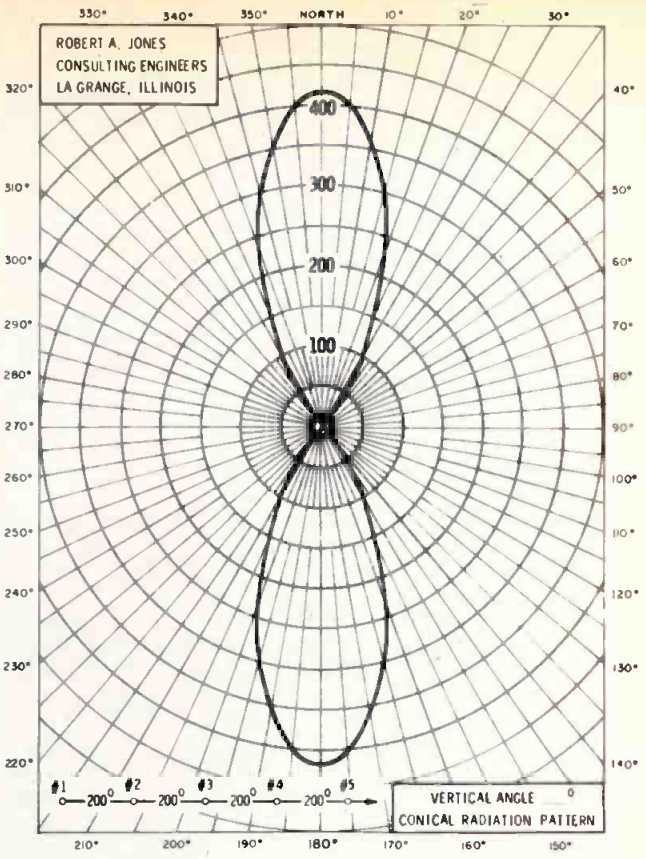

Figure 9

TABLE 3
FOUR-TOWER MULTIPLICATION METHOD, IN-LINE

$$E = Kf(\Theta)\left[\left(\frac{1+M_2^2}{2M_2} + \cos(\Psi_2 + S\cos\phi\cos\Theta)\right)x\right.$$
$$\left(\frac{1+M_3^2}{2M_3} + \cos(\Psi_3 + S\cos\phi\cos\Theta)\right)x$$
$$\left.\left(\frac{1+M_4^2}{2M_4} + \cos(\Psi_4 + S\cos\phi\cos\Theta)\right)\right]^{1/2}$$

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Ø	90 cos A	B-116.4	cos C	1 + D	A-90	200 cos F	1 + G	B-98.4	cos I	1 + J	E•H•K	$L^{1/2}$	MV/M
0	90.0	-26.4	.896	1.000	-90	0.0	1.896	-8.4	.989	1.989	3.7710	1.9420	408.0
10	88.6	-27.8	.885	.976	-100	-34.7	1.885	-9.8	.985	1.985	3.6510	1.9110	401.0
20	84.5	-31.9	.849	.904	-110	-68.4	1.849	-13.9	.970	1.970	3.2930	1.8140	381.0
30	77.9	-38.5	.783	.791	-120	-100.0	1.783	-20.5	.937	1.937	2.7320	1.6530	347.0
40	68.9	-49.5	.649	.641	-130	-128.5	1.649	-29.5	.870	1.870	1.9770	1.4060	295.0
50	57.8	-58.6	.521	.467	-140	-153.2	1.521	-40.6	.759	1.759	1.2490	1.1170	235.0
60	45.0	-71.4	.319	.293	-150	-173.2	1.319	-53.4	.596	1.596	.6160	.7850	165.0
70	30.8	-85.6	.077	.141	-160	-187.9	1.077	-67.6	.381	1.381	.2090	.4580	96.2
80	15.6	-100.8	-.187	.037	-170	-196.9	.813	-82.8	.125	1.125	.0340	.1840	38.6
90	0.0	-116.4	-.445	0.000	-180	-200.0	.555	-98.4	-.146	.854	0.0000	0.0000	0.0
100	-15.6	-132.0	-.669	-.037	-190	-196.9	.331	-114.0	-.407	.593	.0070	.0850	17.8
110	-30.8	-147.2	-.841	-.141	-200	-187.9	.159	-129.2	-.632	.368	.0080	.0910	19.1
120	-45.0	-161.4	-.948	-.293	-210	-173.2	.052	-143.4	-.803	.197	.0030	.0550	11.5
130	-57.8	-174.2	-.995	-.467	-220	-153.2	.005	-156.2	-.915	.085	.0002	.0140	3.0
140	-68.9	-185.3	-.996	-.641	-230	-128.5	.004	-167.3	-.975	.024	.....	0.0078	0.0
150	-77.9	-194.3	-.969	-.791	-240	-100.0	.031	-176.3	-.998	.002	.....	0.0070	0.0
160	-84.5	-200.9	-.934	-.904	-250	-68.4	.066	-182.9	-.998	.002	.0001	.0110	2.3
170	-88.6	-205.0	-.906	-.976	-260	-34.7	.094	-187.0	-.993	.007	.0006	.0250	5.3
180	-90.0	-206.4	-.896	-1.000	-270	0.0	.104	-188.4	-.989	.011	.0011	.0330	6.9

K = 210, S = 196

Antenna basics

continued from page 62

TABLE 4
FOUR-TOWER PARALLELOGRAM BY ADDITION

$$E = Kf(\Theta)\left[\cos\left(\frac{\Psi_1}{2} + \frac{S_1}{2}\cos\Theta\cos\phi\right) + M\cos\left(\frac{\Psi_2}{2} + \frac{S_2}{2}\cos\Theta\cos\phi\right)\right]$$

Where $\Psi_1 = -20°$, $S_1 = 230°$, $M = 0.7$, $\Psi_2 = 105°$, $S_2 = 270°$

A	B	C	D	D	F	G	H	I	J	L
ϕ	115 cos A	B-10	cos C	Θ-3.18	135 cos E	F+105	7 cos G	D+H	I^2	K•J
0	115.00	105.00	-.259	-31.8	114.7	219.7	-.461	-.720	.518	214.4
10	113.25	103.30	-.230	-21.8	125.3	230.3	-.383	-.613	.376	182.6
20	108.00	98.00	-.139	-11.8	132.2	237.2	-.326	-.465	.216	138.5
30	99.60	89.60	.007	-1.8	134.9	239.9	-.301	-.294	.086	87.6
40	88.10	78.10	.206	8.2	133.6	238.6	-.313	-.107	.011	31.9
50	73.90	63.90	.440	18.2	128.2	233.2	-.359	.081	.007	24.1
60	57.50	47.50	.676	28.2	118.9	223.9	-.432	.244	.060	72.7
70	39.30	29.20	.873	38.2	106.1	211.1	-.513	.360	.130	107.2
80	19.90	9.90	.985	48.2	89.9	194.9	-.579	.406	.165	120.9
90	0.00	-10.00	.985	58.2	71.1	176.1	-.598	.387	.472	115.2
100	19.90	-29.90	.866	68.2	50.1	155.1	-.544	.322	.104	95.9
110	-39.20	-49.30	.652	78.2	27.6	132.6	-.406	.246	.061	73.2
120	-57.50	-67.50	.383	88.2	4.2	109.2	-.198	.185	.034	53.1
130	-73.90	-83.90	.106	98.2	-19.3	85.7	.045	.151	.023	44.9
140	-88.10	-98.10	-.141	108.2	-42.1	62.8	.274	.133	.018	39.6
150	-99.60	-109.60	-.335	118.2	-63.8	41.2	.452	.117	.014	34.8
160	-108.00	-118.00	-.470	128.2	-83.5	21.5	.558	.088	.008	26.2
170	-113.25	-123.25	-.548	138.2	-100.6	4.4	.598	.050	.003	14.9
180	-115.00	-125.00	-.574	148.2	-114.7	-9.7	.591	.017	.000	5.1
190	-113.25	-123.25	-.548	158.2	-125.3	-20.3	.562	.014	.000	4.2
200	-108.00	-118.00	-.470	168.2	-132.1	-27.1	.534	.064	.004	19.0
210	-99.60	-109.60	-.335	178.2	-134.9	-29.9	.520	.185	.034	55.1
220	-88.10	-98.10	-.141	-171.8	-133.6	-28.6	.526	.385	.148	114.6
230	-73.90	-83.90	.106	161.8	-128.2	-23.2	.551	.657	.432	195.6
240	-57.50	-67.50	.383	151.8	-118.9	-13.9	.583	.966	.933	287.7
250	-39.20	-49.30	.652	141.8	-106.1	-1.1	.600	1.252	1.568	372.7
260	-19.90	-29.90	.866	131.8	-89.9	15.1	.579	1.445	2.088	430.3
270	0.00	-10.00	.985	121.8	-71.1	33.9	.498	1.483	2.199	441.6
280	19.90	-9.90	.985	111.8	-50.1	54.9	.345	1.320	1.742	393.0
290	39.20	29.20	.873	101.8	-27.6	77.4	.131	1.004	1.008	309.7
300	57.50	47.50	.676	91.8	-4.2	100.8	-.112	.564	.318	167.9
310	73.90	63.90	.440	81.8	19.3	124.3	-.342	.098	.010	29.2
320	88.10	78.10	.206	71.8	42.1	147.1	-.504	-.298	.089	88.7
330	99.60	89.60	.007	61.8	63.8	168.8	-.589	-.582	.339	173.3
340	108.00	98.00	-.139	51.8	83.5	188.5	-.593	-.732	.536	217.9
350	113.25	103.25	-.230	41.8	100.6	205.6	-.541	-.771	.594	229.6
									14.897	

$$K = \frac{191.5\ MV/M}{\sqrt{\frac{14.897}{36}}} = 297.8$$

TABLE 5
FOUR-TOWER FIGURE EIGHT

Formula:

$$E = Kf(\Theta)\left[\left(\frac{1+M_1^2}{2M_1} + \cos(\Psi_1 + S\cos\emptyset\cos\Theta)\right)x\right.$$

$$\left(\frac{1+M_2^2}{2M_2} + \cos(\Psi_2 + S\cos\Theta\cos\emptyset)\right)x$$

$$\left.\left(\frac{1+M_3^2}{2M_3} + \cos(\Psi_3 + S\cos\emptyset\cos\Theta)\right)\right]^{1/2}$$

Assumptions:

