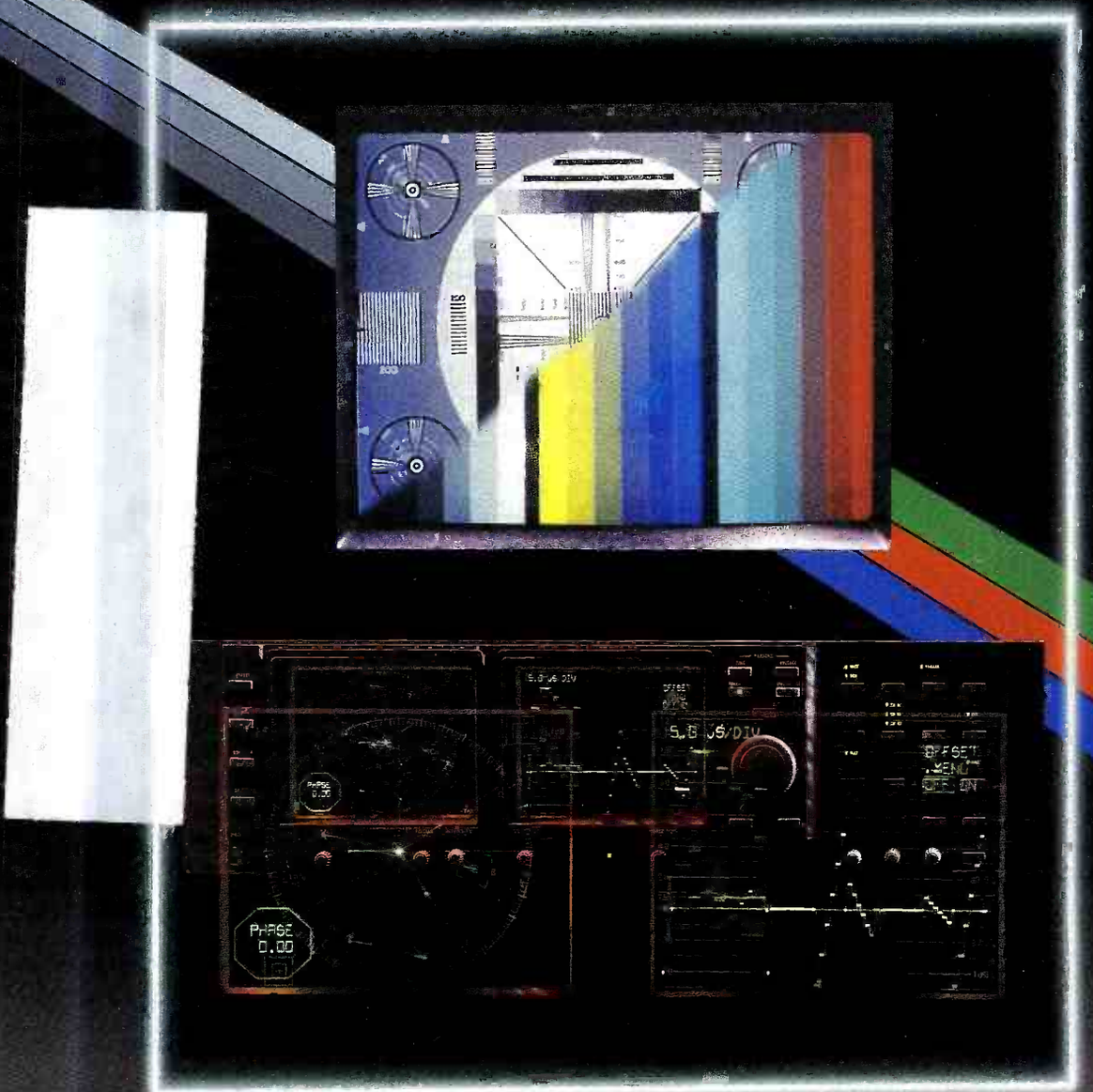
BROADCAST ENGINEERING®
AN INTERTEC PUBLICATION
November 1988/$3



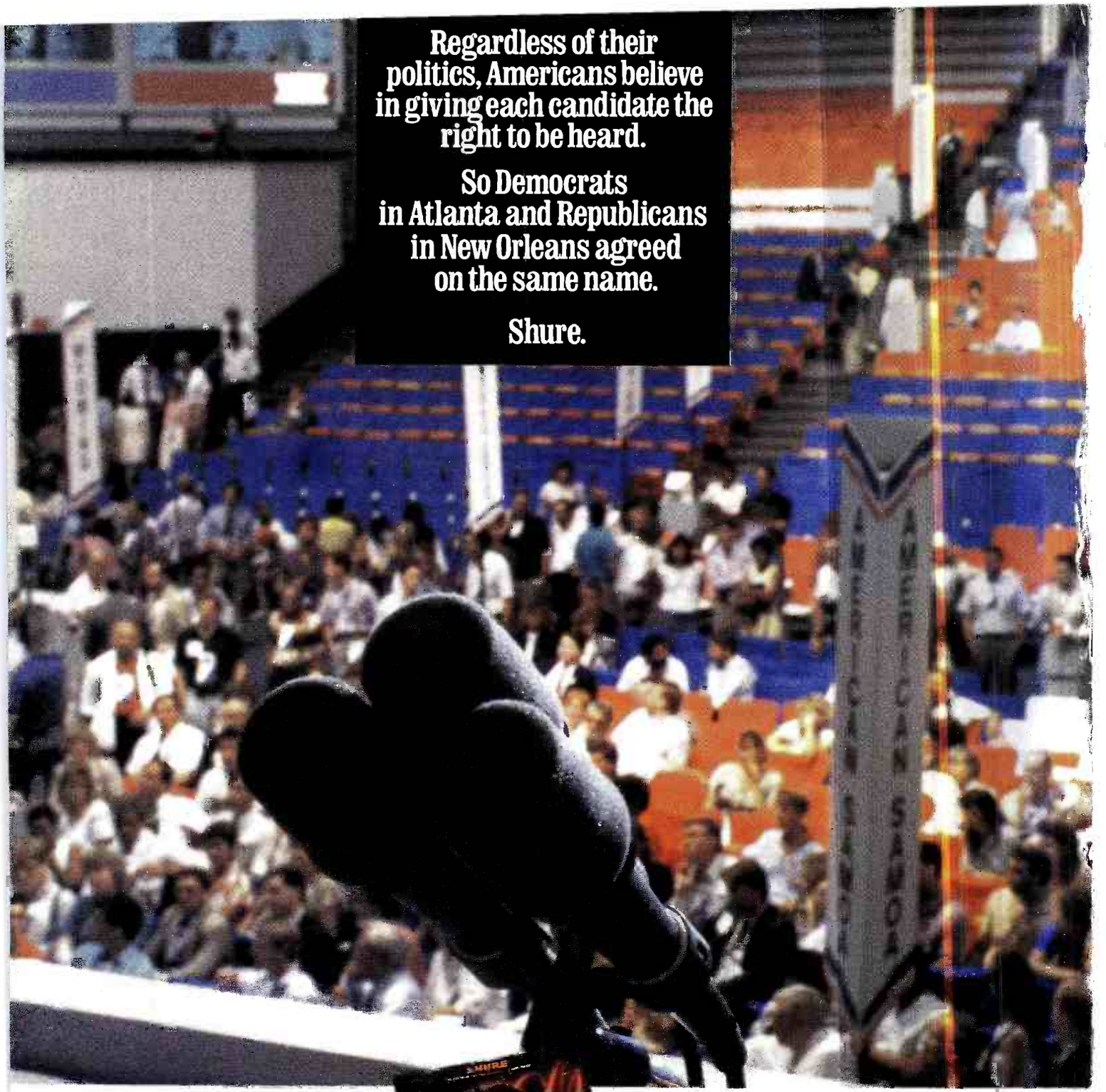
Maintaining broadcast equipment

BROADCAST ENGINEERING • NOVEMBER 1988 • ANNUAL MAINTENANCE SPECIAL REPORT

Regardless of their politics, Americans believe in giving each candidate the right to be heard.

So Democrats in Atlanta and Republicans in New Orleans agreed on the same name.

Shure.



It's no coincidence that when the world is listening, professionals insist on the sound quality and reliability of Shure.

For years, Shure circuitry products and microphones have been a key part of national political conventions, and other major events from the Grammy Awards...to the Olympics.

Providing reliable Shure products is important to us, because performance on your job is so important to you.

For a free copy of our new catalog containing specs on our full line of professional microphones, circuitry products and automatic microphone systems, mail the coupon today. *Or call 1-800-257-4873. (In Illinois, 1-800-624-8522).*

Photo: SM57 Microphones at 1988 Democratic Convention.

Circle (1) on Reply Card

Yes, please send the new Shure Professional Microphone/Circuitry Products Catalog.

Name_____

Title_____

Company_____

Address_____

City, State, Zip_____

Telephone ( )_____

BE 11/88

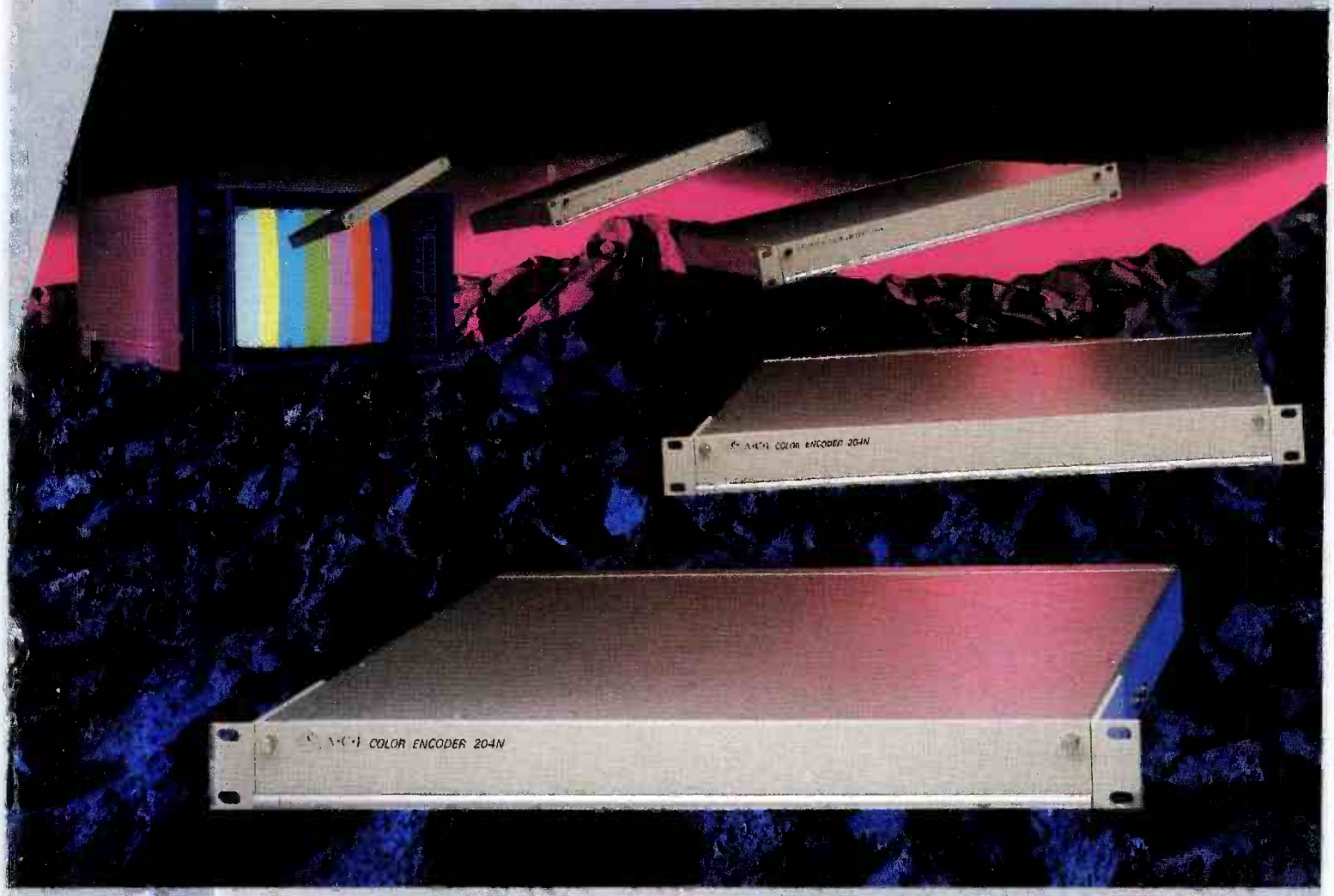
SHURE®

The Sound Of The Professionals®...Worldwide.

222 Hartrey Avenue, Evanston, IL 60202-3696

the SOURCE

A•C•E Encoders . . . Voted 10,000 times over as the industry standard.



A•C•E

With over 10,000 in use worldwide, the Cox encoder is the standard of the industry. The latest version, the 204N, is now sold under the name A•C•E.

An encoder, which converts the RGB outputs from such sources as character generators or paint systems into composite NTSC, can be the weak link in your system. The addition of an A•C•E encoder to even an inexpensive character generator can produce excellent results.

The 204N offers stable performance and easy installation in a rugged, flexible package. The unit accepts either RGB or CAV (MII or Betacam) inputs and provides six composite outputs. The 204N even offers 32 test signals including full-field and SMPTE color bars, red field and pluge.

Don't compromise your graphics system with an inferior encoder. Insist on the A•C•E 204N.

The 204N Encoder from A•C•E, celebrating their 20th year in the design and manufacture of broadcast television equipment.

A•C•E, Abekas-Cox Electronics – Available in the U.S. exclusively from Midwest Communications and backed by Midwest's nationwide service network.

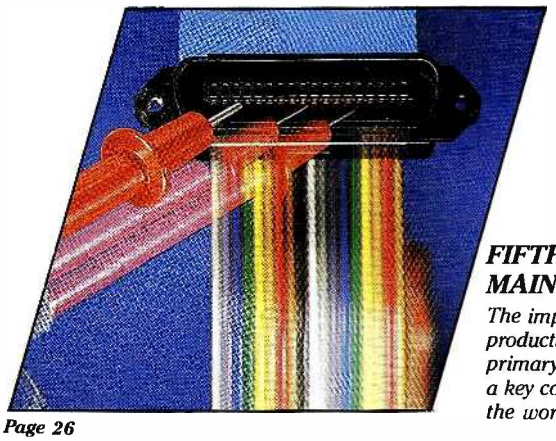
MIDWEST
Communications Corp.

One Sperti Drive
Edgewood, KY 41017
(606) 331-8990

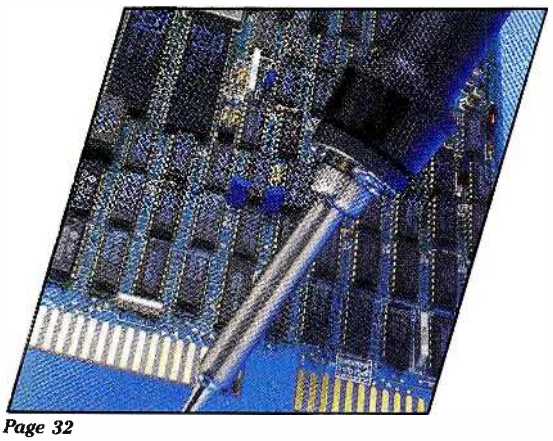
Circle (3) on Reply Card

Contents

November 1988 • Volume 30 • Number 11



Page 26



Page 32

Page 38

BROADCAST engineering

FIFTH ANNUAL STATION MAINTENANCE SPECIAL:

The importance of proper maintenance at a broadcast or post-production facility cannot be overemphasized. Maintenance is the primary responsibility of the engineering department. And it is a key concern to all levels of management. Our examination of the world of maintenance will include the following topics:

ON THE COVER

An aggressive maintenance program is the key to staying on the air. An investment in tools, test equipment and personnel for maintenance functions always pays handsome dividends. Our cover this month illustrates some of the new measurement tools available to broadcasters to assure top-quality video. (Photo courtesy of Tektronix.)

DEPARTMENTS

Hardtop or Convertible

Choose a CCD camera that's right for what you want because there's no reason to pay for more than you need.

The Hitachi FP-C1 3-chip auto set-up camera is a rugged workhorse when you need a stand-alone model with high resolution and high sensitivity that's easy to operate.

The FP-C2 dockable version gives you the added versatility of owning one camera for all formats. Our multi-standard, switchable encoder provides outputs for Beta, MII and S-VHS.

Both incorporate the latest chip technology to give you unparalleled picture performance. Call your local Hitachi dealer or the regional office nearest you for specs and a demonstration.

Hitachi Denshi America

175 Crossways Park West
Woodbury, NY 11797

Circle (4) on Reply Card

New York	Atlanta	Chicago	Dallas	Los Angeles
516-921-7200	404-451-9453	312-250-8050	214-233-7623	213-328-6116

Strong market for satellite TV predicted

Satellite television, especially DBS, will revolutionize European broadcasting, according to the recently published study, "Direct Reception From Satellite in Western Europe," by Frost & Sullivan. The report predicts a viewer potential of approximately 700,000 for 1989 (the scheduled first full year of European DBS and middle-power satellite television). By 1997, this figure should rise to 19.5 million.

Development of satellite television in Europe will vary from country to country. Although DBS is not likely to win over many viewers in Holland and Belgium because of high cable penetration, it is expected to be in great demand in Great Britain, which has a weaker cable market.