$M_1 = M_2 = M_3 = 1.0$, $\Psi_1 = +7°$, $\Psi_2 = -7°$, $\Psi_3 = 0°$, $S = 200°$, $f(\Theta) = 1.0$, $\Theta = 0°$

A	B	C	D	E	F	G	H	I	L
∅	200 cos A	B+7	1+ cos C	B-7	1 + cos E	1 + cos B	D•F•G	H	K•I
0	200.0	207.0	0.109	193.0	0.026	.060	0.000	0.000	0.0 MV/M
10	196.9	203.9	0.086	189.9	0.015	.043	0.000	0.000	0.0
20	187.9	194.9	0.034	180.9	0.001	.009	0.000	0.000	0.0
30	173.3	180.3	0.000	166.3	0.028	.007	0.000	0.000	0.0
40	153.2	160.2	0.059	146.2	0.169	.107	.001	.033	4.9
50	128.5	135.5	0.287	121.5	0.478	.377	.052	.227	33.8
60	100.0	107.0	0.708	93.0	0.948	.826	.554	.744	110.9
70	68.4	75.4	1.252	61.4	1.478	1.368	2.530	1.591	237.2
80	34.7	41.7	1.747	27.7	1.885	1.822	6.000	2.449	365.1
90	0.0	7.0	1.993	-7.0	1.993	2.000	7.944	2.818	420.3
100	-34.7	-27.7	1.885	-41.7	1.747	1.822	6.000	2.449	365.1
110	-68.4	-61.4	1.478	-75.4	1.252	1.368	2.530	1.591	237.2
120	-100.0	-93.0	0.948	-107.0	.708	.826	.554	.744	110.9
130	-128.5	-121.5	0.478	-135.5	.287	.377	.052	.227	33.8
140	-153.2	-146.2	.169	-160.2	.059	.107	.001	.033	4.9
150	-173.3	-166.3	.028	-180.3	0.000	.007	0.000	0.000	0.0
160	-187.9	-180.9	0.001	-194.9	0.034	.009	0.000	0.000	0.0
170	-196.9	-189.9	.015	-203.9	0.086	.043	0.000	0.000	0.0
180	-200.0	-193.0	.026	-207.0	.109	.060	0.000	0.000	0.0
							26.216		
							x 2		
							52.432		

$$K = \sqrt{\frac{180}{\frac{52.432}{36}}} = 149.1$$

gnitudes are of opposite sign and equal in gnitude, the final pattern will contain a null. For mple, at 47° and 122° are nulls in the final ttern. Figure 8 is a polar plot of the final pattern, h the calculations shown in Table 4.

As a comparison of the degree of major lobe gain I ve taken the basic figure eight patterns of Chapter two-towers) and added a fourth tower to produce design shown in Figure 9.

Table 5 is the step-by-step computation used to culate this design. Forward gain is achieved by ening the arc of the pattern minima. Or, in other rds, by narrowing the beam. The top of the major e has been increased from 304.9 to 381.6 MV/M to 420.3 MV/M. From a two-tower to a four-tower you have gained:

420.3 MV/M
304.9 MV/M

Or a ratio of 1.378. This relates to an equivalent power increase of 1.900 times.

If it is assumed that the two-tower pattern had 1 kW of power, this would require increasing the transmitter power into the two-tower to 1.90 kW in order to equal the 1 kW signal you would get off the tip of the four-tower pattern. Thus doubling the number of tower almost doubles the effective power.□

BROADCASTING IN PARADISE:

On the air from the Grand Bahamas

George Ferguson (standing), ZNS-3 chief engineer, keeps a vigilant eye on Kirk Russel, morning man and production manager.

By Dennis Ciapura

While many engineers spend lazy summer weekends mentally transporting their spirits to the sandy shores and soft breezes of some remote Caribbean island, there is at least one engineer whose daily routine is that fantasy come true. His name is George Ferguson and his island lies about 100 miles east of South Florida in the Bahamas. He is the chief engineer at ZNS-3 in Freeport on Grand Bahama Island.

Although you could spend days walking the miles of Grand Bahamas' secluded beaches, just watching the blue ocean curl ashore, the spell is easily broken if you travel inland. You'd find the bustling town of Freeport with its luxurious hotels, casino, and International Bazaar. And right in the middle of it all is ZNS-3, or ZETA-NESH-THREE, as many of the island residents call it.

Despite the relaxed atmosphere of Grand Bahama, ZNS-3 is as busy a radio station as any of its mainland cousins. To better understand how and why the station operates, let's first take a look at how the station came to be located in Freeport to begin with.

When the Bahamas received its independence from Great Britain in 1973, the authorities decided to establish a northern service of radio Bahamas on Grand Bahama Island. Work on the station began at a feverish pace in order to have the facility ready to go on the air for the Independence Day celebration. The station was to start out as a modest installation with plans to improve in the future, not unlike the birth and childhood of most U.S stations which have gone through a series of modifications.

A 1,000-watt Harris transmitter was located in a trailer similar to the ones used for construction offices, and a center-fed horizontal dipole antenna was erected. While this installation was designed to be a temporary facility that could easily be upgraded and relocated later, it was built well enough to serve the island community for a number of years. It's still on the air in that form today, although plans for a new 5 kW station and a conventional vertical antenna system are being considered.

ZNS-3 operates on a frequency of 810 kHz and covers the island fairly well, considering the relatively low power and the length of the island (which is in excess of 100 miles). The studios are located in an office complex in downtown Freeport, with Telco links to the transmitter on the edge of town. Incidently, for those readers who enjoy working with telephone companies, Ferguson has two Telco outfits to deal

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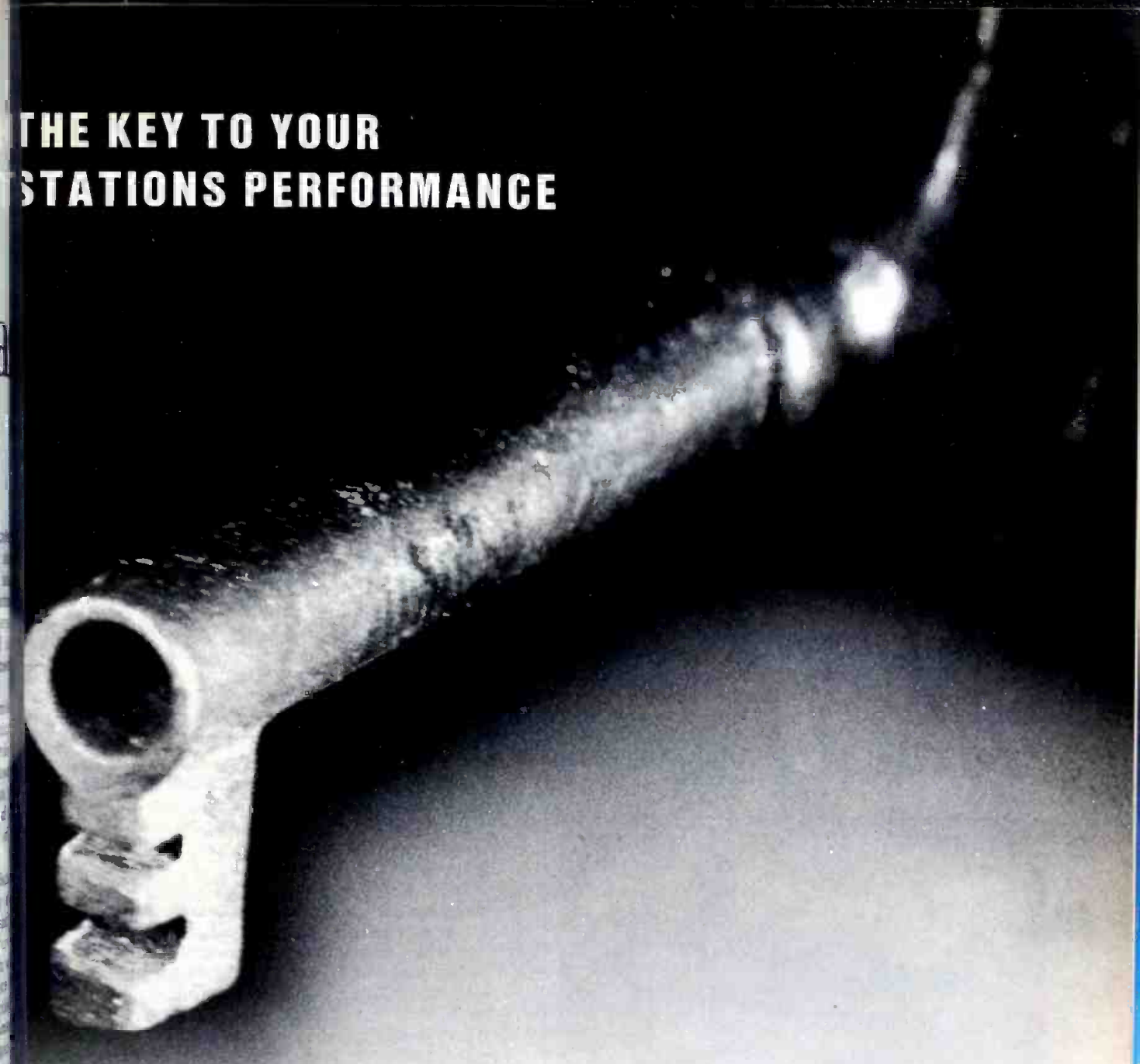

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Grand Bahamas

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with: one local telephone company in Freeport an one national telephone service.

The only game in town

The station is on the air 24 hours a day. Since it' the island's only local broadcast facility, its operatio is extremely important to the people of Gran Bahama. The only other signals received are radi and TV stations from South Florida which, of course do not relate at all to the broadcast needs of th Bahamians.

While ZNS-3 was set up by the government and certain amount of funding comes from the governmen the station sells commercials on a regular basis t local merchants in an effort to become economicall self-sufficient. As a matter of fact, a staff arrange ment at ZNS-3 is almost identical to the typica commercial stations in the U.S. There is a wel organized traffic and billing department in addition t the usual programming and engineering functions.

Since at one time or another alomst all of Freeport' nearly 26,000 residents listen to the station (remem ber it's the only local game in town), a commercial o ZNS-3 is a pretty good advertising buy and the statio seems to be doing quite well. Eventually, the studio and offices will also be relocated, but even th present setup (except for the antenna) is very simila to many small-market stations on the mainland.

The audio consoles and cart equipment are moder Harris solid-state units; Ampex tape decks are use for production duty. One of the station's biggest assets however, is George Ferguson. Aside from being a ver capable and experienced broadcast engineer, he i a good public relations representative for a statio whose easy manner helps visitors feel comfortabl impressed.