Equipment sales, according to Frost & Sullivan, will amount to approximately $11 million in Europe next year. This figure will peak at $684 million in 1992. British manufacturers can expect $362 million in revenue from reception equipment by 1992. German producers, however, will garner only about half this amount.

Williams joins ATTC in engineering role

Edmund A. Williams has joined the staff of the Advanced Television Test Center (ATTC) as manager of transmission and propagation engineering.

ATTC was formed recently by a coalition of broadcasting companies and industry associations to test and report on transmission systems for advanced TV service, including high-definition television. The results of ATTC findings will assist the federal government and U.S. industry in selecting among proposed new systems and determining necessary national standards to implement the new service in this country.

Over-the-air tests will be launched this year. They are designed to determine whether advanced television can be transmitted using more than one TV channel or using parts of the radio spectrum not currently used for TV broadcasting.

Plans abandoned for satellite broadcasts

The British government has abandoned its plans to begin broadcasting BBC 2 and channel 4 exclusively via satellite by 1990. With satellite broadcasts, the government had hoped to make additional terrestrial frequencies available for commercial TV stations. The possibility of establishing a fifth TV channel in Great Britain is being considered.

Cooperation sought among satellite channels

Britain's MTV satellite channel has expressed interest in cooperating with the 3-SAT channel jointly operated by German, Austrian and Swiss public broad-

Continued on page 100

BROADCAST ENGINEERING

Editorial and advertising correspondence should be addressed to: P.O. Box 12901, Overland Park, KS 66212-9981 (a suburb of Kansas City, MO); (913) 888-4664. Telex: 42-4156 Intertec OLPK. Circulation correspondence should be sent to the above address, under P.O. Box 12937. RAPIDFAX: (913) 888-7243.

EDITORIAL
Jerry Whitaker, *Editorial Director*
Brad Dick, *Radio Technical Editor*
Carl Bentz, *Technical and Special Projects Editor*
Rick Lehtinen, *TV Technical Editor*
Paula Janicke, *Staff Editor*
Dawn Hightower, *Associate Editor*
Tom Cook, *Senior Managing Editor*
Maura Base, *Editorial Assistant*
Pamela S. Fleener, *Editorial Assistant*
Pat Blanton, *Directory Editor*

ART
Kristi Sherman, *Graphic Designer*

EDITORIAL CONSULTANTS
Fred Ampel, *Audio*
Nils Conrad Persson, *Electronics*
Ned Soseman, *Video*
Michael Heiss, *Consulting Editor*
Don McCroskey, *Consulting Editor*

BUSINESS
Cameron Bishop, *Group Vice President*
Duane Hefner, *Publisher*
Stephanie Hanaway, *Marketing Director*
Cynthia Baker, *Promotions Coordinator*
Dee Unger, *Advertising Business Manager*
Mary Birnbaum, *Advertising Coordinator*

ADMINISTRATION
R.J. Hancock, *President*
Doug Riemer, *Circulation Vice President*
Jane J. Powell, *Circulation Director*
JoAnn DeSmet, *Circulation Fulfillment*
Barbara Clare, *Reader Correspondence*
Kevin Callahan, *Creative Director*

TECHNICAL CONSULTANTS
Eric Neil Angevine, *Broadcast Acoustics*
John H. Battison, *Antennas/Radiation*
Blair Benson, *TV Technology*
Dennis Ciapura, *Radio Technology*
Dane E. Ericksen, *Systems Design*
Howard T. Head, *European Correspondent*
Wallace Johnson, *FCC/Bdct. Engineering*
John Kean, *Subcarrier Technology*
Donald L. Markley, *Transmission Facilities*
Harry C. Martin, *Legal*
Robert J. Nissen, *Studio/Communications*
Hugh R. Paul, *International Engineering*
Art Schneider, A.C.E., *Post-production*
Elmer Smalling III, *Cable/Satellite Systems*
Vincent Wasilewski, *Communications Law*

MEMBER ORGANIZATIONS
SUSTAINING MEMBERS OF:
- Acoustical Society of America
- Society of Broadcast Engineers
- Society of Motion Picture and TV Enginers

Member, Association of Business Publishers — ABP
Member, Business Publications Audit of Circulation — BPA

BROADCAST ENGINEERING is edited for corporate management, engineers/technicians and other station management personnel at commercial and educational radio and TV stations, teleproduction studios, recording studios, CATV and CCTV facilities and government agencies. Qualified persons include consulting engineers and dealer/distributors of broadcast equipment.

BROADCAST ENGINEERING (ISSN 0007-1794) is published monthly (except in the fall, when two issues are published) and mailed free to qualified persons within the United States and Canada in occupations described here by Intertec Publishing Corporation, 9221 Quivira Road, Overland Park, KS 66215. Second-class postage paid at Shawnee Mission, KS, and additional mailing offices. POSTMASTER: Send address changes to **Broadcast Engineering**, P.O. Box 12960, Overland Park, KS 66212.

SUBSCRIPTIONS: Non-qualified persons may subscribe at the following rates: United States and Canada: one year, $25.00. Qualified and non-qualified persons in all other countries; one year, $30.00 (surface mail); $108.00 (air mail). Back issue rates, $5.00, except for the Buyers' Guide/Spec Book, which is $20.00. Rates include postage. Adjustments necessitated by subscription termination at single copy rate. Allow 6-8 weeks for new subscriptions or for change of address.

Advertising offices listed on page 151.

INTERTEC PUBLISHING CORPORATION

LEADER

THREE.

IN ONE.

And only in the 5870 Vector/Waveform Monitor.

Only the 5870 gives you a unique numerical readout of SCH phase. *And* waveforms from 2 channels, plus vector information - appearing at the same time or separately. All this in one half-rack!

No compromises.

This unsurpassed unit performs like three superb instruments in one.

2-channel NTSC waveform monitor: Features simultaneous or separate display of both channels, and dual filter display, plus a CRT readout of SCH phase, full 525-line select capability with a CRT readout of the line and field selected, memory preset and recall of nine lines. Add to this the unit's remote control capability and extra-bright CRT, and you have a terrific waveform monitor.

Full-fledged NTSC vectorscope: Boxes for error limits of ±2.5° and ±2.5 IRE units; ±1° differential phase and ±1% differential gain; internal Z-axis blanking for line selection and continuous phase adjustment. The 5870 is a great vectorscope, too!

Designed to go anywhere.

Operating from any 11-20 Vdc or 85-264 Vac (48-440 Hz) power source, this 12-lb, half-rack unit is ideal anywhere that size and weight are critical.

Call toll-free

1 800 645-5104

In NY State

516 231-6900

Ask for our full-line Catalog, an evaluation unit, and the address of your nearest Leader Distributor.

Leader Instruments Corporation
380 Oser Avenue, Hauppauge, New York 11788
Regional Offices:
Chicago, Dallas, Los Angeles, Boston, Atlanta
In Canada call Omnitronix Ltd. 416 828-6221

LEADER

FOR PROFESSIONALS WHO KNOW THE DIFFERENCE

For Product Demonstration Circle (5) on Reply Card

For Product Information Circle (6) on Reply Card

Parts is parts

A problem has come up with your station's transmitter, a camera or an audio console. You carefully examine the faulty equipment, drawing on your skills and past experience to diagnose the problem. You determine that a new component is needed. Now comes the frustrating part of your job: When you try to order the component, you find out that either you can't get it or it is so overpriced that your boss won't let you buy it.

The equipment manufacturer says it's on back order from the supplier, or it's a special part the company doesn't carry any more. (The product has been discontinued, you know.) Or, because it's a relatively new product and there is no established level of spares, it will be a while before any are available. Or it is available, but there is a minimum order of $100, cash only.

In the overall scheme of things, these kinds of problems don't crop up that often. But when they do occur, they overshadow the easy fixes because of the frustration level and the inordinate amount of time it takes to solve them.

Not only that, but as time goes by, it is likely that parts problems will develop more often rather than less often. Take a look at the schematic of almost any current professional audio-video product. You will find that whole chunks of circuitry that used to consist of a couple handfuls of components, yards of wire and several ounces of solder now are manufactured in the form of one tiny IC.

Some of these chips are standard—designed and manufactured by a well-known IC producer and second-sourced by other producers. These types of devices will be around for a while. But what about chips that are not second-sourced? What about those chips that were a big hit three years ago, but are dinosaurs today? Can you find those chips today? What about two years from now?

Problems in a piece of electronic equipment usually occur at the tail end of the product life cycle. Replacement parts normally are available when you buy a new computerized system. The big question is whether they also will be available when the product inevitably fails later, in the field, when you're responsible for fixing it.

Still, the replacement parts supply system works fairly well in most cases. If the demand for a particular part is there, someone will find a way to fill it and make a profit in doing so. The key is volume. Unfortunately, the volume derived from the professional audio-video industry is tiny compared with the computer and consumer industries. Our ability to purchase replacement parts in the future will be determined, to a large extent, by the popularity of products in other markets.

The moral of this story is: When you buy a new product, order the spares set. The only things in this world for certain are (1) death, (2) taxes and (3) no stock on the part you want.

Nils Conrad Persson

Conrad Persson,
consulting editor

INSTANT SIGNAL PROCESSING— JUST ADD TALENT.

Orban's new digitally-controlled 787A Programmable Mic Processor integrates an unprecedented combination of vital signal processing functions into one powerful, compact package. It delivers fully programmable **mic- or line-level** processing with access to 99 memory registers through MIDI or RS-232 interfaces, or a console-mounted remote control. All you do is add the talent.

The 787A offers a space-saving, elegant solution to many annoying problems (voice deficiencies, poor room acoustics, noise, sibilance, wandering levels) in the broadcast control room, TV newsroom, or in commercial production, video post, audio-for-video, and film scoring facilities. The 787A gives you an important competitive edge by enabling you to repeat the same optimum sound every day for every voice, quickly and efficiently.

The 787A is complete audio processing arsenal in a box—a flexible parametric EQ, a smooth compressor, noise and compressor gates, and a handy de-esser. The 787A can be operated in mono or dual-channel/stereo (with the addition of a second-channel slave). An optional Jensen transformer mic preamp with 48V phantom power adds further flexibility.

Orban's 787A Programmable Mic Processor will help you remember tomorrow the way your talent sounded yesterday.

orban Blue Chips

Orban Associates Inc.,
645 Bryant Street, San Francisco, CA 94107 USA
(415) 957-1067 Telex: 17-1480 FAX: (415) 957-1070

Circle (7) on Reply Card

Follow the rules that still exist

By Harry C. Martin

Sweeping deregulation of the broadcast industry has taken place in the past few years. As part of the FCC's new approach, monitoring of station technical operation and logging has been drastically reduced. The regulations that remain, however, are being enforced vigorously. Stations should not perceive the relaxation of rules as a signal that the chief engineer's fundamental responsibility to maintain a technically sound operation has been diminished.

Operator on duty

Broadcast stations must have at least one licensed commercial radio operator or permit-holder (of any class license unless otherwise endorsed) in charge of the transmitter during station operation. This operator, who may be stationed at the transmitter site, at an ATS monitor-and-alarm point or at another site where extension meters are installed, must be trained to observe and control the transmitter. While on duty, the operator may perform other functions, such as disk jockey or announcer, provided the work does not interfere with the proper operation of the transmission system.

Chief operator

A chief operator must be designated in writing at each broadcast station. A copy of that designation must be posted with the station's license. If the chief operator is hired on a contract basis, as permitted for AM stations of less than 10kW and all FM stations, the contract must be in writing and in the station's files.

Chief operators are not required to be full-time, but they must work the number of hours necessary to fully perform their prescribed duties. The chief operator also must hold a valid operator's license (of any class, unless endorsed). When the chief operator is not available for duty for some reason, such as illness or vacation, an "acting" chief operator must be designated temporarily.

Responsibilities of the chief operator include inspecting and calibrating the station's transmission system, monitors, metering and control systems, and repairing or adjusting this equipment if it malfunctions. At AM stations that have specific measurement requirements, the chief operator must perform measurements or tests periodically as required by the rules or the station license.

Once a week, the chief operator must review the station's log and other records to ensure that the entries are being recorded properly and that the station is being operated in accordance with the license and FCC rules. The chief operator is responsible for signing off on the records after the review. These duties may be delegated to others, but the chief operator must maintain supervisory control and assume responsibility for the proper execution of the tasks.

Station log

Most of the logging requirements were officially abolished in the early 1980s. A station log, however, still must be maintained at every AM, FM and TV station. The licensee is at liberty to record in the log those measurements and parameters of particular importance to the station. In a brief interview, an FCC field examiner told **BE** that a licensee should keep whatever records are most likely to be helpful to document performance or answer technical questions.

The log must be kept and signed by qualified station employees in a legible and understandable format. Changes made to log entries must be crossed out and corrected rather than erased. All corrections must be approved by the person who keeps the log, the chief operator, the station manager or an officer of the licensee.

The station log must contain:

- Tower lighting information. Describe any extinguished or malfunctioning tower light; the date and time the malfunction was noted; and the date, time and nature of adjustments, repairs or replacements.
- A record of all EBS tests sent and received. This can be kept on a separate log, which will be considered part of the station log.
- Any other information required in the station's authorization or by the commission. For example, if an inspection of a facility shows a consistently high power-level problem, the commission may require the licensee to record transmitter power for a period of time to ensure that the problem has been remedied.

Directional AM stations without an FCC-approved antenna sampling system have additional specific logging requirements, listed in section 73.1820(2) of the rules.

Controlling remote sites

Guidelines issued in September for stations that are operating their transmitters from remote sites recognize the reliability of the newer remote-control systems, yet they take into account the provisions in the Communications Act that require someone to be in control of the transmitter at all times. Some guidelines are:

- The choice of a remote-control system is the prerogative of the licensee, as long as the system will keep the station operating within its authorization and following the applicable rules.
- Dial-up telephone circuits, dedicated telephone circuits, special remote pickup unit cue and control or microwave channels, and other systems are acceptable for metering, adjusting and controlling operation. The system may be accessed by any qualified station employee from any location. However, a duty operator must be kept in some fixed position, with uninterrupted access to the transmitter, to ensure a means of turning the station off.
- Duty operators may be employed to supervise more than one station concurrently, provided that such additional employment does not hamper their ability to respond to the transmission system operating requirements and the EBS requirements of each station.
- Automatic alarms that warn of out-of-tolerance conditions must be unambiguous and must be directed to the duty operator first.
- Remote-control operation requires a staff member to monitor the EBS receiver, activate the EBS encoder promptly and broadcast EBS tests and emergency action announcements.

A copy of the public notice on remote-control operations is available free of charge. For information, contact Kate Weber, c/o Reddy, Begley & Martin, 2033 M Street NW, Suite 500, Washington, DC 20036.

Martin is a partner with the legal firm of Reddy, Begley & Martin, Washington, DC.

Announcing Master-21™ from GVG.

Master control that's expansive. Without being expensive.

Introducing the new MASTER-21™ Master Control System from Grass Valley Group.

With its standard high performance features, available options, and built-in GVG quality, MASTER-21 packs more power than you've ever seen in any master control system.

Let alone in a *complete* system priced around $17,000.

The MASTER-21 system is the first master control system ever designed with a *keyed-in video status display, so you can monitor preset events and transitions.*

Plus a long list of standard features including *16 inputs, stereo audio, a keyer with matte generator, pre-roll,* and RS-232/422 serial control of *every* active function on the panel.

The new MASTER-21 Master Control System from GVG. The price/performance breakthrough you must see to appreciate.

For complete details, contact the Grass Valley Group office nearest you.

Grass Valley Group®

A TEKTRONIX COMPANY

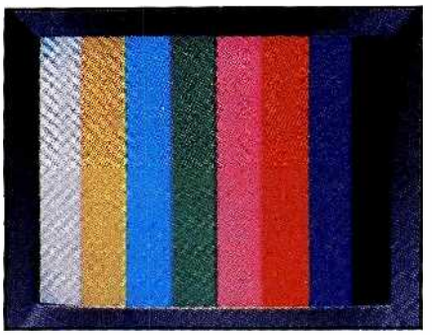
THE GRASS VALLEY GROUP INC.
P.O. Box 1114, Grass Valley, CA 95945 USA
Telephone (916) 478-3000
TRT: 160432

OFFICES: New York (201) 845-7988; District of Columbia (301) 622-6313; Atlanta (404) 493-1255; Chicago (219) 264-0931; Minneapolis (612) 483-2594; Dallas/Fort Worth (817) 483-7447; Los Angeles (818) 999-2303; San Francisco (415) 968-6680; GVG International Ltd. (UK) + 44-962-843939; Grass Valley Group Asia (HK) + 852-3-7396632

Circle (8) on Reply Card

Part 2

Strictly TV



Inside the visual PA

By Carl Bentz, technical and special projects editor

The levels of the TV signal mandated by FCC regulations and good technical practices were discussed in Part 1 of this series. The nature of the signal places a number of wide-ranging demands upon the transmission system in terms of timing and frequency response. Problems of response probably play a greater role than any other consideration in the design of the equipment.

Testing the signal

It would be possible to run tests on a transmitter system using a number of specific frequencies, monitoring the response to each at various points in the system. However, a more efficient method involves using square-wave test signals with rise times selected to avoid overshoots in transmission. During monitoring of the signals at various test points in the system, you may observe tilt and rounding on the square-wave corners as impaired frequency response.

Two square-wave frequencies prove to be useful for this work. The lower frequency of 60Hz (50Hz in PAL) aids in detecting response errors in the frequency range below approximately 15kHz. A 15kHz square wave serves to determine response to several hundred kilohertz. These two test signals exhibit low response problems, when observed on an oscilloscope, as a tilt of the flat part of the square wave (top or bottom) and a rounding of the corners. Ideal response would produce flat tops and bottoms without any rounding at the corners.

Tilt can be determined for both test signal ranges. The measurement is made on a portion of the square wave derived from a demodulator. The starting and ending points of the measurement are suggested to avoid ringing as a result of pulse rise times. To ensure the best measurements, set the sweep range and vertical sensitivity of the oscilloscope as large as possible to accommodate the entire length of trace segment of interest. Tops and bottoms of the square waves should be measured separately.

Rounding is determined from the 15kHz signal. It is realistic to delay the start point and to define a duration along the scope trace for the measurement. Separate observations should be made on rising and falling sides of the square wave.

The effects of tilt and rounding on a video signal in the transmission system can be seen in the demodulated image. Unless it is excessive, tilt is least obvious. It appears partly as a flickering in the picture and partly as a variation in luminance level from top to bottom and/or side to side of the image. Rounding, in this case, manifests itself as a reduction of detail in medium-frequency parts of the image.

If tilt or round error is excessive, it might be difficult for TV receivers with greater sensitivities to signal levels for sync detection to lock to the degraded signal. Most modern receiver designs can accommodate a wide range of error, but following the best practices, the technical staff should endeavor to find and correct the source of the problem.

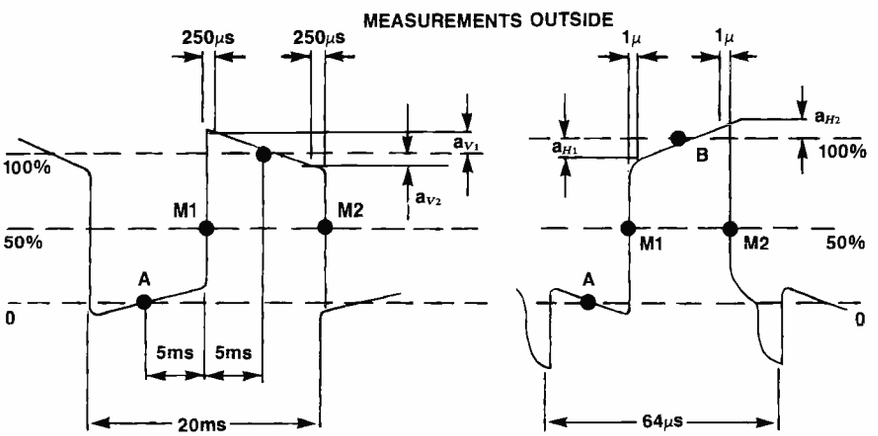


Figure 1. Measurement of tilt on the TV signal is shown for 50Hz and 15kHz signals.

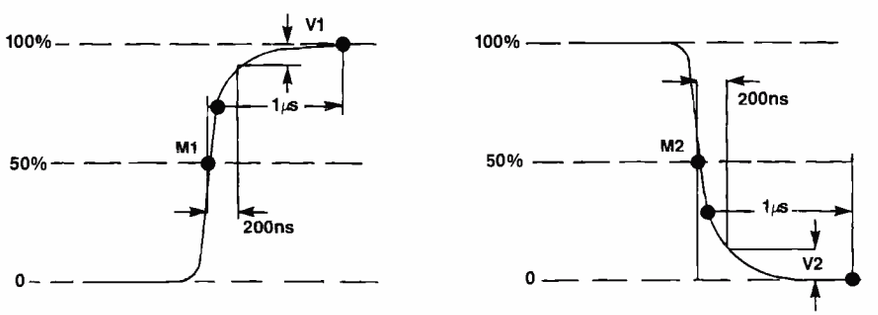


Figure 2. Measurement of rounding of a 15kHz square-wave test signal to find higher frequency-response problems.

Editor's note: This article has been adapted from "Rigs and Recipes: How to Measure and Monitor," a publication of Rohde & Schwarz.

A bold statement. But no exaggeration.

Here's why . . . No 2-track machine available today—at *any* price—offers the same level of advanced technology, plus Studer audio performance and renowned Studer quality. Only the A807.

With the A807, Studer defines a new price point. If you don't believe us, check out the competition . . . It won't take you long, because there isn't any.

Broadcast, post production, or studio—in whatever audio environment you operate—make it your business to check out the Studer A807. Start with price . . .

High Tech, Low Price

Anyone who thinks "Studer" always means "expensive," please take note. With the A807, your dollars actually buy *more* now than they did five years ago—more technology to help you do your job better and faster.

Agile and Easy to Use

The Studer A807 is a fast, full-featured machine for making quick work of your production tasks.

Features include: • tape shuttle wheel • reverse play • right hand edit • tape dump • varispeed • multifunction tape timer and autolocator with programmable "soft keys" • digital setting of audio alignment parameters for 3 tape speeds and 2 tape types • phantom powered mic inputs on portable version • RS 232 port • optional 1/4 track playback head • a variety of portable and console configurations, including a 4 channel ½" version.

Studer Audio Performance and Reliability

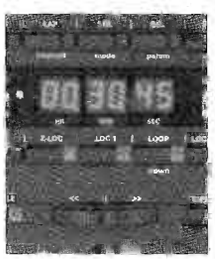
Advanced phase compensated audio-electronics and Dolby HX Pro™ ensure that this compact Studer delivers full-sized Studer sonics.

A massive, die-cast chassis and headblock, rugged AC spooling motors and new brushless DC capstan motor, remind you that the A807 is built with the same quality and precision that have been synonymous with the Studer name for four decades.

So—if "affordable" is not the first word that comes to mind when you think of Studer—think again.

Ask us about the A807. The most affordable fully professional recorder on the market.

Portable version of the A807 with wood side panels



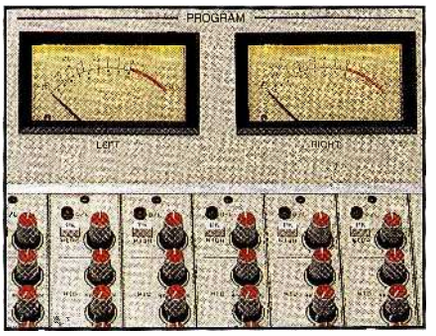
Timer-autolocator-control panel

Available from Studer Revox Full-Line Dealers. Or contact us directly: Los Angeles (818) 780-4234 / New York (212) 255-4462 / Chicago (312) 526-1660 / San Francisco (415) 930-9866 / Nashville (615) 254-5651

STUDER REVOX

STUDER REVOX AMERICA INC.
1425 Elm Hill Pike • Nashville, TN 37210

Circle (9) on Reply Card



Let the FCC know what you think

By John Battison, P.E.

The FCC has issued a proposed rulemaking (MM Docket 88-376) amendment "to improve the quality of the AM broadcast service by reducing adjacent interference and by eliminating restrictions pertaining to the protected contour."

It behooves any interested engineer with sound ideas (no pun intended) on this subject to express them to the commission at this time. Comments filed should include one original and five copies and must be received by Nov. 22. I view this as, possibly, the last chance to have an effect on the issues concerning AM reception. Reply comments must be filed by Dec. 22.

AM technical changes

A change under consideration by the commission is the NRSC audio pre-emphasis, which would limit the highest permissible audio frequency being broadcast to approximately 10kHz. This proposal has been called NRSC-1. Another proposal is to modify the emission limitations of AM stations. Termed NRSC-2, this proposed standard would increase the restrictions of the occupied bandwidth criteria now specified in Section 74.44(a). (See Figure 1.) The proposal also has been called the *RF mask*.

Battison, **BE**'s consultant on antennas and radiation, owns John H. Battison and Associates, a consulting engineering company in Columbus, OH.

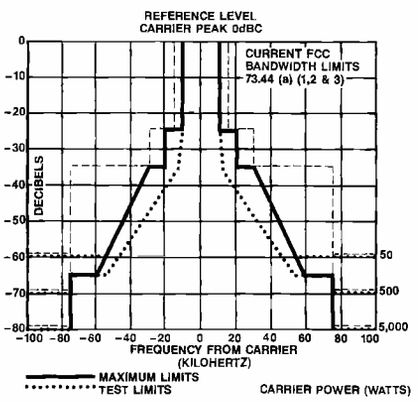


Figure 1. *The proposed NRSC-2 standard would restrict the occupied bandwidth specified in 73.44(a). Such a reduction could greatly lower the interference generated by AM stations.*

The FCC will not impose measurement methods such as with a spectrum analyzer. Any appropriate measurement device will do, provided that disputes about the measured accuracy are resolved in favor of those made by a spectrum analyzer. This may involve additional expense in new equipment.

The idea of adopting emission limits rather than audio standards may be appealing to many, but I am inclined to suggest that the project be completed in two stages. The first stage should include the use of audio pre-emphasis as proposed in NRSC-1. If this technique is not sufficient, then the emission limits could be imposed through NRSC-2.

The commission points out that using the RF mask would eliminate the need for complex rules concerning modulation and transmission parameters, thereby allowing the NRSC standard to be maintained. Use of the mask also would tend to decrease the need for on-site transmitter inspections. An off-air check could be made as the monitoring van passed through a signal area. Imposition of the mask would require only one relatively inexpensive piece of equipment for the station—a device to monitor splatter.

One manufacturer already has developed such a device, which was in operation at the SBE National Convention and **Broadcast Engineering** conference in Denver. It quickly identifies the source of interference. If such equipment becomes widely available, splatter monitoring may become common again.

The commission has tentatively concluded that the implementation of narrow emission standards (NRSC-2) is preferable to any pre-emphasis standard (NRSC-1). Comments have been requested on the relative costs and advantages of implementing each system. The commission also is trying to determine whether broadcasters view the NRSC audio characteristic as an absolute frequency-response limit or merely as a post-audio-processing signal adjustment.

AM interference rules

A major change to rule 73.37(b), which governs the amount of interference between stations, also has been proposed. It specifies the prohibited overlaps of 0.025mV/m and 0.5mV/m contours for existing stations and 1mV/m and 0.05mV/m contours for a first service station.

Suggested rule changes propose giving broadcasters the option of accepting more interference in certain unpopulated or unserved areas, while being allowed to increase radiation in other, more desirable, directions. In other words, broadcasters could accept interference up to their 1mV/m contours in sparsely populated areas, provided they maintain the present 26dB ratio. Of course, it still would be necessary to protect the existing co- and adjacent-channel stations.

The NAB opposes the increase in interference levels for AM service, saying that to permit increased interference would be a mockery of the commission's technical standards. Such a change might encourage receiver manufacturers to produce equipment designed for lower-quality, higher-interference environments. NAB also is opposed to allowing individual broadcasters to make decisions concerning acceptance of additional interference without strict supervision.

I am inclined to agree with the NAB. There are many cases in which a station might reach an area with few listeners while covering another area where a stronger signal would better serve the audience. But the decisions concerning interference should be made by the commission's engineers, not by a non-technical owner who might be more interested in ad dollars than interference. There is enough interference in the AM band without deliberately making more.

For further information concerning AM issues, contact Hank Van Duersen at the FCC, 202-632-9660.

FM concerns

FM broadcasters should be concerned about the strong outcry for additional power for Class A FM stations. One proposal would permit an increase in power up to 6kW ERP. The PRM for Docket 88-375 was issued Sept. 12, and the release number is 88-251. All comments must be received by Nov. 22, and reply comments are due Dec. 22.

Introducing
The most innovative pair of STLs on the market.

- **Frequency Agile**
- **Comprehensive Metering**
- **Excellent Selectivity**
- **Built-in Receiver Transfer Circuitry**
- **Switchable Monaural/Composite Operation**

The PCL 6020 and 6030 Studio-Transmitter Links blend technology and innovative design to provide a reliable, high-performance alternative to leased telephone lines.

The PCL 6000 Series STLs feature transparent audio, excellent selectivity, built-in receiver transfer circuitry, extensive front-panel metering, and frequency agility.

Now, you can select monaural or composite operation from a single system in the field. Receiver IF bandwidth can be set in the field or in the factory for 100 to 500 kHz channel spacing.

PCL 6010 Transmitter

The 6010 Transmitter is common to the 6020 and 6030 systems, and uses direct modulation techniques. FM frequency modulation is converted to final output through an up converter mixer. For long STL paths, a 15-watt transmitter power output is available as an option.

PCL 6020 System

The dual conversion PCL 6020 Receiver uses an FM quadrature detector to provide maximum fidelity. Use the PCL 6020 to replace an older STL, such as the PCL-505 for a 10 dB improvement in SNR and stereo separation.

PCL 6030 System

The PCL 6030 system offers the highest performance in hostile RF environments. The triple conversion PCL 6030 Receiver uses a digital pulse counting discriminator to provide the transparent audio necessary with aggressive processing techniques.

Call Moseley Marketing for more information, and for all your STL needs.

Moseley

111 Castilian Drive
Santa Barbara, CA 93117
805 968 9621
FAX: 805 685 9638

Circle (10) on Reply Card

Space junk caught in dangerous orbit

By Elmer Smalling III

Instead of the dust and ice that ring other planets in the solar system, rings of man-made debris, or "space junk," are forming around the Earth. Approximately four million pounds of debris from the space efforts of many nations encircle the Earth, posing a hazard to space travel and satellite operations. Each year, 1.8 million pounds of debris are orbited. Projections suggest an increase to 2.7 million pounds per year by the year 2000.

This junk consists of non-operating payloads (21%), spent rocket stages (25%) and general debris (49%). The North American Aerospace Defense Command (NORAD) and Goddard Spaceflight Center have a list of 6,194 trackable objects, which are baseball-sized and larger, among the junked items. Included in this category are 1,582 spent payloads, 68 interplanetary probes, and 4,544 pieces of orbital and interplanetary probe debris.

In addition to the trackable scrap, more than 30,000 objects fall into the marble- to baseball-sized category. Trillions of tiny paint flakes and an even larger number of tiny aluminum oxide dust-sized particles also are a source of concern. Traveling at velocities greater than 3km/s, even these microscopic particles can be lethal!

Smalling, **BE**'s consultant on cable/satellite systems, is president of Jenel Systems and Design, Dallas.

Close encounters

A significant contributor to the orbital debris was a series of Delta rocket second-stage breakups. These breakups occurred when residual fuel exploded, sometimes as long as three years after launch. A recent Ariane third-stage booster breakup left about 460 trackable particles.

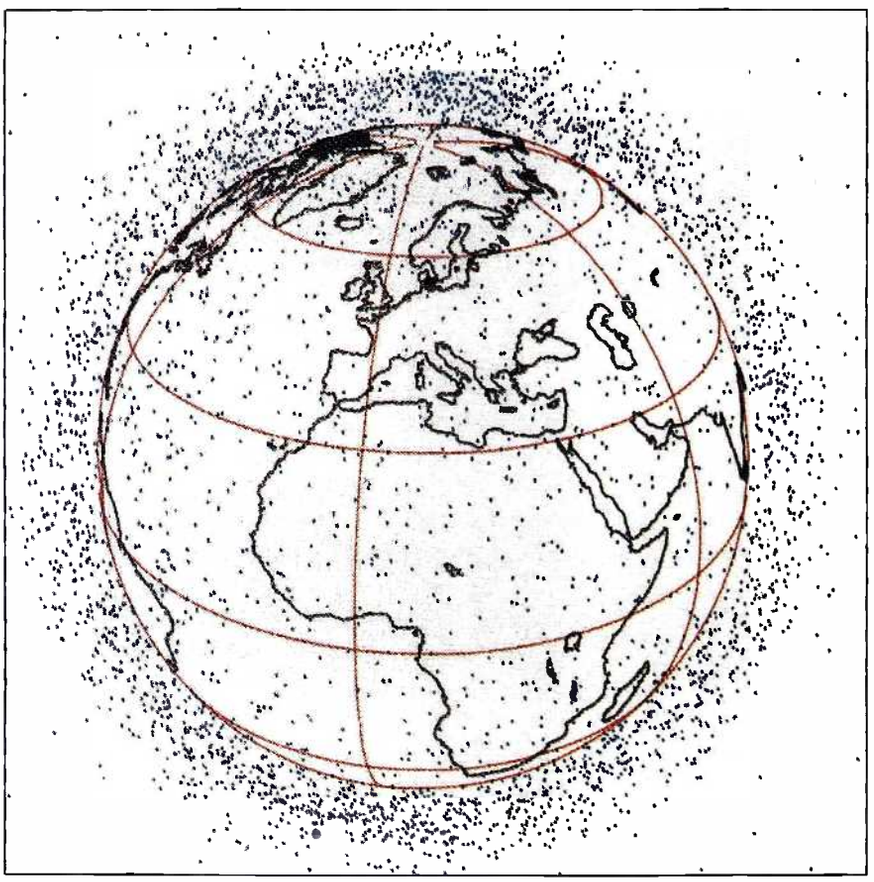
During an orbit of Challenger STS-7, the commander reported a pit on the outside of one of the cabin windows. The window was constructed to withstand pressures of 8,600 pounds per square inch and temperatures of 482°C. When the shuttle returned to Earth, it was found that the chip had been caused by a piece of white paint about 1/100-inch in diameter that had been traveling at a velocity of 3km/s to 5km/s!