From 6 a.m. until 6:30 p.m., the station is locall programmed, featuring as much native Bahamia music as possible in a mix with popular U.S. titles. I this way, the station's programming is able to relat to the resident community while competing with th mainland stations for the tourists' attention. Th balance of the around-the-clock programming come from Nassau via the national telephone company to point called 8 Mile Rock, east of Freeport. It i relayed from there by STL in the 160 MHz band to th station in Freeport.

Problems in paradise

As you might expect, an island located out in th Atlantic Ocean can experience some incredibly violen weather. ZNS-3 is subject to the occasional wrath c nature that is the bane of broadcast engineer working in the tropics. Although no unusual mainten ance problems exist at the station, when equipmen does break down, repair is not always a simple matte because most replacement parts must come from th U.S. It's improtant to know just what to keep in stock However, Ferguson reports that the equipmen manufacturers have been very cooperative, keepin real problems to a minimum.

As you can see, while George Ferguson does hav the opportunity to spend his days enjoying th pleasures of an island paradise (that we are left onl to dream about), it is not quite the vacation it migh first appear to be. Like the rest of use, Ferguso handles all the usual operation and maintenanc problems that come with broadcast facilities, n matter where they're located...even in paradise.

Q&RA or...

Don't fly by the seat of your pants

By Raymond Miller
Chief Engineer,
KGWA, Enid, Oklahoma

Well, first of all what's Q & RA? s a system to straighten out the un in circles, scream, and yell" nic that results when equipment oes to fail" before maintenance d operators "fly by the seat of eir pants" until chaos sets in.

So what does it mean, Q & RA, at is? Quality and reliability surance. I know, you've heard of in big industrial applications, the ilitary, assembly lines, etc., and it on't work in your station. You're ght, it won't if you follow all the dustrial ideas of application. The inciple is good though, so modify to fit the operation. We tried it in ir thousand-watter, and after a uple of years it has made a real provement. If you think you'd like give it a whack, here goes.

The first thing to deal with is ople, you and the boss. Everyone must accept the idea of squawking the faults whether it is equipment, operators or managers that failed. That's easy. The hard part is that every individual must accept the fact that he can get written up for a mistake too. The equipment's defense mechanism is "the pervisity of inanimate objects" while people's defense mechanism is "excuses and rationalization." The former is fixed by parts replacement. The latter may be fixed with communication and understanding.

The other facet is that Q & RA applies to every function of broadcasting that directly affects air time. It starts in quality in hiring and ends at the emission of the antenna.

Quality control

So let's talk about quality control (QC) now that everyone is willing to be a radio inspector (RI) as well as whatever hat or hats they have been wearing. Quality in job accomplishment is controlled by a system of defining the best way to do it. Too often this is verbal and always changing in its basic form. Solve it with a set of **standard operating procedures** (SOP) for those jobs that are repetitive and on-going. Remember to write in a procedure plan to solve the special unexpected situations. SOPs for operator responsibility, operating log, maintenance log, remote control operation, operating parameters, preventive maintenance safety, license posting, equipment inventory, emergency program transmission, quality control (see Figure 1) to interpret FCC rules and define managerial expectations are vital to a healthy quality control application.

Training goes a long way

Training is essential and the SOPs are fine but 100 to 1 says someone will read something into or out of them that you, in your wildest imagination, did not expect. So, from the provisional to the old timer, you have to get eyeball communication about how your station works and what the SOP is trying to

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ENGINEERING RADIO STATION KGWA STANDARD OPERATING PROCEDURE

SOP 116-15
11 August 1976

SUBJECT: QUALITY CONTROL

Purpose: To provide a system of inspection and correction of equipment defects..

GENERAL: The program consists of all facets of daily routines as observed by each Duty Operator, i.e. Progrm, Traffic, Remote Systems, Equipment and operating. This Standard Operating Procedure defines the method of Quality Control for the Engineering Department only. "KGWA Discrepancy Report" shall be used in all cases to report. (See atch #1).

ACTION: The person discovering an Equipment or Remote Systems discrepancy shall:

a. Initiate "KGWA Discrepancy Report" by checking Equipment and/or Remote blanks, filling in the current date and signing (or initialling) the discovered blank.

b. Annotate time and description of trouble.

c. Place the Report on the Chief Engineer's desk. (During normal duty hours call it to his attention when malfunction is discovered.)

CORRECTION: The Engineering Department shall take the following actions to correct fault:

a. Analyze the problem to determine troubleshoot technique.

b. Troubleshoot and correct fault.

c. If the trouble cannot be duplicated, enter "799" in the corrective action of "KGWA Discrepancy Report", date and initial that block.

d. Should fault be found and replacement part consumed, complete the correction block and also make appropriate entry in the Historical Maintenance Record in accordance with SOP 116-6.

FILING: All "KGWA Discrepancy Report" forms, upon completion, shall be maintained in Engineering Department file number 116H-2 for a period of three years.

Raymond L. Miller
Chief Engineer

Atch:
1. "KGWA Discrepancy Report" Form

Figure 1 Standard Operating Procedure.

KGWA DISCREPANCY REPORT

PROGRAM_____ REMOTE_____ EQUIPMENT ✓

TRAFFIC_____ OPERATING_____

DATE: 13 May 74 DISCOVERED BH

TIME	PROBLEM	CORRECTIVE ACTION
	Scully unit record	L-801 bad - Temporary repair - ordered check on Order # 13574-1

DATE: 13 May 74 INIT. [illegible]

Figure 2 Discrepancy Report.

& RA

ntinued from page 69

. Then get their feedback. Remember the only thing standard out broadcasting is that all are ensed—everything else is unique. nother quality control facet is rating technique. Every method airing requires an operator ion. He can act with the finesse broadcaster or a blacksmith. So e the time to impress on him or the delicacy of the equipment, value and repair costs if broken. vil and hammer language might e to be used, but make the dent understanding. It'll save engineering time and management ney.

The discrepancy report

low the nuts and bolts of quality trol. The **discrepancy report** is central document (see Figure 2). have to design one that is iest for the operator to use, for ineering to show action and to fit r file system. Why have a "pink-" write-up? Well, if you're like st of us, your title is chief ineer with a lot of "Hey, you" s going that do not allow you to nd at the studio door waiting for operator to show violent emotion he failure of a piece of gear. So, he discrepancy report blanks are ging on a clip in the studio he q put on his RI hat and write it

When you get in from the transmitter site, there it is. You've got buck and can take care of it ether the operator who discovered it is still on duty or not. 't forget to enter it on the **orical maintenance record**, if it's ificant. At least keep it on file whatever time period you desire. uality control of equipment is tty well defined now. One more g—tell people you appreciate r help! If you get that "What, in" look every time a write-up ws up you'll find fewer discrepy reports and a ration of surses in the form of equipment akdown call outs. On the other d a smile and a thank you brings port of the QC system.

Equipment reliability

k, what about reliability? Sure, rything wears out. But its quality whatever was designed and nufactured into it, can be exded. Preventive maintenance ough diligent scheduled action he heart of reliability.

tart your schedule by designing ystem. Three by five cards, one each month, will suffice for listing what equipment is to be checked out on what month. Question is, how often? Most manufacturers' manuals will give you a clue as to what and how often preventive maintenance need be done. Use it.

Add other items as your own station experience dictates. Change time intervals as needed. Your usage of a particular piece of equipment may be such that more frequent maintenance action will prevent failure or, on the other hand, less usage would allow longer periods of time between performing the scheduled inspection routines.

Initiate an equipment **inspection and maintenance record** (see Figure 3) for each piece of equipment that preventive maintenance is to be applied to. Decide each routine that is needed, number them as you describe them in the *inspection routines* column and then write in the frequency to be done after each routine. As the preventive maintenance actions are achieved enter the date, the number of the routine and initials in the space provided on the front side of the equipment

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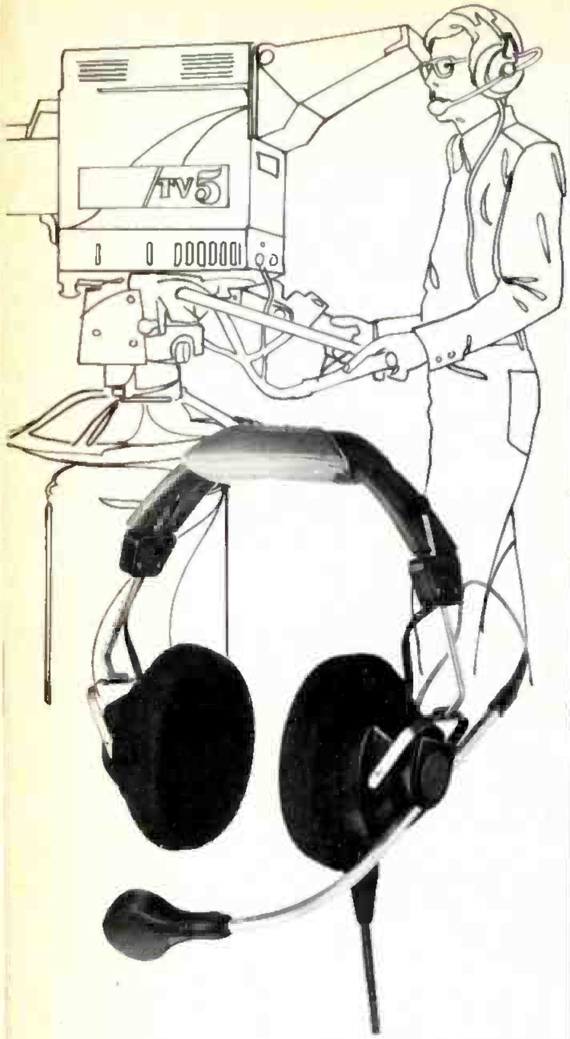

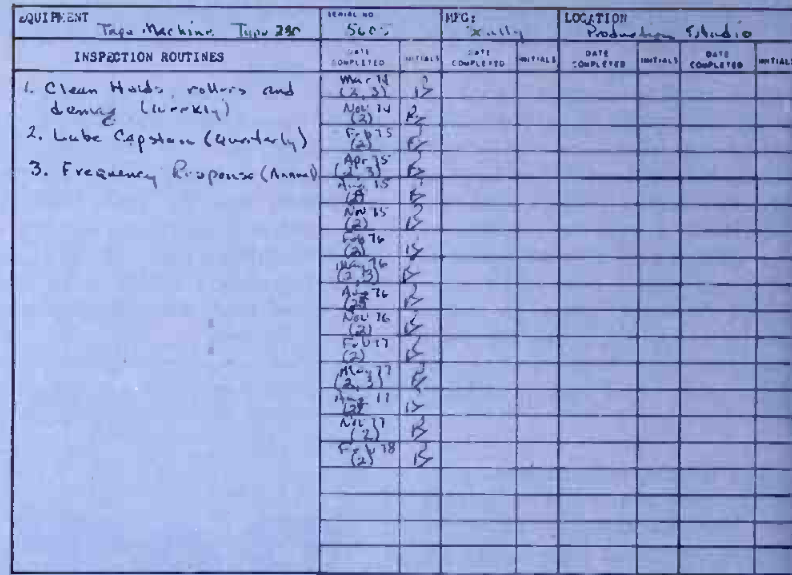

Figure 3 Inspection/Maintenance Record.