A particle the size of a grain of table salt can puncture an astronaut's extravehicular suit and lead to fatal depressurization. A piece of space junk the size of a marble easily could penetrate a space station and cause depressurization. NASA scientists calculate the probability of a space station being hit by a small particle as one in 222 for every 10 years in orbit.

Shielding technology is now under development because of the increased probability of future spacecraft colliding with space junk. One shielding scheme employs an idea first proposed by astronomer Fred Whipple in the 1930s. It calls for a bumper shield or an outer skin or sheet on the spacecraft.

Methods also are being theorized for cleaning up space. One idea suggests the use of a giant foam ball to act as a resistance to orbiting particles. The junk would be slowed down enough to fall back into the atmosphere and disintegrate. A second method calls for the use of a laser beam to atomize the junk. NASA, studying several methods in the lab, is using high-velocity cannons to propel small test particles at more than 3km/s.

The elimination of space junk is a top-priority program and should include participation by all space-using countries. Large particles can be accounted for. But hundreds of trillions of tiny particles pose a deterrent to laser and microwave communications in space. In addition, they mean hazardous, possibly disastrous, consequences for space vehicles and orbital stations.



Debris from a 4-Earth radii altitude for objects greater than 10cm in diameter. (NORAD Catalog, May 30, 1987)

FOR NEWS EDITING, ON-AIR, AND PRODUCTION

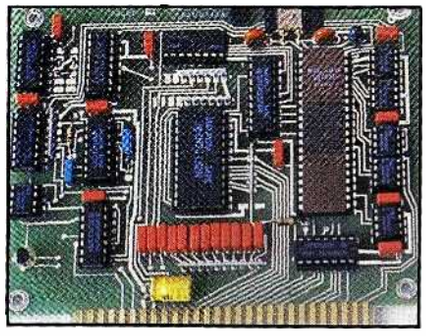
For news editing, on-air, or in the production studio, Otari has exactly the equipment and features to fit any application, or budget.

When you are ready for a multitrack recorder, you can choose from our BQII, MKIII/4, MKIII/8, MTR-10, or the MX-70 with 8 or 16 tracks. Need a 2-track? Choose our famous "workhorse" MX5050 BII, MKIII/2, or the brand new MX-55! Looking for top-end performance? The MTR-10 has all the features you need to stay ahead in the competitive world of broadcast. We also offer three models of our CTM-10 cart machine, and if yours is an automated radio station, our ARS-1000 reproducer is the most popular in the world.

So you see, whatever you need for today, or for the future, Otari can provide it from a complete line of high quality, ultra-reliable tape recorders. Call your nearest Otari dealer today, or contact Otari at (415) 341-5900 for "Technology You Can Trust".

OTARI®

Circle (11) on Reply Card



Digital sampling in real time

By Gerry Kaufhold II

Simple analog-to-digital (A/D) converters, such as the R-2R ladder and analog integration circuits discussed in previous "Circuits" columns, can handle only slow signals. The R-2R ladder circuits "hunt" for a match, and they are only as fast as the software that controls the searching and switching. Analog integration is more accurate, but much slower. These circuits work well for digital multimeters or for audio signal generators. But what about all those real world signals such as video, music program audio, speech synthesis and high-speed data communications?

Fast A/D conversion

To capture extremely fast analog waveforms, three elements are needed: a fast A/D converter, a memory buffer and a fast digital signal manipulator. If the digital signal is to be output as a reconstructed analog signal, a fast digital-to-analog (D/A) converter with filters also is required.

A simple A/D circuit may use a single comparator, but many comparators are used to speed up the process for a fast A/D circuit. This method, illustrated in Figure 1, is called *direct comparison*.

The signal under test goes through a buffer amplifier and is applied in parallel to the inputs of all the comparators. Each comparator is biased to a specific voltage.

Kaufhold is an independent consultant based in Tempe, AZ.

If the analog signal is to be captured with an accuracy of 1%, 100 comparators must be used. If the reference voltage is 1V, and 100 linear voltage levels are used for the comparison, the voltage step between comparators is 10mV. Logarithmic or specialized references are available by weighting the reference voltages. Because there are input offset voltages in the comparators, the voltages applied at the reference inputs may be modified slightly to compensate.

The outputs of the comparators provide a direct reading of the signal under test. For example, a signal of 800mV will produce an output pattern of 80 comparators high and 20 comparators low.

Processing the information

Processing 100 bits of information from the outputs of the comparators is not practical because of the cost. But recall that seven bits of binary can express one part in 128. If the outputs of the comparators go through an encoder, the 100 comparator outputs can be translated swiftly into a 7-bit binary word. This 7-bit binary word can be manipulated in a memory buffer made up of 8-bit memory cells.

The encoder for translating the 100 comparator outputs into seven bits of digital information uses AND gates, OR gates and inverters. To prevent erroneous readings, an overload indicator might activate when all the comparator outputs are high, and might indicate a no-signal condition when all comparator outputs are low.

The speed of this type of direct comparison is limited by the speed of the comparators and the speed of the digital memory circuits. After the signal under test has been captured, its 7-bit binary value is read into the digital memory buffer, where it can be processed.

Output

The output of the digital memory circuit is applied to the R-2R ladder D/A converter, which has eight bits. The output signal will be accurate only to 2% of full scale and will contain some distortion due to quantization error. In addition, a fixed time delay will occur because of the time it takes for the incoming signal to pass through the digital memory buffer.

The number of samples per second sets an upper limit on the frequency of the signal that can be captured. For example, if the memory circuits can shift data each microsecond, the maximum frequency that can be sampled is 500kHz.

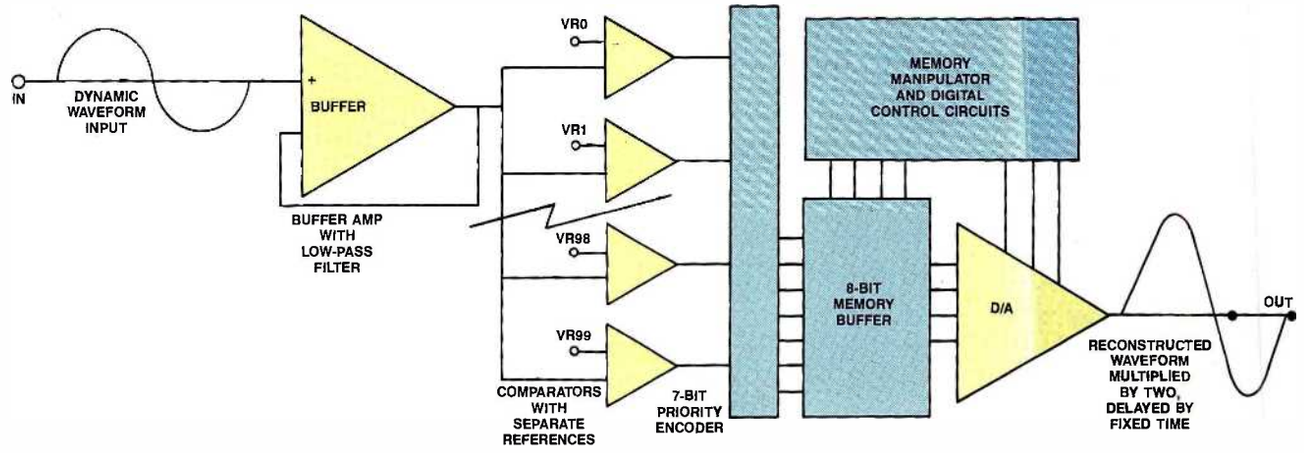


Figure 1. Direct comparison A/D converter for capturing and manipulating fast dynamic waveforms.

Be prepared.

For the first real improvement in AM sound in more than a decade.

The future offers real promise for AM radio. NRSC AM radios are almost here, factory-installed in new cars. Soon, home stereos and portable sets will also be NRSC-equipped.

NRSC (National Radio Systems Committee) has created a voluntary national transmission standard that makes wideband high-fidelity AM radios practical. As broadcasters adopt the NRSC standard, receiver manufacturers can extend and flatten their frequency response without risk of increasing the audibility of interference.

Is your station prepared?

The 9100B NRSC-standard OPTIMOD-AM® is the first choice of AM stations concerned about improving their sound to compete with FM. OPTIMOD-AM sounds great on both the new NRSC receivers *and* on the millions of narrow-band receivers already in the field that will be in use for years to come.

When replacing older-style processors with OPTIMOD-AM, stations experience a significant increase in coverage area. And when replacing any processor, stations experience a dramatic improvement in sound quality, on both *voice* and *music*, with no sacrifice of loudness.

Superior sound is an important part of an overall strategy to increase ratings and profits. With OPTIMOD-AM, your announcers' voices will have presence and impact, while still sounding very clean. Music will have real bass, with punch and warmth, not boom. The highs will seem to open up. And loudness and tonal balance will be consistent from source to source.

OPTIMOD-AM can be configured to operate optimally in mono, C-QUAM® stereo, or Kahn stereo. Mono units can be field-upgraded later to stereo by simply plugging in additional cards.

Be prepared. Call your Orban Broadcast Products Dealer for more information on OPTIMOD-AM 9100B, or call us direct.

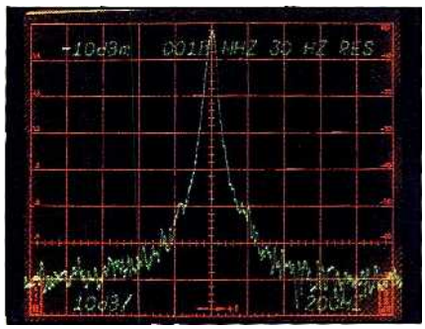
orban

Orban Associates Inc.
645 Bryant Street, San Francisco, CA 94107 USA
Telex 17-1480 FAX (415) 957-1070
Telephone (415) 957-1067 or (800) 227-4498

Circle (12) on Reply Card

Part 2

Troubleshooting



Video terminations play important role

By Peter Hughes

Providing highly accurate terminations for video lines was discussed in the first part of this series last month. Let's examine where these terminations are important and how much accuracy is sufficient.

Using modern technology

Most facilities grow with the addition of new equipment, and older equipment, even if it still functions reliably, tends to be forgotten. The terminations on that equipment also tend to be forgotten. This means that many 5% and 10% tolerance terminations still are in service.

The terminations on older equipment normally contain carbon film or composition-type resistors. Carbon resistors are considerably noisier than metal film resistors, and their temperature coefficients typically run from +350ppm to −1,000ppm. Precision terminations, on the other hand, may have temperature coefficients of only ±50ppm to ±100ppm.

A trend toward ±1% tolerance terminations has begun. Stations often purchase them rather than have their maintenance departments make them as needed. Manufactured terminations are available from several companies and usually contain a ¼W metal film resistor of ±1% tolerance with a ±100ppm temperature coefficient.

A ±1% tolerance termination is better than a ±5% tolerance termination, but even this small amount of error will produce level differences in the system. Most important, these differences are cumulative. (You can thank Murphy's law for that.)

Hughes is president of Target Technology, Penn Valley, CA.

Precision terminations

The best solution to the level-difference problem is the use of precision 0.1% tolerance terminations throughout the entire system. Output 6 in Figure 1 shows that a 0.1% termination produces a level difference of 0.1mV, or less than 0.1IRE units. This level is 10 times more accurate than a 1% termination and 50 times more accurate than a 5% unit.

Replacing all terminations with 0.1% units will produce the following benefits:

- All levels within the system can be adjusted to match each other. The only limitations are the resolution capability of the test equipment and the skill of the operator. As many as 10 terminated feeds connected in series would produce less than 1IRE unit of error.
- Any change in levels noted after changing to 0.1% terminations can be attributed either to drifting or unstable devices, which can be repaired or replaced, or to personnel with a bad case of "tweakitis," who can be retrained or replaced. In either case, the maintenance costs are reduced, the quality of the finished product is improved, and the production and engineering staffs can move a little closer to harmony.

Additional considerations

Precision terminations can make a device with inaccurate build-out resistors work better and minimize the effect of inaccuracies by not contributing to them. Inaccurate terminations, however, can make a good piece of equipment look bad for the opposite reasons.

How many system engineers rely on the built-in termination resistor selected by the slide switches on the back of many studio monitors? This resistor might be terminating a cable run that has been looped through an important piece of equipment. Any error in this termination resistance affects the level at that device and its input return loss.

What tolerance and which type of resistors are being used in your patch panels? Terminating patch fields from some manufacturers use 5% resistors. Because levels often are monitored at the patch field, this is a place where precision should rule.

Suggested parameters

The termination is a vital component in any video system. It deserves the same care and consideration expended on other system components. Terminations should meet the following specifications:

- The resistive element should be metal film, ¼W or ½W ±1% tolerance, ±50ppm temperature coefficient, RN60C75R0B or RN65C75R0B.
- The resistor should be soldered to both the central pin and the body, not crimped. Crimped contacts may corrode over a period of time, causing bad contact, especially in a chemical or salty environment.
- The resistor should be mounted in a body that has a 75Ω characteristic. Gold-plated center pins should be used because they are less susceptible to corrosion and provide ultralow resistance.

Facilities that experience video level differences that are not easily traced to defective equipment or ill-trained personnel should consider replacing all terminations with high-precision 0.1% units, then conduct a systemwide setup.

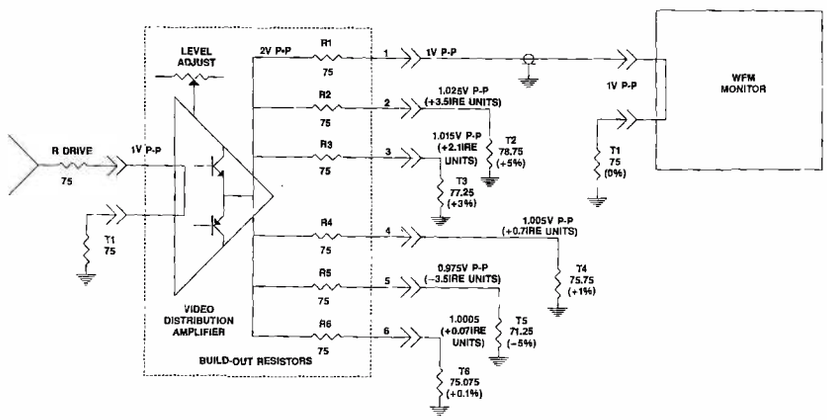


Figure 1. The circuit shows the voltage error produced by various tolerances of termination resistors. The error produced by a 5% tolerance termination may be as much as 50 times greater than that produced by a 0.1% tolerance termination.

SYDNEY OSAKA PARIS LONDON NEW YORK LOS ANGELES

The good news is...

Studio camera automation has arrived...*the HS-110P.*

The HS-110P automated pan/tilt head provides more effective utilization and distribution of production talent...*and at a surprisingly affordable price.*

- Our highly repeatable servos and stiff mechanical design provide the same feel and responsiveness of a manned camera...*absolutely essential for camera automation.*
- Four HS-110Ps, using our software driven Multi-Controller, provide a quality production with one operator. As an alternative, *the HS-110P Heads can be controlled directly by a News Room computer via MultiController's serial input.*
- These features coupled with our Multi-Controller's "shot storage" and "motion learn" capability provide the director with complete and repeatable camera moves...with less staff and improved communications... *resulting in a more efficient production and a lower operating budget.*
- Automate for your future...now. Call us for a demo.

HS-110P features:
- Load capacity of 250 lbs.
- Max. velocity of 90°/Sec.
- Preset return accuracy of 18 arc seconds (0.03141" from 30 ft.)
- Highly responsive servo design.

TSM

TOTAL SPECTRUM MANUFACTURING INC.
709 Executive Blvd., Valley Cottage, NY 10989
914-268-0100 FAX: 914-268-0113

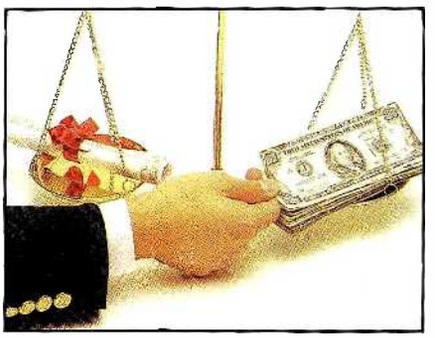
Circle (14) on Reply Card

Part 3

Management for engineers

Techniques for dealing with problem behavior

By Brad Dick,
radio technical editor



Larry, the maintenance supervisor, was losing his patience. As usual, Mike, the chief engineer, was pouring cold water on one of Larry's ideas for technical improvements in the operation of the engineering department. Maintenance costs on the ENG trucks had increased dramatically during the past year. Because the costs had to be covered by Larry's budget, he wanted to make changes in the operation of the trucks. Unfortunately, he first had to convince Mike that the changes would be beneficial. Mike, in turn, would have to get the cooperation of the news director and the union.

Larry was proposing to assign a truck and its operational responsibilities to each operator. He had studied the situation and discussed solutions with employees of several other stations. In many cases, he found that such an arrangement not only reduced maintenance costs, but also improved the response time to fast-breaking stories.

Mike listed the many reasons why any change in procedure wouldn't work. Every reason Larry cited for making the changes was met with a dozen reasons not to. "Besides," Mike said, "that idea was tried several years ago, and it didn't work then. And, in any case, the news director would never go along with it."

Larry could see he was losing the argument.

"Well, what should we do about the increase in maintenance costs?" he asked.

"I guess there isn't much we can do," Mike said, "except talk to the operators and ask them to be more careful."

Wet blankets

Mike's attitude is another example of difficult behavior—negativism. A negativist stalls any suggested change by listing all the reasons something can't be done. It's difficult, and sometimes downright impossible, to use logic to win an argument with a negativist.

This kind of behavior also can have a detrimental effect on the staff. Negativists quickly hook that certain element in everybody that says, "Nothing can be done." To gain control, they tap the potential for despair that exists in each of us. This can poison an otherwise productive meeting, causing it to quickly degenerate into a pessimistic forum.

People with negativistic personalities often feel trapped, discouraged and defeated. They are convinced that they have little control over their own lives. Fate or external powers seem to direct every aspect of their lives. In the work place, these external powers may be supervisors, the "system" (defined by the person's position) or the company.

However, everyone who raises an objection or questions your suggestions doesn't qualify as a negativist. You probably don't have all the answers, and it is often helpful to have someone force you to question your approach to a problem. Looking at proposals with an eye for potential problems is a healthy perspective.

A positive approach

If your supervisor is a negativist, be on your guard. Failure to recognize this trait opens the door to discouragement and a reduction in your own effectiveness. In conversation, the negativist may attempt to get you to confirm the hopelessness of a situation. When you begin to hear the negative responses, redirect your approach.

An effective approach requires optimism. Restate your suggestion in positive terms. Also, it's important to be realistic. If the issue involves the excessive cost of a project, don't try to overstate the potential savings or discounts. If knowledgeable in this area, the negativist will realize that your suggestions are unrealistic. Your pie-in-the-sky approach only strengthens the negativist's pessimism.

Usually it's not effective to argue the point or try to persuade negativists that their positions are wrong. Remember, in their minds, they already are convinced they're right.

When you recognize this personality trait, especially in a group discussion, wait as long as possible before you propose solutions. Suggestions offered early in the conversation may be quickly dismissed. Allow the pessimist to run through all the reasons why other suggestions won't work before you propose yours. Then, present your proposal in such a way as to minimize the objections already raised. You may be able to show how your idea solves some of the problems already mentioned.

Circumventing the negative

Let's say you have to work closely with a negativist on an important project. The following exchange illustrates ways you can circumvent some of the can'ts and nos.

You: We've got to get the automation system up and running by Sunday morning.

Crew chief: That's impossible. You'll just have to tell operations it can't be done. The CPU hasn't even arrived. I don't know how long it will take to get that going.

You: I still think there's a chance if we pull out all the stops.

Crew chief: I don't see how. Even if the CPU arrives, who's going to load the software and run the test routines? We can't go on the air with that thing until it's completely checked out. The factory can't send anyone until next week.

You: Jim has been to the factory's school. He knows how to load the software and run some basic tests. Chances are the factory could talk him through the setup and through any problems we encounter. All we need to do is arrange for the CPU to be air-shipped on Saturday.

Crew chief: Well, it's too late. It's already 5:30. There's not going to be anyone around to do it tonight.

You: Maybe, but it's worth a try. I think I've got their emergency number. Give them a call.

Just say yes

A negative attitude can be passed around a staff or company like a flu virus. The disenchantment and pessimism are contagious. Soon, everyone will be agreeing that "It can't be done."

Use the early recognition of problem behavior to your advantage. Don't argue. Respond with positive, optimistic statements. Remember, you can't argue negativists out of their pessimism. Use their negative perspectives as a list of potential problems to be overcome. If nothing else seems to work, be prepared to proceed on your own. Often, that is the only way to move forward.

|:(-)))|

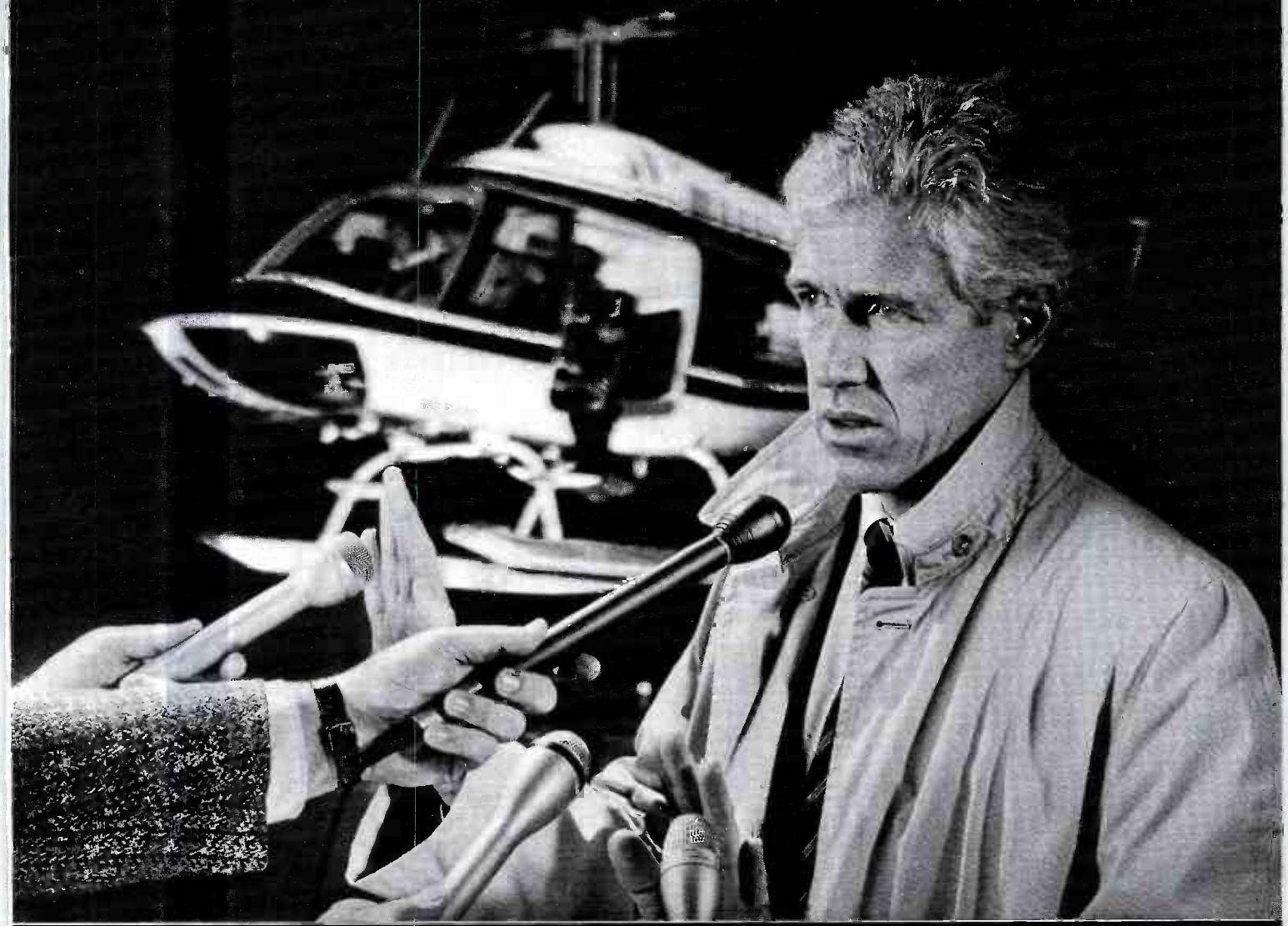
TOO MANY OF TODAY'S MICS ARE YESTERDAY'S NEWS.

When you're in the fast-paced business of news, why use outdated microphones? Time marches on, and old habits become bad habits if you don't keep up with the times.

The M 58, on the other hand, proudly benefits from new technical developments like a unique design employing a tiny, low mass diaphragm. Highly sensitive and accurate, its contoured upper frequency response produces unprecedented intelligibility, even off axis.

A sophisticated modern internal shock-mount system reduces handling noise and vibration down to new levels. The 58 is scientifically "weight balanced" for greater comfort during lengthy interviews. Its slim, elegant profile and special "on-camera" finish look exceptional—in an understated way —on camera. The mic's thoroughly rugged and reliable construction stands out in a world of "disposable" mics.

If your news microphone is old news, audition an M 58 at your authorized Beyer dealer and experience the sound of modern news mic technology. Or contact:
beyerdynamic U.S.,
5-05 Burns Avenue,
Hicksville, New York 11801,
(516) 935-8000,
FAX (516) 935-8018.



ACCURACY IN AUDIO **beyerdynamic**

Canada: ELNOVA Ltd. 4190 Rue Sere, St. Laurent, Quebec H4T 1A6 Tel. (514) 3 41 69 33 Telex 5824086
Great Britain: beyerdynamic, Ltd., Unit 14, Cliffe Industrial Estate Lewes, Sussex BN86JL Tel. 273 479 411
Australia: Hi-Phon Distributors Pty. Ltd., 356 A-358 Eastern Valley Way Chatswood N.S.W. 2067 Tel: (02) 417 7088
Germany: Eugen Beyer Eletroteknische Fabrik GmbH & Co., Theresienstrasse 8, Postfach 13 20, D-7100 Heilbronn Tel: (07131) 617-0 Telex 728771

Circle (54) on Reply Card

Wouldn't it be great if somebody built fully-integrated systems for all your distribution, control, and automation requirements (including digital routing), using standard, expandable equipment?

SOMEBODY DOES.
UTAH SCIENTIFIC.

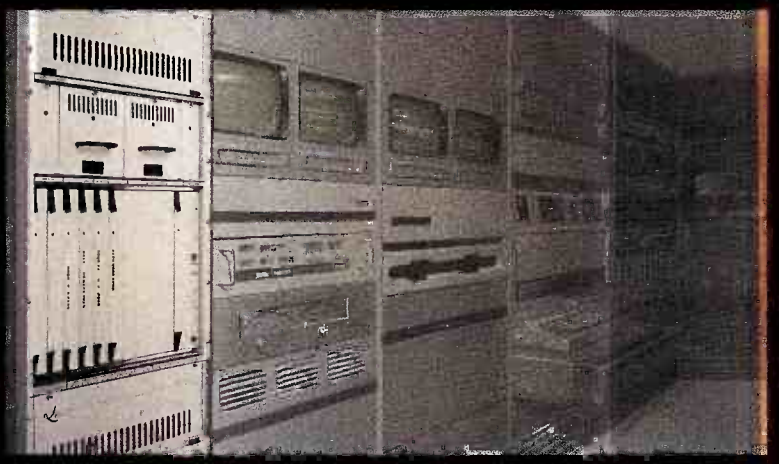
ROUTING SYSTEMS

ROUTING SYSTEMS. Utah Scientific routing systems perform to the best specs in the industry. Reliability, easy system expansion and long-term stability have been proven in more than 500 installations around the world. Controlling the router is easy with the industry's broadest selection of control panels, computer interface equipment, and automatic control systems, all of which are user reprogrammable to ensure that your system continues to accommodate your changing requirements.

AUTOMATION SYSTEMS. As the need to automate more and more of your facility's operations becomes important, Utah Scientific is ready to help you with a fully integrated system, designed to meet your current needs and expand easily as your requirements grow.

From a simple routing switcher event programmer, to a fully integrated on-air automation system for a broadcast network, Utah Scientific has the products, and the experience, to meet all of your automation needs.

DIGITAL SYSTEMS



DIGITAL SYSTEMS. Now there's a single-source supplier for all your switching requirements including DIGITAL video. Our new DVS-1 Digital Video Routing Switcher offers 10-bit performance and maximum reliability. Available in a wide variety of configurations, the DVS-1 handles either the D-1 (component) or D-2 (composite) signal format. Of course, like all Utah Scientific products, the DVS-1 can operate as a stand-alone system or be integrated with other components.

NEW FROM ARRAKIS SYSTEMS

10,000 SERIES

For features, performance, price and reliability,

NOBODY BUILDS CONSOLES LIKE ARRAKIS.

Call (303) 224-2248

Circle (13) on Reply Card

ARRAKIS SYSTEMS INC. 2619 MIDPOINT DRIVE FORT COLLINS, CO 80525

arrakis SYSTEMS, INC.

Fifth annual station maintenance special

Equipment maintenance isn't what it used to be. And that's probably a good thing.

The use of digital technology in professional audio-video equipment has given users new ways of putting pictures and sounds on the air. This change also has required new test equipment and a new approach to maintenance and troubleshooting.

During this decade, professional audio-video products have undergone immense changes. For starters, most hardware now contains tens or hundreds of ICs, many of them surface-mounted devices. The march of technology has given our industry products that are more versatile and more reliable than systems built of discrete components. The watchwords for broadcasting during the 1980s have been *better, faster, cheaper.*

Those responsible for maintenance of new-technology equipment, however, are not necessarily pleased with many of the trends in equipment design. The days of troubleshooting a piece of gear armed with only a scope, a voltmeter and a general idea of how the hardware works are gone forever. Today, unless you have a detailed maintenance manual and the right test equipment, you're out of luck.

The test bench of the 1970s—stocked with a VTVM, oscilloscope, signal generator and signal analyzer—is a relic of the past. The workbench of today more closely resembles a small computer repair center than anything else.

The changing work place

A broadcast engineer's most basic job requirement is equipment maintenance. It also is, however, an art that cannot be practiced unless adequate resources are put into the maintenance efforts of a facility. These resources include trained personnel and specialized tools and test equipment.

Most maintenance engineers have their favorite story about the first night on the job when they really found out what it meant to work in broadcasting. Maintenance is a fun, but trying, job. Nobody calls you at 3 a.m. to report that everything at the station is fine. The beeper never goes off during dinner to let you know things are running smoothly.

The broadcast industry lives on technology. It thrives on electronic gadgets. But without competent engineering support, the electronic tools of the trade are of little value. No product installs itself or maintains itself.

Keeping up to date

It is easy to get into a rut and conclude that the old ways, tried and true, are best. Change for the sake of change doesn't make sense, but the electronics industry has gone through a revolution within the past eight years. Every facility should re-evaluate its inventory of tools, supplies and procedures. Technology has altered the way electronic products are designed and constructed. The service bench needs to keep up as well.

Related articles in this issue include:

Jerry Whitaker,
editorial director

Maintaining broadcast equipment

Edited by Jerry Whitaker

Keeping up-to-date is no easy task.

Two of the more important pieces of equipment for a maintenance technician servicing current-technology products are good lighting and a whopping big magnifier! OK, that's an exaggeration, but it points up an important problem in equipment maintenance today: There are many tiny components, most of them jammed into a small amount of circuit board real estate.

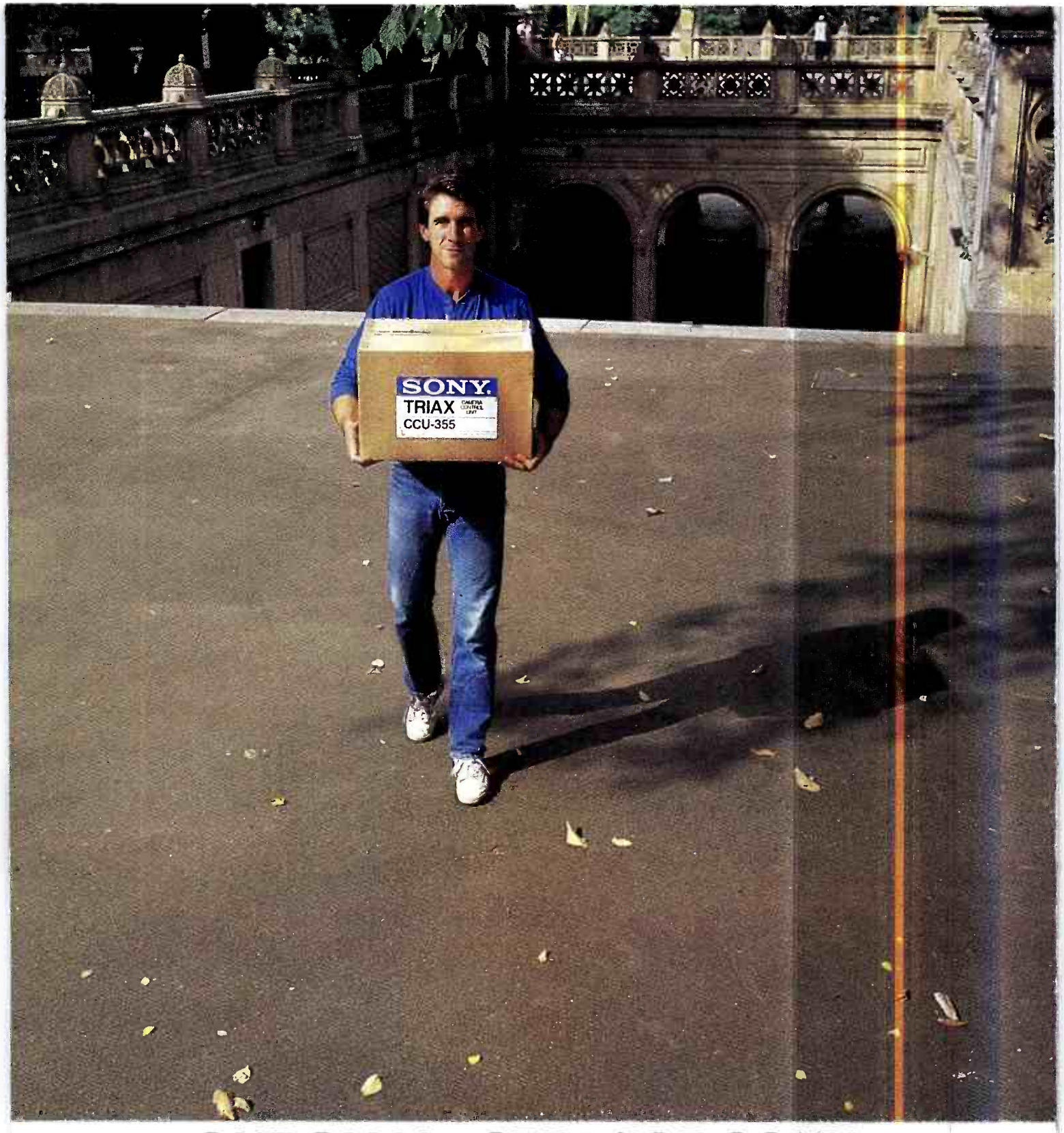
Tight component packaging makes printed-wiring boards (PWBs) difficult to repair. If you add complex and inter-related circuitry to the servicing equation, repair down to the component level may be virtually impossible. The equipment is just too complex, electrically and mechanically. The sophistication of hardware today has ushered in a new era in equipment maintenance—that of repair by replacement.