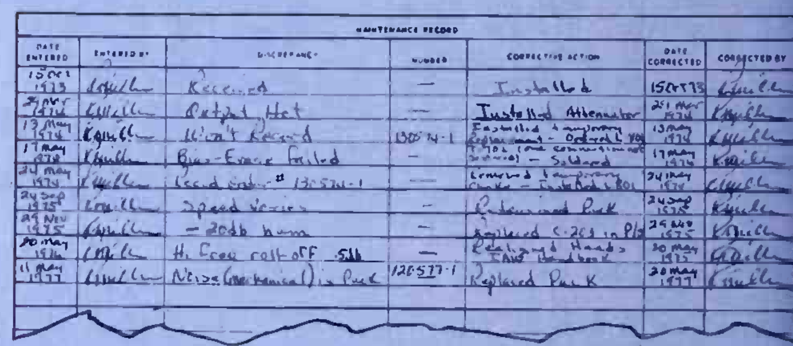

Figure 4 Maintenance Record

Q & RA

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inspection and maintenance record.

Now remember those discrepancy reports that the operators have been handing you? Ok, turn the equipment inspection and maintenance record over (see Figure 4). That maintenance record is where you are going to find many interesting things. Things like pinch wheel life, trouble cures that the manufacturer never mentions in the troubleshooting charts, how often like troubles occur that you never thought of putting on the preventive maintenance schedule, and many others.

A word of caution. This composite maintenance record does not take the place of the official maintenance log. The maintenance record is a better engineering management tool simply because all the troubles and cures are documented in one place for the life of the equipment instead of strung throughout the official maintenance logs.

Quality and reliability techniques are taken care of but what about assurance? Well, don't sit back and wait! The only way it'll come is by devotion to reporting discrepancies, fanatical adherence to the PM schedules and good engineering practices on every installation, repair or replacement action. Then one day, when assurance comes, you realize you are not hearing the dreaded phrase "Due to technical difficulties..."

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Circle (42) on Reply Card

Studio construction
PRELIMINARY PLANNING

Part 1/by Peter Burk

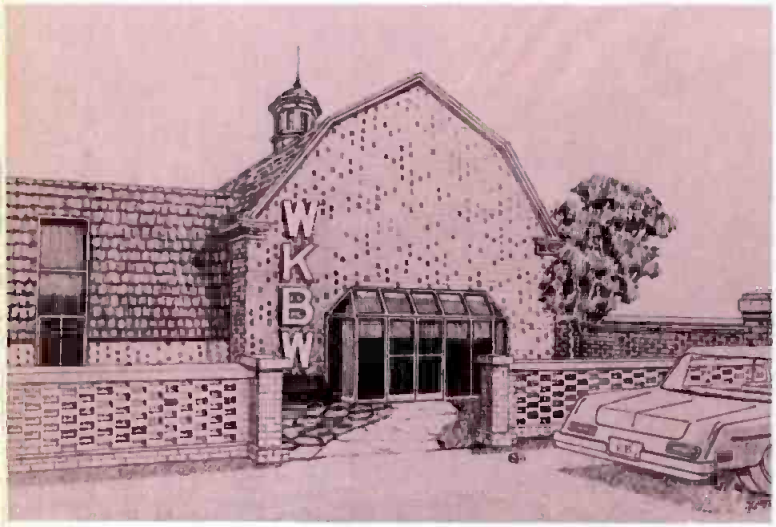

Figure 1 New studios for WKBW, Buffalo, are being constructed in this turn-of-the-century carriage house. The addition on the left and the entire inside of the structure are totally new construction, with the flavor of wood and old brick retained to tie the building together with its surroundings in an historically significant neighborhood.

One of the nicest challenges facing a broadcast engineer is the opportunity to construct new facilities. Unlike many of our responsibilities, building new studios is a tangible and highly visible achievement.

Ten years from now, no one will say "Remember how station WWII sounded in 1978?" But ten or even twenty years from now, the person responsible for the technical installation of new facilities will be remembered, one way or another.

For the next few months, **Radio Workshop** will focus on modern broadcast studio construction. If you've got a building project coming up in the future, or even a minor remodeling project at your station, stay with us. We'll try to make it easier for you to be remembered in the right way.

WKBW Studios

Throughout this series, we'll use the new WKBW studios in Buffalo, New York (Figure 1), to illustrate some of the techniques discussed in the **Workshop**. This facility is presently under construction, and provides a convenient example of one approach to modern broadcast facilities. Every station has a slightly different method of operation, so it's not likely that the same approach would work for your station. However, you may find some of the basic ideas useful i planning your new facility.

Choosing a site

As in most things, choosing the best location for radio station is loaded with compromise. Some of th general considerations are the same as for any othe type of service business: adequate floor space sufficient parking, compatible neighborhood, proximit to the business community, cost of real estate.

Some special technical considerations must also b entered into the formula:

Is the proposed site in the flight path of an airport? low flying jet aircraft will pass overhead frequentl special acoustical construction will be required.

Is the site next to a busy thoroughfare or railroad Again, consider the amount of acoustical treatmer necessary to keep the noise and vibration out of th studios.

Is the power source for the area reliable? It's a fac of life that the utilities provide more reliable service t some areas than others. Find out as much as you ca from the utility. If your site is at the end of a lon above-ground feed or, for some other reason, is les than ideal, you'll have to consider the additional co (and space requirements) of an auxiliary generato and voltage regulators.

Do you have line-of-sight from the studio site to th transmitter? If your transmitter is located som distance away, having a microwave shot from th studio can be quite important, expecially if you' building stereo facilities. Also consider suitability f remote pickup antennas if you're into RENG.

Sharing

If you're considering an office building (or an building shared with other tenants), there are som additional points to consider. Make sure that th tenants adjacent to your space are compatible wit your operation. A medical clinic, for instance, migh produce unwanted RF radiation from older diatherm equipment. (A clause in the lease stipulating th other tenants comply with Part 15 of the FCC Rules a good general precaution.)

In one case, an FM studio was constructed in a office building with a health spa immediately above. took special acoustical treatment in the ceiling to kee Mantovani free of the sound of fifty fat people runnin in place!

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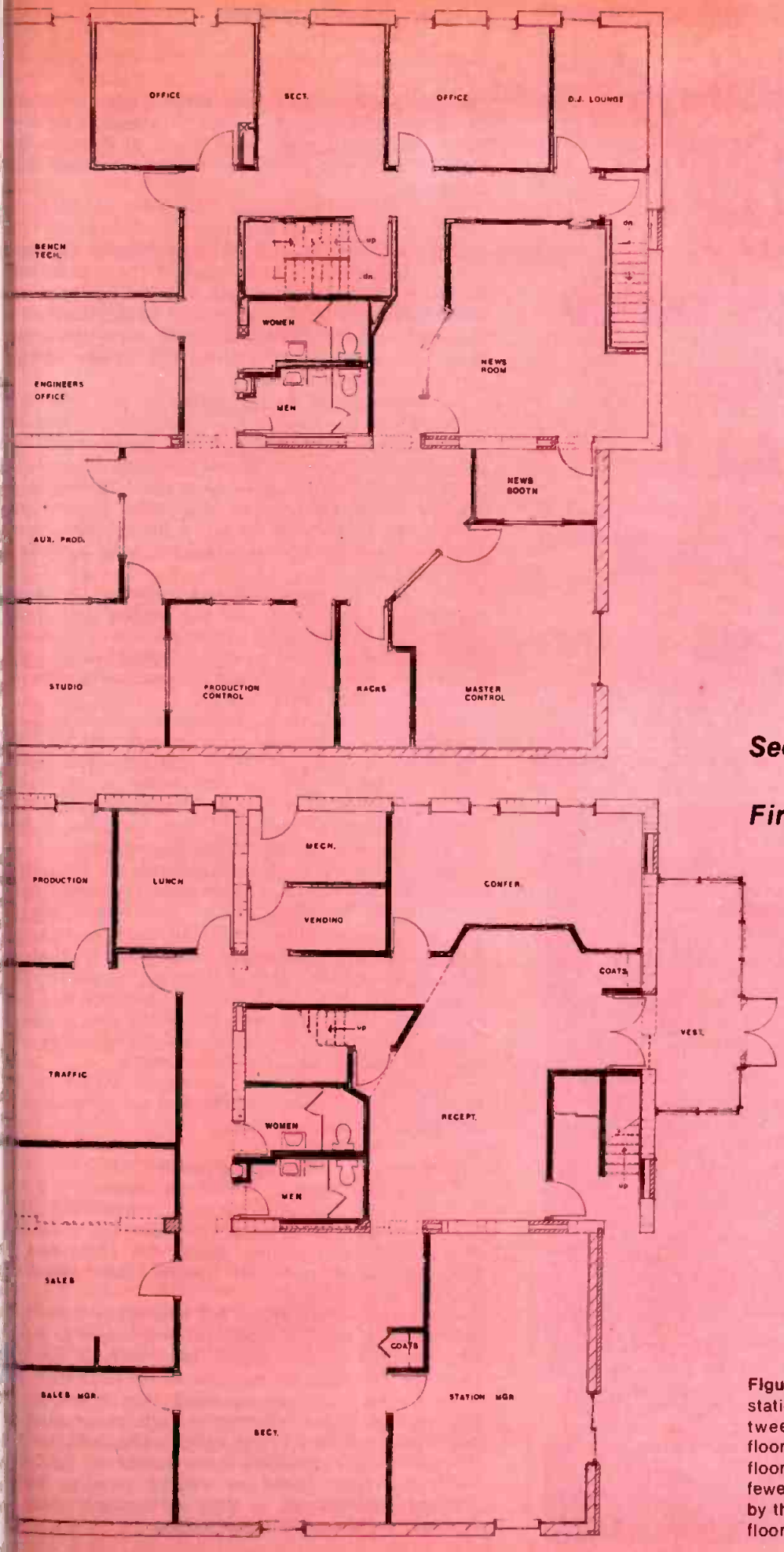

Second floor

First floor

Figure 2 Floor plans for the station show the division between business offices (first floor) and operations (second floor), compromising so that the fewest people will be affected by the stairway between the two floors.