Some equipment manufacturers have built sophisticated test and diagnostic routines into their products. This trend is welcomed, and it is likely to accelerate as the maintainability of products becomes an important selling point.

Still, however, specialized test equipment often is necessary to trace a problem to the board level. A well-equipped shop should have on hand the equipment necessary to keep those expensive graphics systems, audio effects devices and automation hardware on-line.

Our examination of "Maintaining Broadcast Equipment" includes the following elements:

Input for this article was provided by Conrad Persson, author of *Electronic Servicing and Technology* magazine (an Intertec publication).



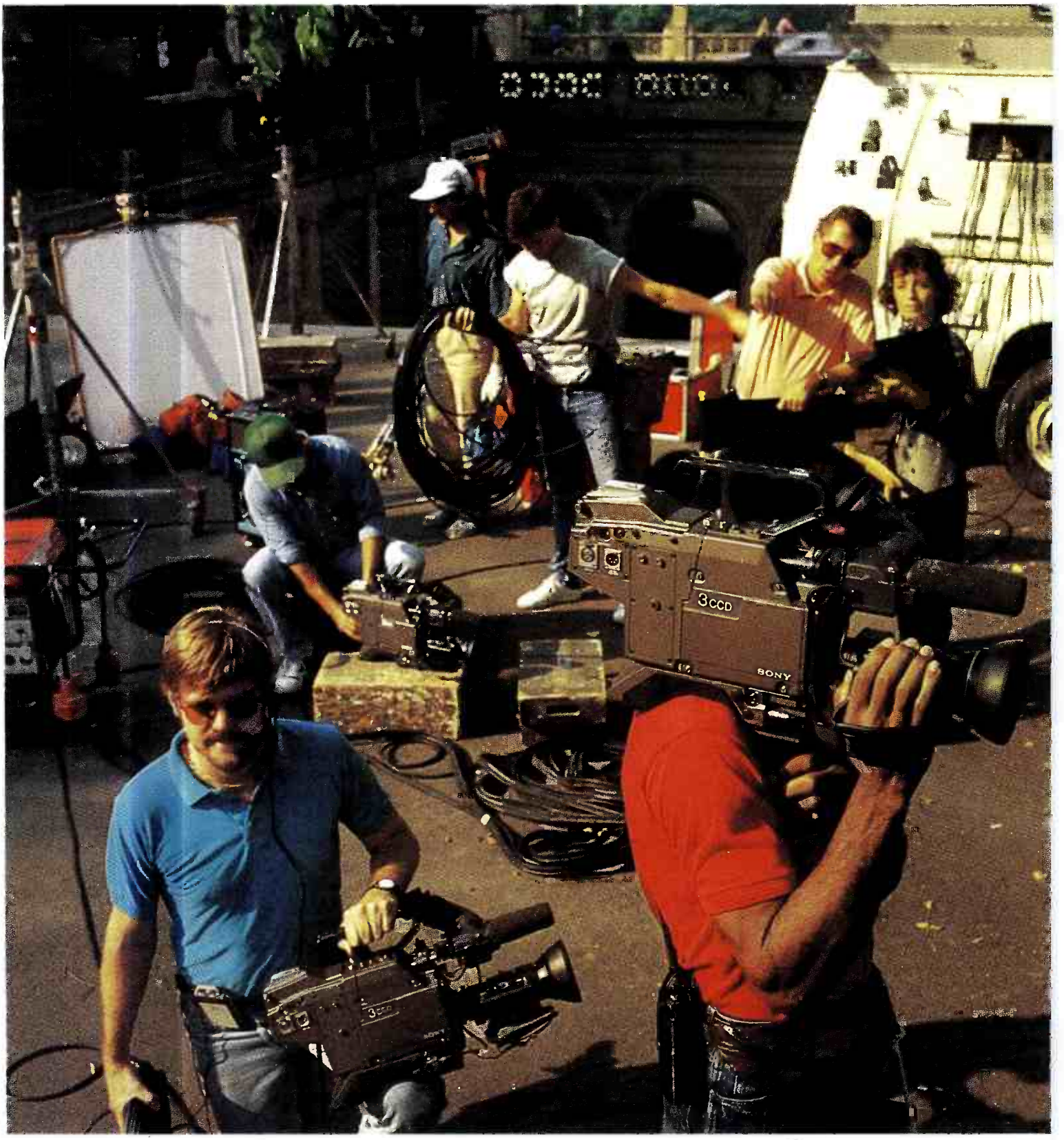
ONE SMALL STEP FOR SONY.

For Sony, it's a small addition to the world's finest line of broadcast cameras. But it means a long jump for EFP.

With the new CCU-355 Control Unit, you can have the freedom of triax while using the best broadcast portable CCD cameras in the world—the Sony BVP-7 and BVP-50.

Sony has offered leading-edge CCD broadcast camera technology for over two years, bringing you the reliability and consistent picture quality you expect from Sony–plus the portability and freedom of triax.

No one else sells as many broadcast cameras as Sony. And it's hardly surprising—



ONE GIANT LEAP FOR EFP.

considering the broad range of leading edge products Sony offers.

So take the plunge into the inherent reliability and stability of solid state technology. Check into the Sony broadcast portable CCD camera family: the BVP-5, BVP-7 and BVP-50. And the BVW-200 single-unit camera-recorder. The first step is a demonstration. Just contact your Sony Broadcast Sales Engineer. Or call us at (800) 635-SONY.

SONY®

Sony Communications Products Company, 1600 Queen Anne Road, Teaneck, NJ 07666. © 1988 Sony Corporation of America. Sony is a registered trademark of Sony.

BROADCAST PRODUCTS

Circle (15) on Reply Card

Maintaining broadcast equipment

On the bench

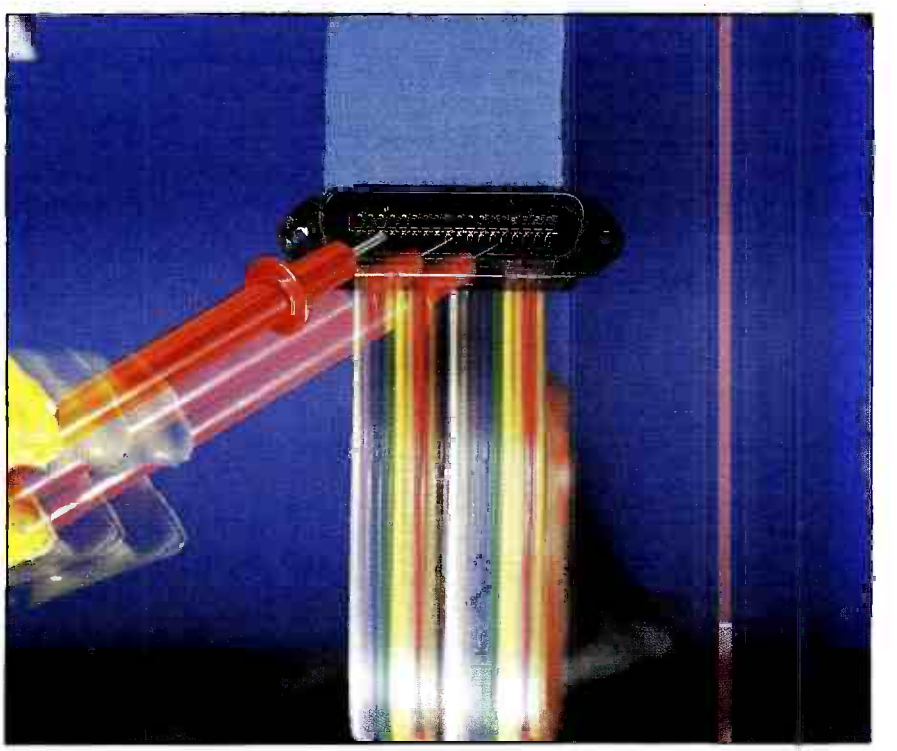
Without the proper test equipment, you're just spinning your wheels.

Some equipment problems at a broadcast station or post-production facility still can be located with little more than a DVM and oscilloscope, given enough time and effort. But time costs money. Few technical managers are willing to make the trade. With current technology equipment, the proper test equipment is a must.

Table 1 lists the test instruments necessary for a well-equipped maintenance shop. It does not include specialized instruments and gauges needed to maintain particular types of electromechanical hardware. The list can be expanded easily, depending upon the sophistication of the equipment at a particular facility. By and large, however, the recommendations given should provide the maintenance staff with most of the tools it needs.

Servicing certain types of hardware requires special test fixtures and/or test equipment. Maintenance of a VCR, for example, is nearly impossible without the proper gauges. Money spent on purchasing alignment tools and detailed technical documentation is well-spent.

The next time you consider making an equipment purchase, build into the acquisition funds the cost of test equipment and specialized tools that will be needed



To maintain broadcast equipment today, you must understand digital hardware. You also need to have the proper tools and test equipment for servicing computer-based equipment.

ARRAKIS SYSTEMS

5000 SERIES

...At A Down-To-Earth Price: 16 Channels, Under $10,000.

THE FEATURES YOU WANT—

- 16 Modular Stereo Channels.
- Program, Audition and Mono Mixdown Balanced Outputs.
- Telephone Mix-Minus Buss.
- Full Monitoring Facilities.
- Remote Equipment Start/Stop.
- Remote Module Control.
- Standard Digital Clock and Timer.
- Optional EQ and Effects Modules.

THE DEPENDABILITY YOU NEED—

- DC Controlled – No Audio On Pots.
- Rugged Modular Construction.
- Penny & Giles Slide Faders.
- ITT Schadow Switches.
- NE5532 IC Module Design.
- External Regulated Power Supply.
- Superb Audio Performance Specs.
- Most Important, Arrakis Systems Designed-in Ultra Reliability!

For features, performance, price and reliability,

NOBODY BUILDS CONSOLES LIKE ARRAKIS.

Call (303) 224-2248

Circle (13) on Reply Card

ARRAKIS SYSTEMS INC. 2619 MIDPOINT DRIVE FORT COLLINS, CO 80525

arrakis SYSTEMS, INC.

BASIC TEST EQUIPMENT

_____ OSCILLOSCOPE
_____ ACCURATE BENCH DVM
_____ ISOLATION TRANSFORMER
_____ ELECTROSTATIC DISCHARGE PROTECTION KIT
- bench mat
- wrist strap
- ESD protective packaging

AUDIO TEST EQUIPMENT

_____ AUDIO SIGNAL GENERATOR
_____ DISTORTION ANALYZER
_____ ac VOLTMETER
_____ WOW AND FLUTTER METER
_____ TAPE MACHINE ALIGNMENT GAUGES

VIDEO TEST EQUIPMENT

_____ VIDEO SIGNAL/PATTERN GENERATOR
_____ VECTORSCOPE
_____ WAVEFORM MONITOR
_____ HIGH-VOLTAGE PROBE
_____ CRT TESTER/RESTORER
_____ VCR/VTR TEST AND ALIGNMENT GAUGES

DIGITAL HARDWARE TEST EQUIPMENT

_____ LOGIC PROBE
_____ LOGIC PULSER
_____ LOGIC MONITOR CLIP (IC clip-on)
_____ BREAK-OUT BOX
_____ LOGIC COMPARATOR
_____ LOGIC STATE ANALYZER (optional)
_____ LOGIC TIMING ANALYZER (optional)

RF TEST EQUIPMENT

_____ TRANSMITTER DUMMY LOAD
_____ LOW-POWER DUMMY LOADS
_____ HIGH-VOLTAGE PROBE
_____ CLAMP-TYPE CURRENT PROBES
_____ TRUE-rms ac VOLTMETER
_____ WATTMETER WITH SELECTION OF SLUGS
_____ ASSORTED COAXIAL CONNECTORS/ADAPTERS

Table 1. *Basic test equipment required to maintain broadcast products today. Give careful consideration to the recommendations of equipment manufacturers regarding test equipment needed to maintain their products.*

APPLICATION	BANDWIDTH	RISE TIME	OTHER KEY FEATURES
VIDEO	12.5MHz[1]	28ns	TV frame and line triggering
DIGITAL	50MHz	7ns	Dual channels, alternate horizontal magnification
AUDIO	175kHz	. . .	500μV sensitivity
ELECTRO-MECHANICAL	10MHz	35ns	Single sweep, HF/LF reject trigger
ROBOTICS	10MH	35ns	Single sweep, HF/LF reject trigger, 500μV sensitivity
POWER SUPPLIES	175kHz	. . .	500μV sensitivity

[1] Based on 0.14μs sync pulse rise time requirements. At least 50MHz is needed for IF sections.

Table 2. *Minimum requirements for oscilloscope performance for various types of equipment. Before you buy a scope, try it out for a few hours at the dealer's showroom to determine whether the functions are clearly labeled and the unit is easy to use.*

to repair the product. If the sales representative tells you that the equipment will never fail or will troubleshoot itself, don't believe it.

Looking at scopes

The selection of most test equipment is relatively straightforward, except for the oscilloscope. Choosing a scope is important because it is one of the most general-purpose test instruments. A scope can be used to measure voltages, examine waveshapes, check phase relationships, examine clock pulses and perform countless other functions.

Scope technology has improved considerably within the past few years. Now, in addition to familiar choices such as bandwidth and rise time, single or multitrace operation, oscilloscopes come in digital as well as analog versions. Some offer logic tracing functions, and one or two even will give you a hard-copy print-out.

A common question with regard to oscilloscopes is: How much performance is enough to suit my needs? Table 2 contains some basic guidelines on performance characteristics that can be used as a starting point for matching your requirements with the products available in the marketplace.

The toolbox

The simplest maintenance task is next to impossible without the right tools. There's more to a well-stocked tool chest than meets the eye. Tools for maintenance may seem too basic to warrant discussion, but having the right tools is essential to efficient equipment repair. Table 3 lists common tools, fixtures and chemicals that should be on hand in any shop.

Deciding whether to invest in a customized tool kit or to buy the tools individually is not always easy. Although, at first glance, it might seem more economical to buy tools one at a time as needed, a careful examination of the maintenance department's needs may point to a different conclusion. Tool manufacturers offer packages intended for special servicing applications that include tools that may or may not be readily available from your local parts supplier.

Comprehensive, high-quality standard tool kits for professional engineers and technicians are available from a number of reputable suppliers. Special, off-the-shelf kits also can be found for telephone equipment, computers and peripherals, robotics, fiber optics and other technologies. Because of the competitive nature of the tool-kit market, buyers usually receive good value on any of these standard products.

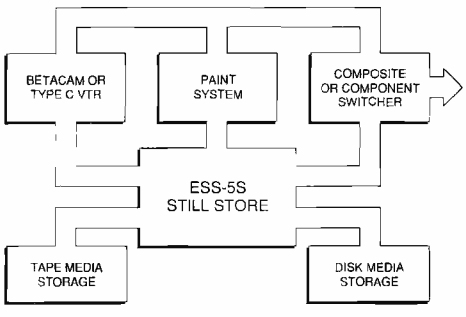
Case style and construction are important points to consider in the selection of a tool kit. It makes little sense to economize by buying a $50 case to carry

Analog still stores won't give you the picture quality of our new digital ESS 5S, but look at the money you'll save.

Not only is our new digital still store "just pennies" more than old-fashioned analog versions, it's thousands of dollars *less* than it's nearest digital competitor!

And the ESS™5S has a direct upgrade path to graphics. You can use it to do layered graphics *without* a paint system, external video effects system, or switcher.

But if a full graphics suite *is* what you've got, (or expect to have someday) the ESS 5S system's CCIR-601 digital or analog component I/O makes for easy interface to other devices in your studio, like RGB paint systems, composite or component switchers, telecines, or Betacam.



The ESS5S system's CCIR-601 digital or analog component I/O gives you complete interface flexibility.

You can review random stills or your entire library 12 stills at a time.

Of course, we've included our unique multi-picture browse feature as standard equipment, plus on-line cataloging, too. (It lets you store or recall stills by alpha title, date, ID number or category.)

And a 5¼" optical disk or tape streamer back-up means never having to say you're sorry.

For more information on this new and inexpensive digital still store that's "graphics easy," call your nearest Ampex dealer or Ampex regional office.

AMPEX

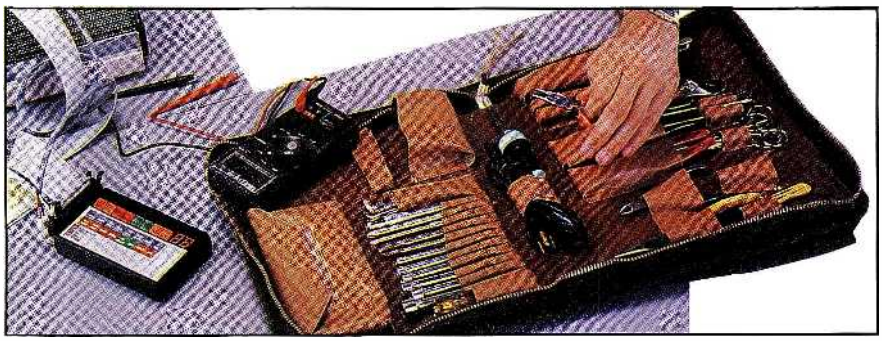
Atlanta (404) 491-7112 Chicago (312) 593-6000 Dallas (214) 960-1162 Los Angeles (818) 365-8627 New Jersey (201) 825 9600 (In New York (212) 947-8633)
San Francisco (415) 367-2202 Washington D.C. (301) 530-8800 Canada (416) 821-8840

Circle (17) on Reply Card

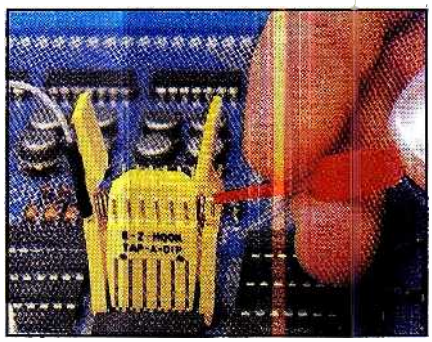
TOOLS, FIXTURES & CHEMICALS

_____ PLIERS AND WIRE CUTTERS	_____ SELECTION OF CLIP-ON HEAT SINKS
_____ SCREWDRIVER SET	_____ HEAT SINK GREASE
_____ NUTDRIVER SET	_____ SILICONE LUBRICANT
_____ HEX WRENCHES	_____ FREON CLEANER SPRAY
_____ WIRE STRIPPER	_____ GLASS/PLASTIC CLEANER
_____ CRIMPING TOOL	_____ ANTI-STATIC SPRAY
_____ WIRE WRAP/UNWRAP TOOL	_____ COMPRESSED AIR
_____ TWEEZERS	_____ ADHESIVES
_____ VISE	_____ COMPONENT COOLANT SPRAY
_____ PC BOARD-HOLDING FIXTURES	_____ TAPE HEAD CLEANER
_____ SOLDER FLUX	_____ HIGH-VOLTAGE INSULATING PUTTY
_____ FLUX REMOVER	_____ SPRAY-TYPE CONTACT CLEANER

Table 3. *Basic tool complement for a well-equipped maintenance shop. The right tools for the job can make a big difference in maintenance productivity and worker morale.*



Having the right tools for a maintenance job can make all the difference in the world. The tool requirements for servicing computer-based equipment are different than for older hardware. Don't skimp on your budget for tools.



You can't check a component if you can't reach it. Handy test clips and adapters provide ways to access test points on individual ICs without running the risk of causing a short-circuit.

expensive tools and instruments. If the case doesn't provide adequate protection for its contents, it is of little or no value.

Test jigs and fixtures

When organizing your shop, don't forget to purchase a variety of jigs and fixtures for holding printed circuit boards and small components. Why? Well, you only have two hands. And, sometimes, it takes more than two hands to repair a piece of electronic equipment. Enter the specialized tools, jigs and fixtures available for use with PWBs.

With modern equipment, components have become so small and their leads so closely spaced that all work must be performed with great care. The last thing you want is for the PWB to slide across the workbench while you're trying to work on it. The solution is to get another pair of hands, either simple or elaborate, depending on the nature of the hardware you are working with.

A simple device for holding a small printed circuit board is a jig that consists of either a weighted base or a bench clamp and a pair of alligator clips mounted so you can adjust them into various positions. For larger, heavier boards, you will need something more elaborate. A number of board holders are available to secure the PWB in a convenient position.

If you are working on a large piece of equipment—a rack-mounted tape deck, for example—some type of holding fixture is recommended.

Testing adapters

Test equipment manufacturers have come up with a number of tools to aid troubleshooting of circuit boards crowded with components. One of the simplest of these is the spring-loaded hook probe that lets you grab one pin out of a group of closely spaced pins without contacting other conductors. If you are careful, you might be able to leave power on and move this type of hook from pin to pin to trace a fault. Conventional wisdom, though, suggests that when pins are packed tightly enough to warrant using one of these hooks, you should disconnect power before moving the hook to a new test point, to avoid the possibility of damage.

Another aid in testing PWBs is the test clip. This handy device operates much like a spring-type clothespin. Both sides of the clip have a particular number of conductors with the same spacing as the leads on a DIP integrated circuit package. The test points at the top of the clip provide easy access to the IC leads away from the crowded surface of the PWB.

Another handy testing aid is the cable interface. Have you ever tried to take test measurements at the point where a flat cable connects to a device? In most cases, manufacturers have made no provisions for getting a meter or scope onto a connector while it is plugged in. Test adapter manufacturers have come up with a convenient way to make such tests. The adapter consists of a short extender plug that provides test points for each pin of the connector.

A variation on this basic theme provides not only the cable interface and test points, but also two test pins with a switch between them for each conductor of the flat cable. With this adapter, it is possible to isolate a single conductor, or several conductors, and probe both on the *device side* and the *cable side* of the open switch.

To make you a better editor we had to get personal.

Personal computers are easy-to-use, fast, and extremely reliable. That's why we chose this powerful technology for the engine of our new low-cost editor, the ACE™ 25.

As you cut your first shows, you'll realize that the ACE-25 is not only fast, powerful, and fun to use, but that it also delivers a host of *professional* features: an easy-on-the-eyes menu display with EQ bar-graphs and VU meters, a 1000 line EDL with list management, and a multi-function rotary knob that controls everything—from transports, to key clip, to audio levels.

This new technology also allows us to give you the flexibility you've always needed. You can choose between an internal composite, or a *component* video switcher, plus an internal audio switcher—each built on a single board and designed to fit neatly into the ACE-25 system's main chassis. Even better, these unique switchers are controlled fully by the keyboard's rotary knob! All this simplifies system operation and lets you devote your energies to the creative job at hand.

And now the best news! No matter what your business, whether it be TV news editing or off-line post production, the ACE-25 delivers more features than any comparably priced editor.

You see, we took the PC's greatest strengths and used them to *your* advantage to give you power and affordability—*and* an editor that's easy to get to know. So call your nearest Ampex dealer or sales engineer to find out more about the newest, friendliest editor in the world.

It's about time you had some fun in the edit bay.

AMPEX

Atlanta (404) 491-7112 Chicago (312) 593-6000 Dallas (214) 960-1162 Los Angeles (818) 365-8627 New Jersey (201) 825-9600 (In New York (212) 947-8633)
San Francisco (415) 367-2202 Washington D.C. (301) 530-8800 Canada (416) 821-8840

Circle (18) on Reply Card

Maintaining broadcast equipment

Solder: the tin that binds

There is more to PWB rework than just pouring on the heat.

Whatever piece of equipment you may be faced with servicing, a big part of your tool chest should be occupied by high-quality soldering and desoldering equipment. Many facilities unwisely skimp on soldering hardware because it's basically boring stuff. True, a soldering station isn't exactly high-tech. However, you need good soldering equipment to keep your high-tech gear running. Table 1 lists the recommended items.

When it comes to soldering and desoldering today's generation of products, the rules have changed dramatically. You don't have to throw away that 100W soldering gun; just don't use it on anything built within the past 10 years. For circuit board work, product manufacturers recommend using a 10W to 50W soldering pencil that is temperature-controlled.

For desoldering an IC, you're going to need either a soldering iron with a head that will heat up all the leads at one time, or some method of removing the solder from each lead in turn. A number of products are available for removing solder from component leads. One of the least expensive is desoldering braid: fine copper wire formed into a braided wire, impregnated with rosin flux and rolled up into a coil for easy handling. Other tools available for desoldering are suction devices that are applied to the joint while the solder is molten, and use either a squeeze bulb or spring-loaded plunger to draw the solder out.

Better yet, if you do enough PWB rework to justify it, buy a solder/desolder

Successful solder rework of a printed circuit board requires skill, patience and the proper tools. One of those tools is a temperature-controlled soldering iron.

Varian EIMAC has taken the 3CX4500A7, with a proven performance record and by improving the design, developed the YU-148 hi mu triode—a 6000 W plate dissipation tube.

The YU-148 has been performance-proven and is currently in use in 10 kW FM transmitters. The YU-148 combines EIMAC's state-of-the-art technology, and cost-effective production, with a 5000-hour warranty—offering broadcasters the ultimate choice for their RF power requirements.

- Grounded Grid Triode Design
- Screen Supply Not Required
- Zero Bias
- No Need for Neutralization
- Efficient Forced Air Cooling
- Quick Warm-Up

These features, combined with EIMAC's reputation as the leader in electron tube development, plus 50 years of serving the broadcast industry, are the reasons you should specify EIMAC.

Varian EIMAC
1678 S. Pioneer Road
Salt Lake City, UT 84104
(801) 972-5000

varian
eimac salt lake division

Circle (19) on Reply Card

SOLDERING/DESOLDERING PRODUCTS

_____ FINE- AND MEDIUM-GRADE SOLDER	_____ DESOLDERING BRAID
_____ SOLDERING IRONS (35W and 75W)	_____ IC INSERTION/EXTRACTION TOOLS
_____ TEMPERATURE-CONTROLLED SOLDERING IRON	_____ SELECTION OF CHIP-MOUNT SOLDER HEADS
_____ SOLDER SUCKER	_____ SELECTION OF SMC SOLDER HEADS
_____ HEAT SINKS OF VARIOUS SIZES	

Table 4. *Check list of solder equipment necessary for equipment maintenance. There is more to soldering today that just melting lead.*

station. They cost from a few hundred dollars and up, but they do everything from soldering and desoldering surface-mount components to repairing PWB conductor traces.

Some of the more exotic soldering stations have two or more heat-producing elements on the same unit so you can vacuum desolder with one while soldering with the other and not change tips. Another design comes complete with a self-contained air pump to give you both vacuum and air under pressure. Or, if you already have compressed air available, you can buy a unit that's designed to interface with your existing compressed air system.

The sensitive integrated circuits used in many products today require attention to electrostatic discharge (ESD), and this caution extends to soldering equipment. Your soldering iron or pencil should be grounded to drain off any accumulated charge. Soldering tools usually are grounded through a resistance of 250kΩ to 1MΩ to drain away the static build-up without posing a shock hazard to the user.

Any solder rework station should include a good-quality magnifying lamp for inspecting soldering work and circuit board traces.

One strike, and you're out

If you needed to desolder a component back in the days before transistors and ICs, you yanked out the soldering gun and poured on the heat to the joint while you pulled and poked at the wire with one of a variety of tools. If, after removal, the suspected component turned out not to be the culprit, you just soldered it back in place and continued your trial-and-error search. Not anymore!

In today's world of crowded boards and delicate components and traces, you don't remove a part unless you're dead sure it has failed. When you do remove it, kiss it good-by!

If you attempt to remove a component on a crowded PWB, and it turns out there was no problem to start with, there probably will be a problem by the time you're finished. Under the best of conditions, a trained technician with the proper tools causes stress to both the component and the board. If you try replacing components one at a time in an attempt to find the cause of a fault, you usually will end up with a board that is beyond repair.

Turning on the heat

When you decide that a certain part has to come out, use the right tools and procedures. Use 0.028-inch (22-gauge) solder with a rosin core. Small-sized solder strands melt fast and lose less heat, allowing better control over the amount of solder applied to the joint. The solder should be made of virgin tin and desilvered lead, and it should be free from impurities such as zinc, aluminum, iron, copper and cadmium. Don't try to save money on solder. The solder that has the lowest melting point and yields the strongest bond is made with a ratio of 63% tin to 37% lead, but 60 tin/40 lead is nearly as good.

For certain jobs, some manufacturers recommend *silver solder.* Silver solder contains about 3% silver along with the lead and tin. Silver solder is used when soldering components such as ceramic capacitors, which have silver-palladium fired onto the conductive surfaces. If straight tin/lead solder were used, it might absorb some of the silver from the component, causing a weak joint and poor adhesion. The small amount of silver in the solder reduces migration of the silver from the component connections. Silver solder is used in the same manner as ordinary solder and performs essentially the same, except for a slightly higher melting point.

Moving heat to the joint

Most soldering irons are sold on the basis of heating-element wattage. This rating is, unfortunately, commonly the subject of misunderstanding. The wattage indicates only the potential amount of heat an iron can produce. The amount of heat that actually reaches the tip of the iron will be considerably less than the iron's rated heat.

The amount of heat delivered to the work point is determined by the heat-transfer efficiency of the iron, the shape of the soldering tip and the distance between the heating element and the work.

In most electronics applications, 650°F is the minimum amount of heat required to *reflow* a solder joint. However, this does not take into consideration heat lost from the tip. A heat reserve also must be figured into the choice of an iron. Be careful: Too much heat can ruin components and carbonize the flux before it has a chance to do its job. In general, most connections require about 800°F. Large connections, such as braided wire grounds or heavy-gauge wire, require about 1,000°F.

Soldering-iron tips available today usually are made of copper with a thick iron or nickel plating for long life. They must never be *redressed* because filing or grinding will destroy the tip. Coated tips also need to be re-tinned less often than traditional copper tips.

Corrosion is the worst enemy of a soldering tip because it prevents the effective transfer of heat to the solder joint. When a clad tip becomes corroded, it should be sanded lightly with a piece of emery cloth, then re-tinned.

Never re-tin a soldering iron while it is hot. Let the iron cool, then warm it up for about 90 seconds and apply flux-core solder. This procedure is recommended because corrosion is faster at higher temperatures. Tinning while the tip is cooler will provide the best soldering surface. Replace a clad tip when corrosion has eaten through the plating.

The dangers of using too much heat to solder or desolder a component are obvious, but what about not using enough heat? If the solder connection is not heated sufficiently, a *rosin joint* will result. Although a rosin joint looks nearly identical to a solder joint, the flux resins in a rosin joint insulate the component lead and prevent good contact with the PWB trace.

After the circuit board has been soldered, clean all flux residues, and inspect for rosin joints. A good solder joint is smooth and shiny; a rosin joint is dull gray and full of pinholes.

Solder flux

The rosin core of the solder usually is adequate to clean oxide from the joint as you solder. In some cases, however, you may need additional flux. It is good prac-

Singular Vws, Multiple Functions

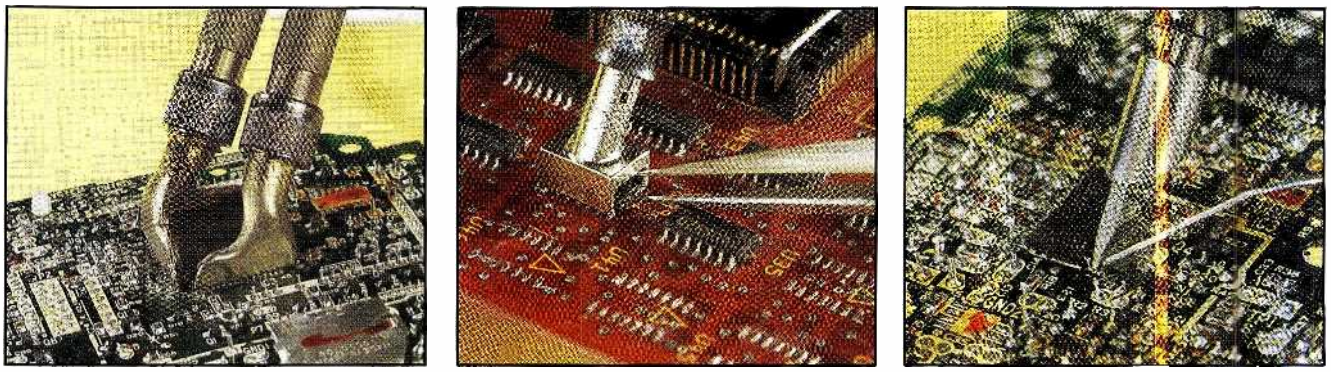
If you're thinking about a truly integrated video workstation system, think HarrisVws™. Now you can handle multiple applications while working in the same operating environment and all on a single video monitor. With HarrisVws, you can cost-effectively manage large libraries of video stills. Better still, you can now interactively enhance these images via high quality paint, titling and composition software.

And, with more applications right around the corner, you can expand your system's capabilities to meet your future needs.

For more information on HarrisVws, contact Harris Video Systems, 960 Linda Vista Avenue, Mountain View, CA 94043, or call 1-800-4-Harris, ext. 3616.

HARRIS

Circle (20) on Reply Card



Specialized soldering tools are needed to remove surface-mount components (SMCs). Shown are three such tools. The photo at left shows a heated tweezer system available in sizes that accommodate most popular SMCs. A specially designed tip, center, is used on a standard soldering iron to remove or reattach discrete chips. The blade tip for a soldering iron, right, is particularly useful when reattaching multiple leaded devices such as small outline ICs and plastic leaded chip carriers.

tice to have some high-quality liquid rosin flux on hand. Rosin is a non-conductive, non-corrosive flux that is recommended for work on electronic circuits. Rosin flux is sticky, however, and will collect dust if allowed to remain on the solder joint. After soldering, clean off any excess flux to remove a potential cause of future problems.