Studio construction

continued from page 74

Office buildings may pose several other problems Air-conditioning probably won't be adequate (and wi be too noisy) and might even be set to shut down a night. After-hours access to the building will be a necessity, too.

Experts

Many studios are built without benefit of exper help in specialized areas. Some of them even worl well. If you've got a lot of faith in your contractor, yo might be able to build a successful facility without a architect or other professionals. If you'd like a littl more assurance that everything will go according t plan, let the experts help.

An architect will do a lot more for you than dra up plans and specifications. In fact, the real value o his services comes during actual construction. Th architect will supervise the work as it progresses, an make certain that the finished product resembles th original plans. He'll be on your side, too, when i comes time to account for all of those little change that you thought of after the job was already i progress.

Generally, the architect can arrange to have mechanical engineer lay out the heating and coolin system, but be careful! Frequently the ME doesn' fully understand the special considerations of broadcast studio. In a future column, we'll show yo what to look for besides hot air.

One other expert is frequently overlooked—th acoustical consultant. His services will cost less tha you might think. In fact, he might save you severa times his fee by helping you select a more cos effective method of producing the desired acoustics results. He'll work closely with your architect to com up with the best cost/performance compromise.

Your architect may recommend an acoustic consultant or may even profess to be competent in th field himself, but check for yourself before you sa yes. Broadcast studios aren't the same as churche and high school auditoriums. Find someone that ha done *small* studios—they're treated differently tha large concert halls. Actually, the country is full o acoustical consultants and engineers, but many o these people are skilled at industrial noise an vibration control, and not studio design.

Whether you employ an acoustical expert or no you'll find lots of useful information on acoustics in subsequent **Workshop** column.

The jigsaw puzzle

Once a site has been tentatively selected, it's tim to see how the people will fit into the available space Whether the studio is being built from the ground u or being fit into existing space, the rules are th same: **Make it work for people, then solve th mechanical problems.**

This may sound obvious, but how many times ha you been in a building where the people had to put u with needless inconveniences daily because the floo plan was designed for mechanical convenience? Thi is not to say that you shouldn't take advantage obvious mechanical efficiencies such as locating th men's room adjacent to the ladies' room. Just don't l the mechanical considerations dominate. An extr hundred dollars spend on copper pipe to put drinking fountain in a more convenient place probably a reasonable compromise.

Before you start on a floor plan, decide how much space is required for each person or task. You have to know how big the pieces are before you try to fit them into the puzzle.

Next, draw a traffic flow diagram for your operation. Connect "bubbles" that represent people or work areas with traffic lines that indicate the interaction between areas. Use variable line thicknesses to indicate the relative amount of traffic between areas. As you fit the pieces into the puzzle, your traffic flow diagram will help you make the ever present compromises in areas where the fewest people will be affected.

As you fit the rooms together, don't forget to allow for wall thickness, especially in the studio area. Acoustical construction may require some walls to be as much as twelve inches thick.

Studio layout

A good studio plan for today's broadcaster will bear little resemblance to broadcast studios of the past generation. Frequently, automation must be incorporated, and even in a live operation the tasks are divided between people and rooms differently than in the past. In the air studio, announcers are usually running a board, answering telephones, and controlling the transmitter. In addition, room must be allowed for as many as several thousand cartridges instead of a small bin of records. In short, planning new studio layouts should be done with an open mind.

One past concept that seems to reappear frequently is the idea that the studios should all be in visual contact with each other. In some cases, it's necessary, but don't get carried away. Providing good acoustical isolation is tough enough without making the walls 50 percent glass. The control room and the production room, for instance, probably don't need to have visual contact. In fact in most cases, it would just be another distraction. Notice in Figure 2 that the production room and master control are separated by a rack room. This is not only convenient from a technical standpoint, it provides a natural sound barrier between the two rooms.

Sound locks are another concept left over from an earlier day. With the rushed pace of most modern stations, sound locks serve more as people obstacles than sound barriers. If your staff is typical of most, the sound lock doors would just get left propped open anyway, so why include them?

Sizes and shapes

You probably already know how big you'd like each studio to be, but be careful about the *shape* of each room. You can spend many hours and dollars trying to correct the sound of a studio that was built to the wrong dimensions.

Avoid room dimensions that are nearly square. The low frequency resonances are almost impossible to eliminate. Rectangular rooms are the most efficient from a utilization standpoint, but are not necessarily the best acoustically. If it's convenient to offset the wall or ceiling by ten degrees or so, the reflections will be more evenly distributed in the room.

Coming soon

Future workshop columns will deal with acoustical treatment, equipment placement, wiring practices, and heating and cooling systems. If you have a specific area you'd like to read more about, or if you'd like to share your solution to a particular problem, drop a line to the **Radio Workshop** editor. □

SOCIETY OF
BROADCAST ENGINEERS, INC.
P.O. Box 50844, Indianapolis, Indiana 46250

James Hurley elected SBE president

James E. Hurley of WTAE-TV, Pittsburgh, has been elected president of the Society of Broadcast Engineers for 1978. Hurley replaces Robert Wehrman of the Cox Broadcasting Corp., Atlanta.

Other newly elected officers include Howard Immekus, KCBS-AM/FM, San Francisco, vice president; and James Grinnell, ABC-TV, Chicago, secretary-treasurer.

Members of the 1978 board of directors are Ron Arendall, WTHR-TV, Indianapolis; Morris Courtright, Jr., Rockwell/Collins Radio, Yuma, Az.; Steve de Satnick, KCET, Los Angeles; P. J. Ford, WCLY-TV Tampa, Fl.; Ralph Green, CBS Radi Network, New York; Ed Herlihy KTLA-TV, Los Angeles; Albin F Hillstrom, KOOL Radio-TV Inc. Phoenix; Robert Jones, consultin engineer, LaGrange, Il.; Bill Powers WSB-TV, Atlanta; and Ralp Thompson, Post Newsweek Stations Washington, D.C. Ford, Hillstrom and Thompson were elected t second terms.

NEW CHAPTERS

The society announces the add tion of two new chapters to the lis of active SBE chapters throughou the country.

CHAPTER 14—Connecticut Valle has finally become an active chapte because of the continued interes and efforts of charter membe Carmine Iannucci, WTNH-TV, Ne Haven. He has made several a tempts to get a chapter started i his area and now his long-tim dream has come true. SBE extremely proud of this kind dedication and realizes this is th kind of member that keeps th society growing and progressing.

CHAPTER 51—Tri-Cities, Wash ington was organized under th direction of Dave Bauer, Kenn wick. Bauer is another SBE membe who has done an excellent jo recruiting new members and o ganizing his group into the newe chapter.

SBE congratulates both thes members for their accomplishmen and is happy to have them aboard

CHAPTER REPORTS

Chapter 1—Binghamton, New York

Barry Enders and Roger Willian of Tektronix spoke on digital vide at the March 14 meeting, held Owego. They discussed digital tec niques and Tektronix's method processing and measuring.

Chapter 3—Kansas

The March 14 program, held Wichita, was presented by chapte member Jay Zacharias of KPTS-T and dealt with satellite earth r ceiving stations, such as the on recently installed at KPTS. A bri tour of the KPTS plant followed th meeting.

Chapter 9—Phoenix, Arizona

The chapter met March 22 Mountain Bell's studios in Phoeni Wilbur Steinman, associate profe sor of engineering, Arizona Sta University, presented a progra entitled, "Digital Electronic Present and Future."

apter 16—Seattle, Washington
At the March 8 meeting, Bob letsch of the FCC presented a port on current FCC activities and troduced Bill Johnson, recently pointed director of FCC Region 5. ve Christian, chief engineer at cific Lutheran University, led a scussion on radio and TV RF erference. He had some interging observations and experiences ated to increasing the power of educational FM station from 10 tts to 40,000 watts with the ansmitter located in an urban ea.

apter 20—Pittsburgh, nnsylvania
Hank Kaiser gave a report on FCC ws at the March 16 meeting. In dition, Curt Gramlich, customer vice engineer for AMPLEX, gave presentation on the manufacture, re, and handling of audio and eo magnetic tape.

apter 22—Central New York
The March 16 program was sented by Ross Kauffman, dictor of engineering, WCVB-TV, ston. Kauffman is currently chairn of Chapter 11. He presented a cussion on frequency allocations, veys, and record keeping of the ta (a subject of increasing importance to broadcasters as radio and television remote pick-up units proliferate). Kauffman spearheaded the frequency allocation coordination program in the Boston area.

Chapter 24—Madison, Wisconsin
The March 21 meeting was held at the WISC-TV transmitter. The program was an inspection of the new 18 kW Harrison transmitter and a demonstration of the surface acoustic wave filter method of vestigal sideband suppression. The SAW filter eliminates the "plumbing" commonly used for VSB attenuation.

Chapter 26—Chicago, Illinois
The meeting on March 30 was conducted in Lake Bluff for a program by Howard Knaack, president, Radio Aids. His subject, "It's Your Frequency—Thou Shall Not Stray," was an in-depth look at the world frequency measurement.

Chapter 28—Milwaukee, Wisconsin
The guest speaker at the March 21 meeting, held in the WTMJ studios, was Dennis Fraser of NEC America Inc. Fraser discussed the history of digital video and framestore development, as well as digital video effects systems available now.

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SBE

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Chapter 33—Southwestern Ohio

The March 9 meeting was held a WHIO Radio in Dayton. Steve Baughn, assistant chief engineer a WHIO Radio, explained and demon strated how the Cox stations utiliz the Tektronix 7L13 Analyzer t facilitate audio and transmitter ad justments, some difficult problems and how the 7L13 helped resolv them.

Chapter 46—Baltimore, Maryland

The March 15 meeting featured program by Dave Stuart of Kliegl He gave a brief description of th Kliegl operation, then provided a interesting review of the new trend in lighting fixtures.

Chapter 47—Los Angeles, Californi

Mike Ziol of Southern Californi Edison Company spoke on "The Fli Side of Your Breaker Box" at th March 15 meeting. Ziol also de scribed the Los Angeles power dis tribution system and some of th "nasties" that can come down th line into your equipment.

Chapter 48—Denver, Colorado

Dick Davis of NBS Time and Fre quency Standards Lab presented program on "Frequency Calibratio Using the TV Color Subcarrier." H also explained the use of networ TV programming as a frequenc standard traceable to NBS.

Chapter 49—Central Illinois

Chapter 49 met March 28 for program presented by Willia Meintel, an engineer from the FC Chicago field office. He discusse his function as a field inspecto covering the entire communication field, from CB to broadcast station There was also a question an answer session.

Chapter 50—Fort Collins, Colorado

Computer Image Corp. provided videotape demonstrating compute created animation at the March meeting, held at Colorado Stat University.

NOTE:

Pat Satter of the national offic announces that several of the new forming SBE chapters are progres ing very well with their organiza tion, and the society can expe some new active chapters in th near future. She will be happy send information to anyone inte ested in receiving the name of th person to contact regarding chapt activities in your area.

rom blue bananas to ag tails

Hell-o, goodbye

he control room tape decks at WROK, Rockford, nois, not only play back prerecorded programs, but record the telephone network, or "air-check." In dition, the machines may be started by a digital ck for automatically recording network spots.

ne Sunday, a former (you'll understand why he's rmer" in a minute) part-timer was playing a gious tape and chatting with friends on the phone ead of paying attention to his job. Sure enough, recorder had been left on automatic start with the phone input selected from a previous show.

ll was normal until the tape deck kicked into ord, erasing the church program and putting the ne conversation on the air. You can imagine the gram director's surprise when the startled board- realized something was amiss and bellowed, "What hell is going on!" *John Shepler, WROK, Rockford, ois.*

ave A Banana? Send It To roadcast Engineering Today

zoom in!

This is the official column of the American Society of TV Cameramen (ASTVC). The ASTVC can be contacted by writing to: P.O. Box 296, Sparkill, NY 10976. (914) 359-5985.

Take 1...Advice to the Job-Worn

(**Editor's Note:** This article is from Gregg Suhm, graduate of UNC presently servicing as associate director of ASTVC's Plans & Services, and a veteran of the "job-seeking route.")

Making the *big-time* in the television industry is not as easy as you may have been led to believe, especially if you plan to come to New York.

I know that the usual plan is to make the rounds in the Big Apple and, as a result, save years at the smaller, more "insignificant" stations. But the fact is that the smaller stations provide the necessary experience to be considered in this very competitive job market. After all, other pilgrams have come, and are still coming to Mecca. It's not exactly an original idea.

Even if you are well-qualified, there are a lot of people who went to some very fine TV-film schoo right here in New York (such NYU, Columbia, the New School

One sad fact is that a lot of th network operations have moved the West Coast. In other words, th city that was once a Mecca f radio and television has lost i place at the head of the line.

An executive at NBC told me tha if 36 openings came up in th spring, the vacation relief (VF people who worked last year fro April to November in VTR or e cameramen (etc.) would have to b offered the positions first, accordin to the NABET contract.

CBS hires year 'round (unlik NBC and ABC), but it's tougher y because they have the VR peopl from the other two networks t choose from. Well, what about th other stations in New York, such a Channels 5, 9, 11, and 13? Her again, a 1st Class FCC license is must. As Karl Malden says, "Don leave home without it!"

All in all, it would be better f the aspiring writer, producer, director to start small and work u rather than look to New York Cit for those greener pastures. By th way, NYC doesn't have any pa tures—a lot of muck and mire, b no pastures.

station-to-station

Interfacing the TG2/EBS with an automation system

By Edd Monskie, Chief Engineer, WDDL/WNCE, Lancaster, Pennsylvania

I was looking for a circuit that would completely interface our McMartin TG2/EBS generator with the automation system. We broadcast the tones as a source through the system rather than interrupt the program lines. The circuit would hopefully be compatible, simple, and inexpensive.

The remote state was already in the unit, but getting the end-of-message auxiliary tone signal was the problem. Having someone manually switch out of the tones or let the silence sense do the work was not copy. The following circuit filled the needs.

In the McMartin generator, pin 3 of IC7 (the timer) goes high for 22.5 seconds to time out the tones. I wanted to use the falling edge of that pulse to trigger a circuit. Using the 74123 IC seemed the easiest route to take. Other circuit ideas worked, but they also triggered on the rising edge of the 22.5-second pulse and that would confuse the automation.

In the 74123, you tie pins 2 and 3 high, use pin 1 as the input, and the Q output. Using pin 1, the IC generates a negative-going pulse on the output that triggers the 555 timer for 2.5 seconds. The high output pulse of the timer turns on Q1 and energizes K1. The NO contacts on the relay send the end-of-message pulse to the automation.

R1 (10K) and C1(.02) set the pulse width on the output of the 74123. They are not critical values as long as the pulse is long enough to trigger the 555. R2(100K) and C2(10 mfd) set the 2.5-second pulse on the 555 timer to close the relay contacts. You may need a longer time depending on your automation. The +5 and +12 voltages were easy to find in the McMartin, and there was plenty of empty space to fit a piece of PC board inside. All you have to do is bring the relay contact leads to the outside world. Also, if you tie pin 1 low and pin 3 high on the 74123, and use pin 2 as the input, it will trigger, but on the leading edge of a pulse (if that is easier to get to in your system).

The circuit should be compatible with almost any TTL tone generator and any automation system. You might find other uses for the circuit too. You can wire the generator in as another source, and program the test whenever you need it for the weekly test.

The circuit can be built probably for under $10 if you buy everything. You might be lucky, as I was. The only part that wasn't on the shelf was the 74123. I had to buy that for 99 cents!

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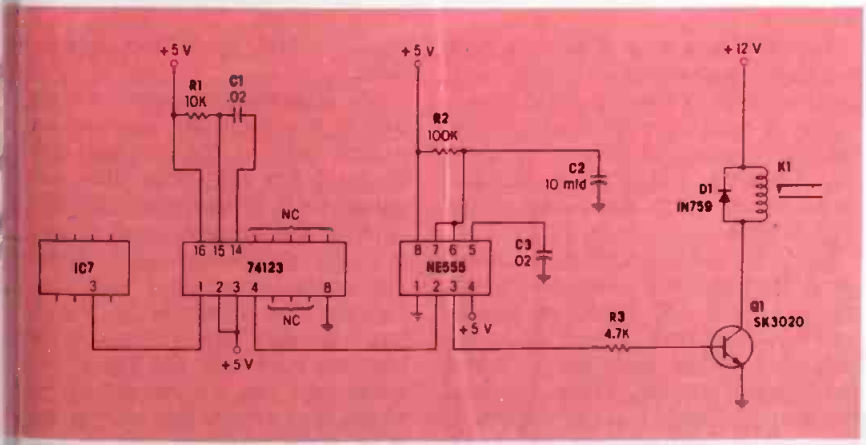
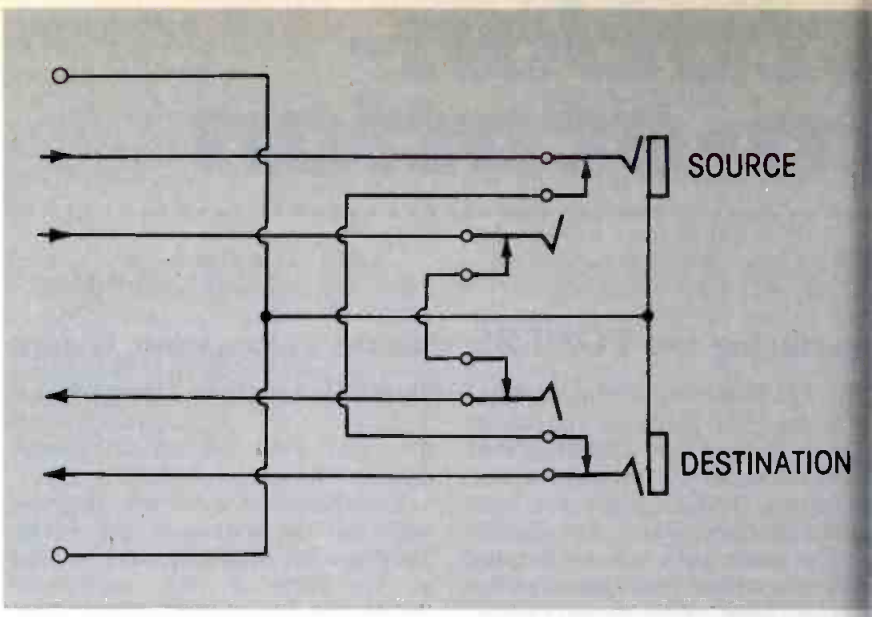
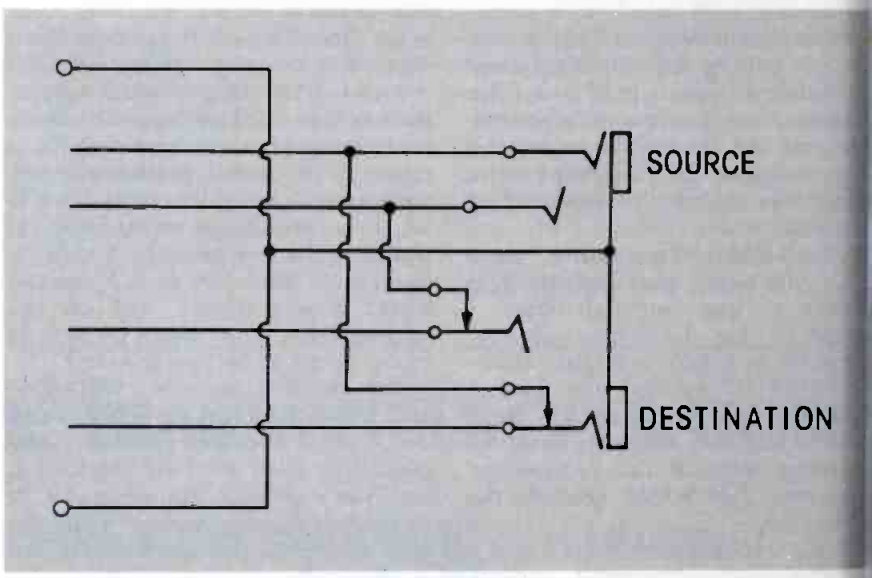


Figure 1



Figure



Figure

Station-to-Station

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Wiring patchbays for maximum flexibility

By James Sensenbach, Chief Engineer, KMUW, Wichita, Kansas

To allow maximum flexibility with minimum equipment, I wired our patchbays in a new (I think) way. Although I rarely want to cut off the normal connection when patching signal sources, I do want to cut that connection when patching signal destinations.

Our bays were wired in the usual short fashion—with normal circuits wired to the NC contacts on the patch jack at both ends. Putting the plug into either jack would break the normal circuit. This required the use of "multi" jacks (wired in parallel) to split a mono signal into stereo or to mix two stereo outputs to mono and send them down tw lines.

My improvement was merely t defeat the contacts on the signa source side of the normal circui Thus, plugs put into the sourc patch jack bridge the circuit, in cluding the normal, and plugs pu into the destination jack interru the normal circuit. I did this b shorting the contacts in the jac but when initially wiring the patch bay you wire both the signal sourc wires and the normal circuit wire to the jack where the source wirin is normally attached.

Advantages of this include usi

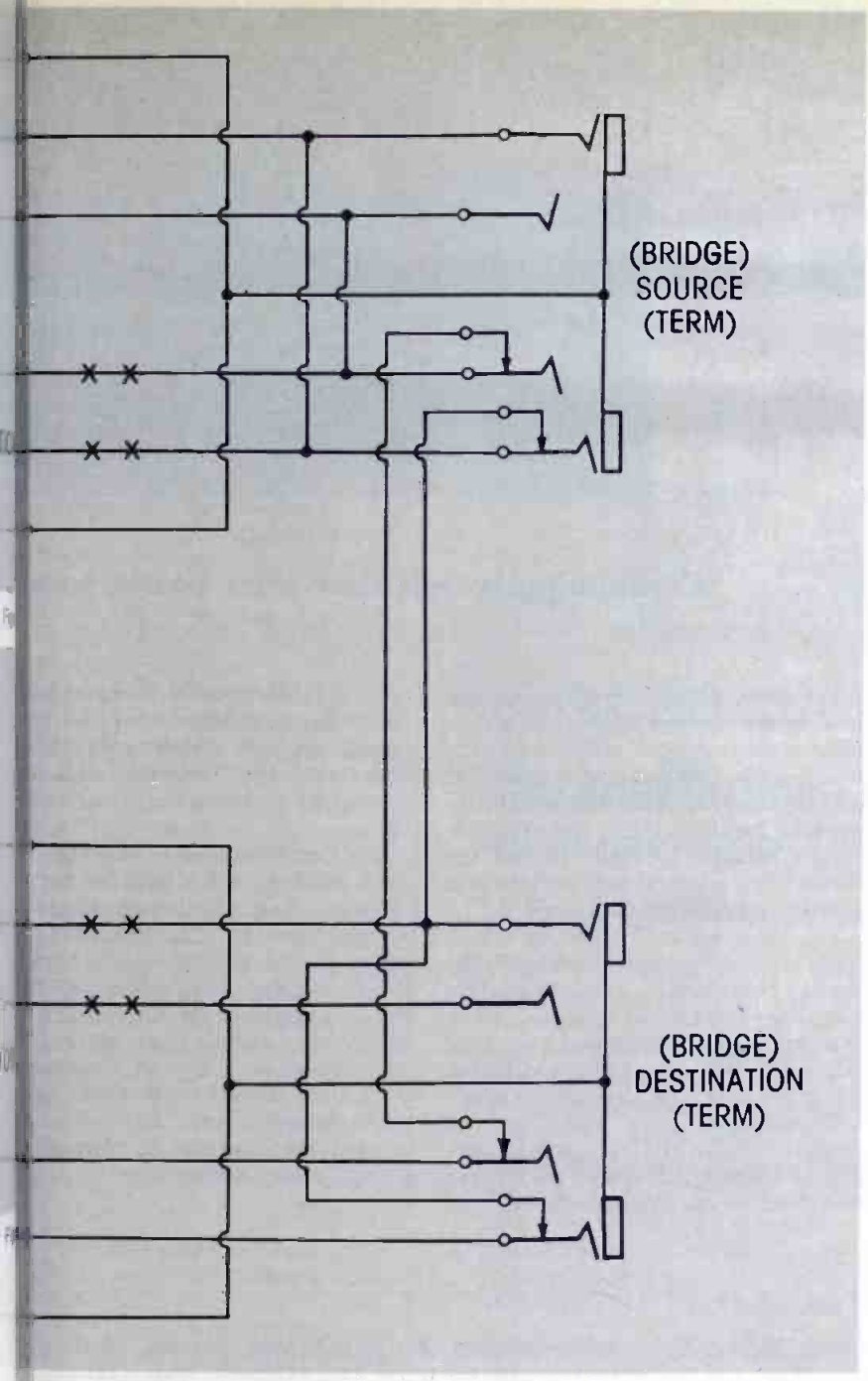

Figure 3

patchcord to split mono-to-eo and stereo-to-mono mixes. It vides a bridging and a terminat- access to each circuit through patchbay without using four s for each circuit. It allows ole attachment of bridging test ecording gear. It also eliminates t of the need for "multi" jacks.

here are some tradeoffs. The t obvious is impedance mis- ching. I've found this is not ous as long as you keep straight re the bridging inputs are and re the circuits are terminated. may still need a "multi" set of h jacks if you need a three-way signal split or if you want to split a test input that does not normally come through a jack. You might also need the multi if you want to split mono to stereo where neither "stereo" line is normalled from the mono line.

Although I find it hard to explain, it's easy to wire, and I think you can see that the tradeoffs are oriented to a broadcast station. I won't vouch for how well they work for a recording studio-type operation. They do come in very handy when working with telephone company program lines.

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Station-to-Station

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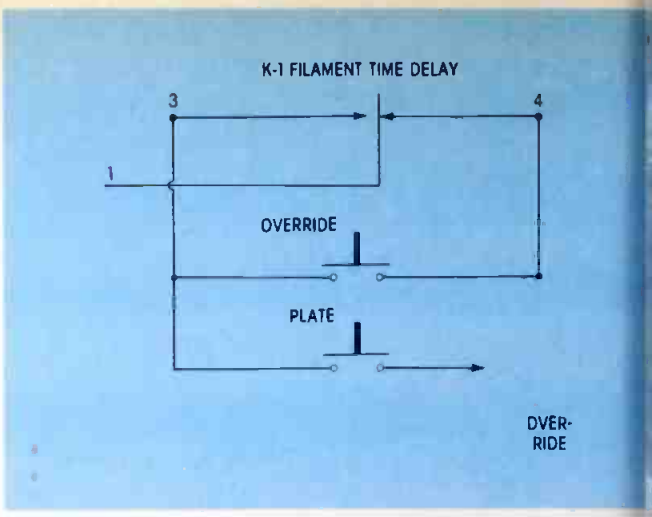

Figure 1

Eliminating recycle time after power outag

By Alex Fraser, Chief Engineer, WVNH Radio, Salem, New Hampsh

We were plagued with numerous one to ten second power interruptions from the local utility company which have knocked our transmitter off the air with a three-minute recycle period. (The power company's excuses typically placed the blame on a squirrel getting into one of their sub stations.)

We have a CSI T-10-A rig which uses a three-minute filament time delay relay (K1) in its control circuitry. The circuit is closed when the relay is energized, making contact between pins one and three; when not energized, contact is made between pins one and four. A normally open SPDT switch was placed in circuit between pins three and four so that when closed, the control circuit would be complete no matter which position the rel contactor is in. After relay K1 energized, the override switch normalled by the transmitter oper tor.

For the switch, I used a Switc craft 84206-L which has the featu of being illuminated with either amber color in the normally op position, or green when close Power for the lamp was taken fr the transmitter's 24-volt supply. T illuminated switch is an option, b one appreciated by the transmitt operators as it is located eas when needed; and the two colo remind the operator to normal t switch after K1 energizes.

Editor's Note

In the January Station-to-Station column, Mark Wharton took exception to a comment in the June 1977 Radio Workshop concerning the use of a spectrum analyzer for official equipment performance measurements.

Wharton presented a valid method for computing THD from the spectrum analyzer display. This, however, is not the reason a spectrum analyzer is presently unacceptable for FCC measurements.

The rules require a measurement of *modulation sensitivity*. That is, at each frequency, you must show how much signal is necessary to produce a particular level of modulation. Unless your system happens to be perfectly flat, the spectrum analyzer display of response doesn't meet this requirement.

The spectrum analyzer is, indeed, a useful tool, but at least once a year you'll still have to resort to conventional techniques to satisfy FCC requirements.

Peter Burk

ew roducts

his month's New Products sec- kicks off with just a few of the ducts introduced at last month's B convention. Next month, adcast **Engineering** will feature complete NAB Wrap-up issue, a summary of the exhibits, ussion of new products, and ments on the convention itself. the total NAB story, be sure to l the June Wrap-up issue.

Search-to-cue accessory

multi-point search-to-cue and timing accesory providing up to ue storage capability for a ty of mixdown and over-dub- operations has been introduced mpex Corporation.

10-button keyboard panel and a store control allow access to a al memory array. The keyboard s up to 20 cues in memory and lls them as desired.

ree time displays show tape memory time, and keyboard time. (The time displays are nately available through the LED readout.) An additional ay shows current cue refer- The main time display auto- ally returns the tape time upon ing the desired memory time e.

Circle (80) on Reply Card

Portable color camera

C's new CTC-5X portable color ra features a 1½-inch elec- viewfinder. The camera uses nch striped filter vidicon tube will use any 1-inch C-mount

er features include an omni- tional condenser-type mike, for external mike, front panel r switch for activating porta- TR, adjustable control for in- or outdoor shooting, automatic ivity control for changing light , and EIA RS 170 sync.

camera can be used with any and is NTSC compatible. The ncludes the camera, the view- , an AC power supply, 8-foot and a removable hand grip. nal accessories include a ble power supply, battery; n battery for DC power supply ing portable camera oper- s; and a 25-foot extension

Circle (82) on Reply Card page 88

new products

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Personal computing products

Heoth Compony has introduced line of personal computing produ for hobby, home, educational, a small business applications.

The product line is design around two new computers, the and the H11. The H8 is an 8 computer based on the popu 8080A microprocessor. It feature front panel with octal data en and display, and a resident mon with built-in bootstrap for o button program loading or storin

The H11 is a 16-bit compu using the Digital Equipment Cor ration (DEC) LSI-11 with 4k mem built-in backplane, and regula switching power supply. Sys compatible peripherals includ CRT terminal; paper-tape reac punch; serial and parallel in faces; a "hard copy" print terminal; and a cassette play recorder.

Circle (81) on Reply Card

Routing switcher

Vertical interval switching available for *Dynasciences'* 88 series routing switcher line.

The 8500 series modular syst consists of a single rack housing to six 12x1 plug-in modules. Ea module contains both video a audio switching circuitry and ha self-contained power supply. Lo through high-impedance inputs p mit configurations of up to 12 without signal degradation.

The system can be expanded larger configurations through use of external video distribu amplifiers.

Circle (83) on Reply Card

Video camera

Sony Corporation's new small- color video camera utilizes la scale, charge-coupled technol and a fourth-generation semi ductor.

Designed for wide applicatio ultra-high-density memories, si processing, and logic circuitry, CCD camera contains about 110 elements on a single chip, allowing size, weight, and po consumption reductions in cur electronic equipment. The new measures 10.3mm by 0.1mm, each element 36 micron millime by 13 micron millimeters, arra

a matrix of 226 horizontal ments by 492 vertical elements, a total of 111,192 picture ments.

The CCD camera will contain ee chips, and by utilizing Sony's prietal spatial offsetting tech- ue (which allows a doubling of izontal resolution), provides for atly increased picture resolution. erline transfer organization, ied channels, and SNO2 trans- ent electrodes made possible provements in picture quality, olution, sensitivity, and signal-to- e ratio. As a result, greater n 280-line horizontal resolution 700-lux minimum scene illumin- n (AT F2) are achieved.

Circle (84) on Reply Card

Frequency counter

hillips Test and Measuring In- ments has introduced a new -MHz automatic frequency ter to complement its existing matic counter with a tempera- -compensated crystal oscillator. cording to the company, the 6664-01 counter is particularly able in production testing, re maximum accuracy and a stability time base is an ntial requirement.

e unit can be used with a uency generator to produce a tant readout.

Circle (85) on Reply Card

Frame synchronizer

e new VW-1 frame synchron- from *ADDA Corporation* is gned to meet the need for -quality, low-cost full-frame hronizers. The VW-1 is a fourth nonic, digital synchronizer with ability to lock remote network, and satellite feeds to station ence.

e synchronizer functions as a for heterodyne color U-matic der formats. The system will pt any NTSC-type standard an optional freeze frame.

Circle (86) on Reply Card

1-inch camera tube

A new 1-inch Plumbicon TV era tube which will permit the n of portable cameras for EFP s available from *Amperex*.

ysically interchangeable with entional 1-inch Plumbicon pick- ibes, the S73XQ can be used in ng cameras with only minor it modifications. Its limiting ution is 1,000 TV lines; modula- depth is 65% at 400 TV lines, a advance over previous 1-inch

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new products

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Plumbicon tubes. The increase beam acceptance of its photoconductive layer reduces signal decay lag, even at low light levels: decay lag at 50 msec is typically 2% signal levels down to 50 nA.

Other technical advances in the S73XQ include an increase in beam reserve (resulting in reduced comet tailing and blooming) and a low capacitance target contact that allows overall signal-to-noise ratio to be maximized. Another feature of the tube is a modified triode electron gun operating in a diode mode, improving the electron beam energy distribution uniformity to provide smaller spot size and better control over spot shape.

Circle (87) on Reply Card

Videotape editor

Convergence Corporation is introducing their new ECS-100 series Superstick editing control system suitable for ENG, EFP, and commercial post-production. Because of their modularity of design, Superstick systems allow the start of a basic low-cost system, and expansion to meet the needs for increased capability. They interface with most low-cost videocassette recorders, as well as the new 1-inch Type "C" teleproduction videotape recorders.

The system's new CUT/LAP allows for program fades and simulated dissolves from a single playback VCR, without adding a switcher or time base corrector. Other features include Liplock™ audio pitch control, automatic return to edit, auto tag, and ADR (automated dialogue replacement).

The post-production version, the ECS-103, also gives SMPTE time code; A/B rolls; special effects; split edits; multiple source machine CRT display of all edit data, and hard copy edit decision list for automated assembly; programmable animation; full automatic audio monitoring; and adjustable edit cycles.

Circle (88) on Reply Card

Digital time base corrector

Consolidated Video Systems' new broadcast-quality, digital time base corrector is designed for heterodyne VTRs.

Called the CVS-516, the new TBC is compatible with current heterodyne VTRs. Standard features

detection; programming lookahead (19 program and 9 time events, with optional clock); multi-CRT capability; dual (music and voice) program busses; programmable source cards which are switch-selected to match various makes of audio sources; the six-source multi-cue system; and multi-level subroutine capability.

The series is field-expandable and upgradable, with computer ports for billing/traffic automated systems, telephone line remote connection, VEL, 'debug' module, modem, load/dump cassette system, etc.

Circle (90) on Reply Card

News recording system

A News Recording System (NRS) developed for major radio stations and networks has been developed by *UMC Electronics Company*.

NRS is a computer-logic system incorporating a series of Beaucart audio cartridge tape recorder/producers and sequencing equipment to allow news to be recorded automatically from the UP or AP wire services.

In addition to the NRS, UMC Electronics has introduced a full line of equipment produced by its broadcast products division, includinb Beaucart cartridge tape machines, motors, and tape heads.

Circle (91) on Reply Card

ude correction of chroma/ minance delay problems, a 3 dB roma noise reduction, velocity mpensation, and color dropout mpensation. The unit also has VS's Gyrocomp circular memory.

Other features include a broadst stable gen lock sync generator, utomatic VTR sync, and an adstable proc amp. Users can plug an optional image enhancer/noise ducer printed circuit card which duces luminance and chroma ise, and improves subjective resotion. A 16-line window plug-in is so available as an option.

Circle (89) on Reply Card

Computer

The Cetec Schafer Series 7000 corporates a third-generation croprocessor (the Z-80) with a mputer-grade CRT terminal as ntrol center.

The basic sequential Series 7000 stem is supplied with a CRT rminal, 16 audio source capacity e first nine are random selectable 999 trays), and thousand-event emory. The system may expand to ur separate CRT channels, up to ,000 events, and up to 64 audio urces.

Features include Plain English ogramming; programming error

professional services

advertisers' index

classified

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WANTED: McMartin RM-45 remote metering kit. Angus Rockett, WBRU(FM), 75 Waterman St., Providence, RI 02912, (401) 272-9550. 5-78-1t

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HELP WANTED (CONT.)

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TELEVISION—CCTV Video Maintenance Technicians. Full Benefits. Greater New York, Suffolk County or New Jersey Area. Send resume to: VPC, P.O. Box 268, New Hyde Park, N.Y. 11040. 6-77-tf

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Mountain View, California—*Dennis Triola*, 2680 Bayshore Frontage Rd., Room 102, Mountain View, CA 94043, (415) 961-0378.

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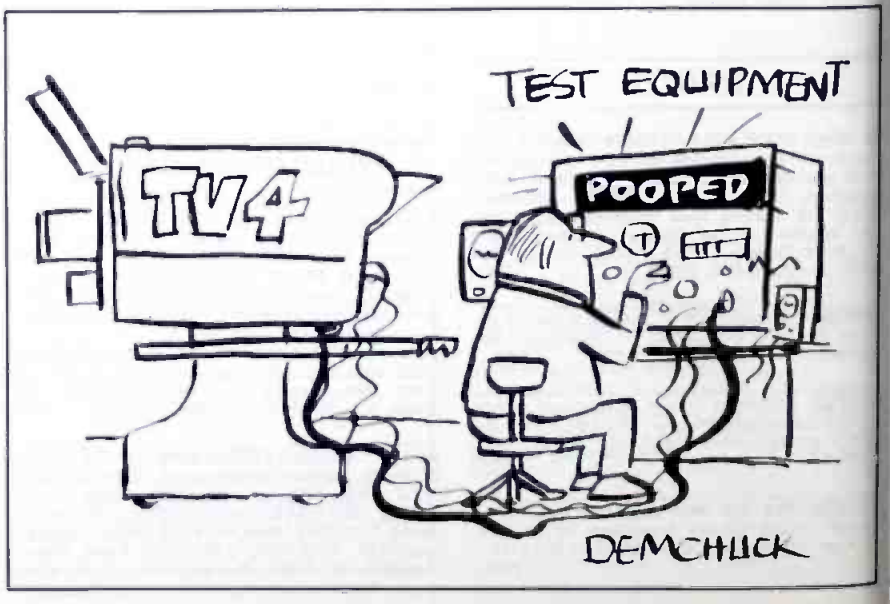

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14	26	38	50	62	74	86	98	110	122	134	146	158	170	182	194	206	218	230	242	254	266	278	290	302	314
15	27	39	51	63	75	87	99	111	123	135	147	159	171	183	195	207	219	231	243	255	267	279	291	303	315
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24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240	252	264	276	288	300	312	324

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14	26	38	50	62	74	86	98	110	122	134	146	158	170	182	194	206	218	230	242	254	266	278	290	302	314
15	27	39	51	63	75	87	99	111	123	135	147	159	171	183	195	207	219	231	243	255	267	279	291	303	315
16	28	40	52	64	76	88	100	112	124	136	148	160	172	184	196	208	220	232	244	256	268	280	292	304	316
17	29	41	53	65	77	89	101	113	125	137	149	161	173	185	197	209	221	233	245	257	269	281	293	305	317
18	30	42	54	66	78	90	102	114	126	138	150	162	174	186	198	210	222	234	246	258	270	282	294	306	318
19	31	43	55	67	79	91	103	115	127	139	151	163	175	187	199	211	223	235	247	259	271	283	295	307	319
20	32	44	56	68	80	92	104	116	128	140	152	164	176	188	200	212	224	236	248	260	272	284	296	308	320
21	33	45	57	69	81	93	105	117	129	141	153	165	177	189	201	213	225	237	249	261	273	285	297	309	321
22	34	46	58	70	82	94	106	118	130	142	154	166	178	190	202	214	226	238	250	262	274	286	298	310	322
23	35	47	59	71	83	95	107	119	131	143	155	167	179	191	203	215	227	239	251	263	275	287	299	311	323
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15	27	39	51	63	75	87	99	111	123	135	147	159	171	183	195	207	219	231	243	255	267	279	291	303	315
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19	31	43	55	67	79	91	103	115	127	139	151	163	175	187	199	211	223	235	247	259	271	283	295	307	319
20	32	44	56	68	80	92	104	116	128	140	152	164	176	188	200	212	224	236	248	260	272	284	296	308	320
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