Chip components

The biggest challenge facing maintenance engineers today in PWB rework is how to deal with chip capacitors and transistors and other surface-mounted components (SMCs). Replacing one of these parts without destroying it—or the PWB—requires the right tools and procedures.

Chip components are tiny and are soldered on the same side of the PWB that they are mounted on. To remove a 2-terminal device, grasp the failed component with pliers or tweezers, and melt the solder at both ends using a dual tip designed for that purpose. If such a tip is unavailable, melt the solder at one end of the device, and quickly apply the soldering iron to the other end. The dual-tip procedure, not surprisingly, is the easier of the two methods.

While heat is being applied to the chip component, use a gentle twisting motion to free the device. In many cases, a drop of adhesive was applied to the component and board during the manufacturing process to hold it in place while the board was mass soldered. This glue is specially formulated so that once it has cured, a twisting force will cause it to shatter, freeing the device. The adhesive also may be heat-sensitive. Application of the soldering iron may soften it enough to allow removal of the component.

Not all SMC parts on a board are glued down. In many cases, certain ICs or other parts are soldered manually after the mass soldering of all other components is complete.

Another approach to chip component removal involves the use of two soldering irons, one at each of the two joints. Once the solder has softened, the part can be removed. This usually requires the assistance of another technician (unless you are exceptionally coordinated, or have three hands).

Using any of the methods described, you probably will be left with excess solder on the PWB *lands*. Application of a clean soldering iron may be enough to remove the excess. If not, use solder wick or a vacuum device, along with heat from the iron, to get rid of it.

When replacing a chip device, load one land with solder, and bond the chip to the board with the soldering iron and a small amount of additional solder. After the first bond has solidified, apply heat and solder to the other end to complete the job.

Chip transistors can be handled in much the same way as 2-terminal chip capacitors and resistors. Because three leads are involved, however, a tool designed for desoldering chip transistors should be used.

If you remove a chip component from the board only to find out that it wasn't the problem, don't solder it back onto the board. Never reuse a chip device that has been removed from a PWB. If the part wasn't destroyed by repeated soldering and desoldering, its life probably has been shortened significantly.

Flat packs

Never remove a *flat pack* IC unless you're dead sure it is defective. With a flat pack, as with other components, there are several methods to remove the device. The best approach is to buy a special desoldering head for your iron that will heat all the terminals at the same time. Make sure the head will fit the flat pack device that needs to be replaced.

After the defective component has been removed, clean the lands on the PC board as necessary using soldering braid. Inspect all connection points to be sure no solder bridges were formed during the removal process.

To replace the device, brush the lands with a small amount of liquid flux. This accomplishes two things. First, because little solder is needed for each connection, the flux built into core solder might not be enough to clean the joint properly. Second, the flux is sticky, and this will help hold the IC in place while you solder it. Do not let the flux evaporate or thicken after application.

After you have the IC in place and properly aligned with the PWB lands, solder down a couple of leads, then carefully solder the rest, one at a time. Apply enough solder to form a good bond, but not so much that a solder bridge can form.

The last step in this process is to carefully inspect the final product for solder bridges. If a bridge is found, a soldering-iron tip (clean of excess solder) can be drawn along the length of the gap between the two leads. The tip should pick up the excess solder forming the bridge. Another approach is to apply solder wick and heat the iron at the solder bridge, absorbing the excess solder with the wick. This should leave enough solder between the leads and the lands to ensure a good connection.

Soldering: no easy job

Soldering skill always has been a determining factor in the successful repair of electronic circuits. Poor soldering technique can lead to cold solder joints or voids that, in time, result in equipment failure or in short circuits that cause a circuit board to go up in smoke. If you will be doing much PWB rework, take advantage of instructional videotapes offered by consumer electronics companies, soldering equipment manufacturers and industry organizations such as the Electronic Industries Association.

The Abekas A53-D Digital Special Effects System adds WARP option. The hottest digital 3-D effects system in the video universe is now even hotter with its new WARP option.

WARP lets you turn the page all-the-way-over picture borders, cleanly and smoothly. Bend and warp the picture to make a circle, cylinder, wave, roll, twist, zigzag, split, slide and much more.

Add perspective, rotation, multi-pictures and other standard effects to WARP shapes to create the most dazzling transitions.

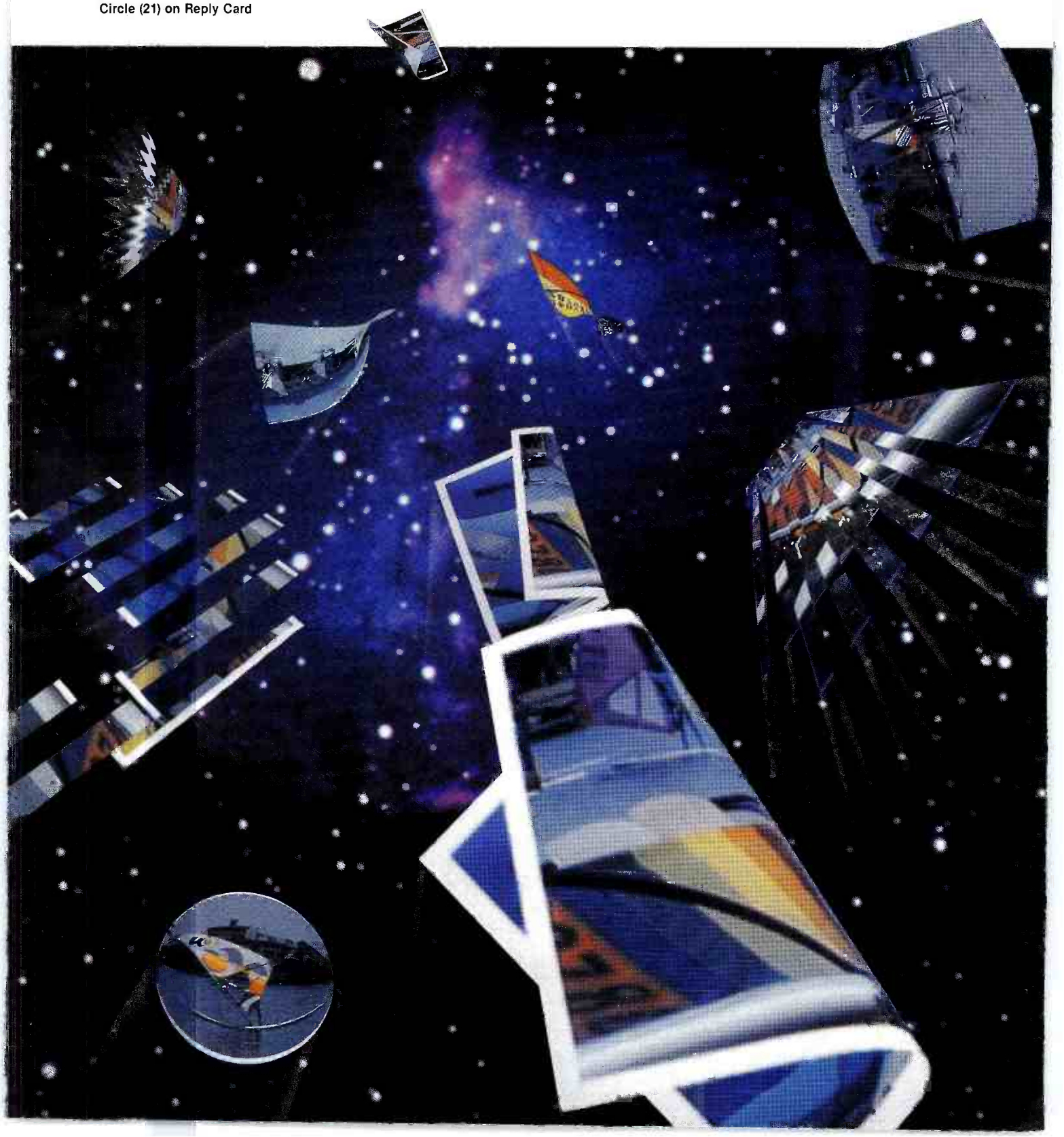
The A53-D comes in composite or component digital versions. The A53-D can be configured as a single- or dual-channel system with up to four control panels. The dual-channel version with WARP gives you live page-turn with a different picture on each side.

Throttle on up to WARP speed. And leave the competition in your wake. For details, contact Abekas Video Systems, Inc., 101 Galveston Drive, Redwood City, CA 94063 (415) 369-5111.

Move on up to WARP speed

Abekas
Video Systems, Inc.
Now Anything is Possible.

Circle (21) on Reply Card



Maintaining broadcast equipment

Using chemicals in the shop

Never go into a troubleshooting battle without a supply of chemical weapons.

Chemicals are important in servicing professional electronic products. The right chemical applied to the right point often will help identify the problem or restore the system to proper operation.

Every maintenance engineer knows that periodic cleaning of electronic hardware is essential for reliability. Cleaning removes oxides, dust, grease and other environmental contaminants that can reduce electrical conductivity and trap heat. Cleaning also imparts a degree of protection against frictional wear, corrosion and static build-up. Nevertheless, the wide variety of advanced, specialized cleaning products now available is frequently overlooked in favor of less reliable and, often, outmoded techniques.

Bring on the chemicals

Several types of solvents and cleaning agents are available, in both aerosol and liquid form, to remove performance-inhibiting contaminants from electronic equipment. The principal applications of these chemicals are:

- removing oxides from tape heads and drive components.
- cleaning printer mechanisms.
- degreasing contacts and PWB connectors.
- removing organic flux after soldering.

Although personal preference and habit often determine which cleaning solvents maintenance engineers use in the shop, other more objective factors, such as safety, effectiveness and convenience, should be considered.

Electronic cleaning solvents can be divided into four major categories based on chemical composition:

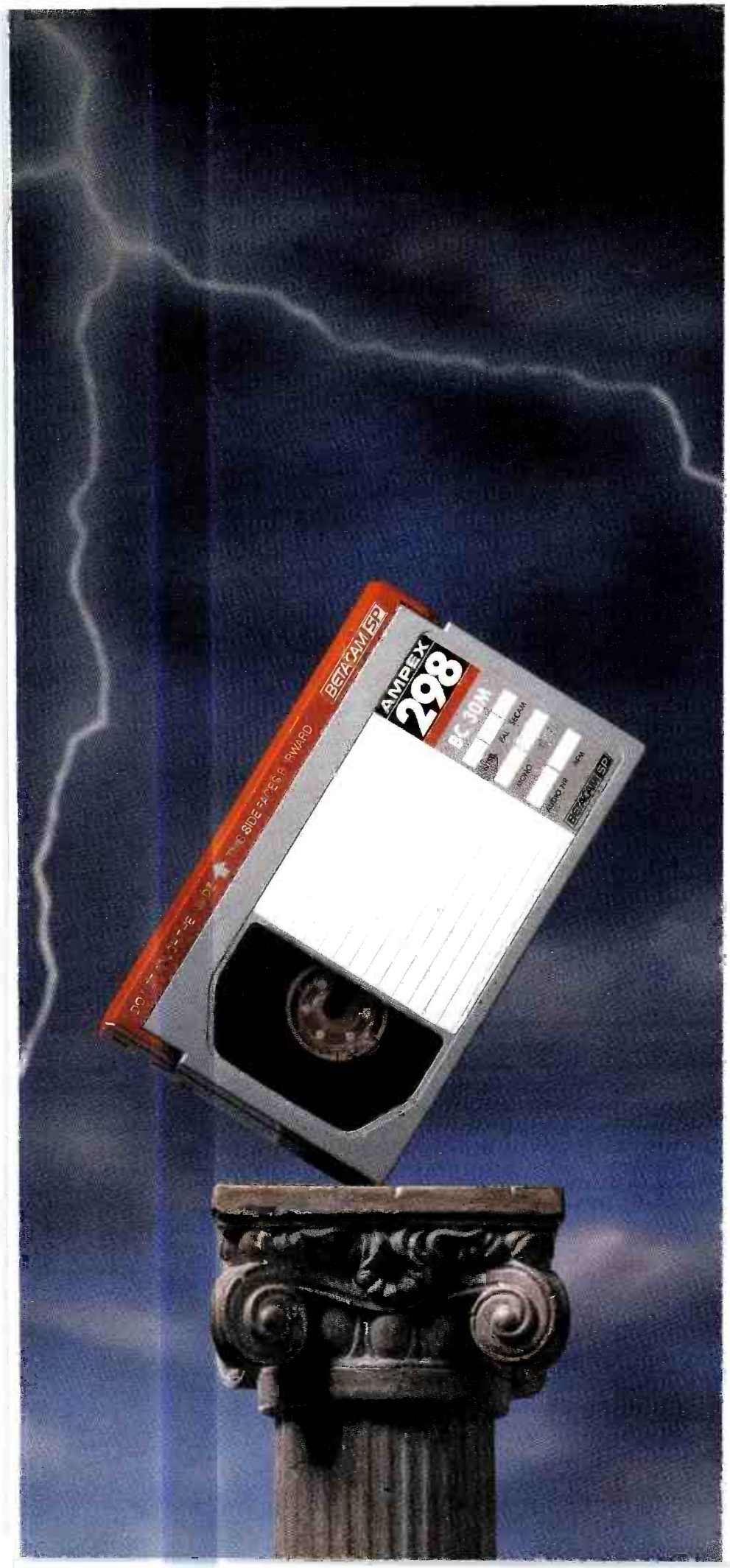
- chlorofluorocarbons.
- chlorinated solvents.
- alcohols.
- blends of chemicals.

Aerosols are preferred by many technicians because they deliver a continually fresh supply of uncontaminated solvent with sufficient pressure to dislodge and remove even encrusted grease and gunk without scrubbing. Aerosol solvents can be applied effectively with a lint-free cloth for catching overspray and wiping. It should be noted that carbon-dioxide-propelled aerosol systems provide the greatest initial spray pressure.

Chlorinated solvents, such as 1,1,1-trichloroethane, are the strongest electronic cleaners used today. They also are non-flammable and available as both liquids and high-pressure aerosols. Chlorinated solvents, however, are more toxic and slightly more unstable than chlorofluorocarbons. They also have a tendency to cause swelling in certain types of plastics.

Alcohols, such as isopropanol, commonly are used for electronic field service work. Although they are good general-purpose solvents, alcohols have several

Continued on page 42



Ampex Betacam SP will take the video world by storm.

Here's a flash.

New Ampex 298 Betacam SP metal particle tape.

Now you can have the convenience of the ½" format, with major improvements in signal output and luminance. For picture quality you'd expect only from a 1" tape. And images that are still crisp after generations of editing.

It's the perfect tape for production and post production. And the perfect complement to our 198 Betacam tape for ENG and EFP. Both come in 5- to 90-minute lengths, with distinctive color coded cassettes for easy SP identification. They also feature our exclusive labeling and logging system.

And both are backed by the best service in the business, including full technical support, immediate deliveries and the personal attention of your Ampex representative.

So take a good look at Ampex 298 and see how far ½" technology has come. And why it's taking off like a bolt from the blue.

AMPEX

It's your best shot.

Ampex Corporation
Magnetic Tape Division
401 Broadway
Redwood City, CA 94063
(415) 367-3809

Circle (22) on Reply Card

WHAT YOU SHOULD KNOW ABOUT MULTI-FORMAT INTEGRATION.

Multi-Format Integration is an exciting, cost-effective way to merge your existing video equipment with today's technology and tomorrow's expectations. The result is superior performance and enormous versatility. Best of all, Multi-Format Integration doesn't come with a high price tag.

The beauty of Multi-Format Integration is its ability to get the most out of key formats — MII, ¾", S-VHS, and VHS. Combine them, and you've got much more than any single format can provide. And JVC is the only manufacturer who can offer all four.

Unfortunately, there is a widespread misconception that these formats cannot work together. That each format was created separately to work separately. That one format can and should serve all your video needs.

It's just not true.

For example, the ¾" format was never designed for camcorder applications. When ¾" was introduced, it simply wasn't possible to put all the necessary components into a small package. While ¾" technology has evolved brilliantly over the years, it still doesn't have the portability, convenience, or playing time necessary for all field applications. JVC's full array of S-VHS camcorders solve the problem. They offer two-hour playing time, outstanding resolution, one-person operation, and all the features you'd expect in a product designed for the professional. You can make superb tapes in the field without a support staff to carry the equipment. JVC's S-VHS camcorders are true camcorders — the ones you never had. And there's one designed especially for you.

So how can you shoot with JVC's S-VHS camcorders, and integrate them with your existing systems?

Simple. Transfer raw S-VHS footage through JVC's KM-F250U Multi-Format Frame Synchronizer/ Time-Base Corrector right to JVC's KR-M800U MII Editing Recorder.

Now you can edit the best way possible — in component video. Your edited master will have the quality of your original S-VHS

footage. Since you're editing in component form, you'll retain that quality from generation to generation, with virtually all the resolution and fidelity of

the original raw footage. So you can make as many copies as you want — in any format.

It's a dream come true in post-production applications, where multi-generation quality is absolutely essential.

Think about it. The field performance of S-VHS, the component editing qualities of MII, and the ability to continue a commitment to your present format. It makes sense. And you can reap all these benefits for a lot less than you'd expect.

It's just one more way JVC keeps you a step ahead. At JVC that's more than a slogan. It's a promise.

To see how MII, ¾", S-VHS, and VHS work together, call JVC PROFESSIONAL PRODUCTS COMPANY, 1-800-JVC-5825. You'll see how Multi-Format Integration lets you link your past, present, and future video technologies.

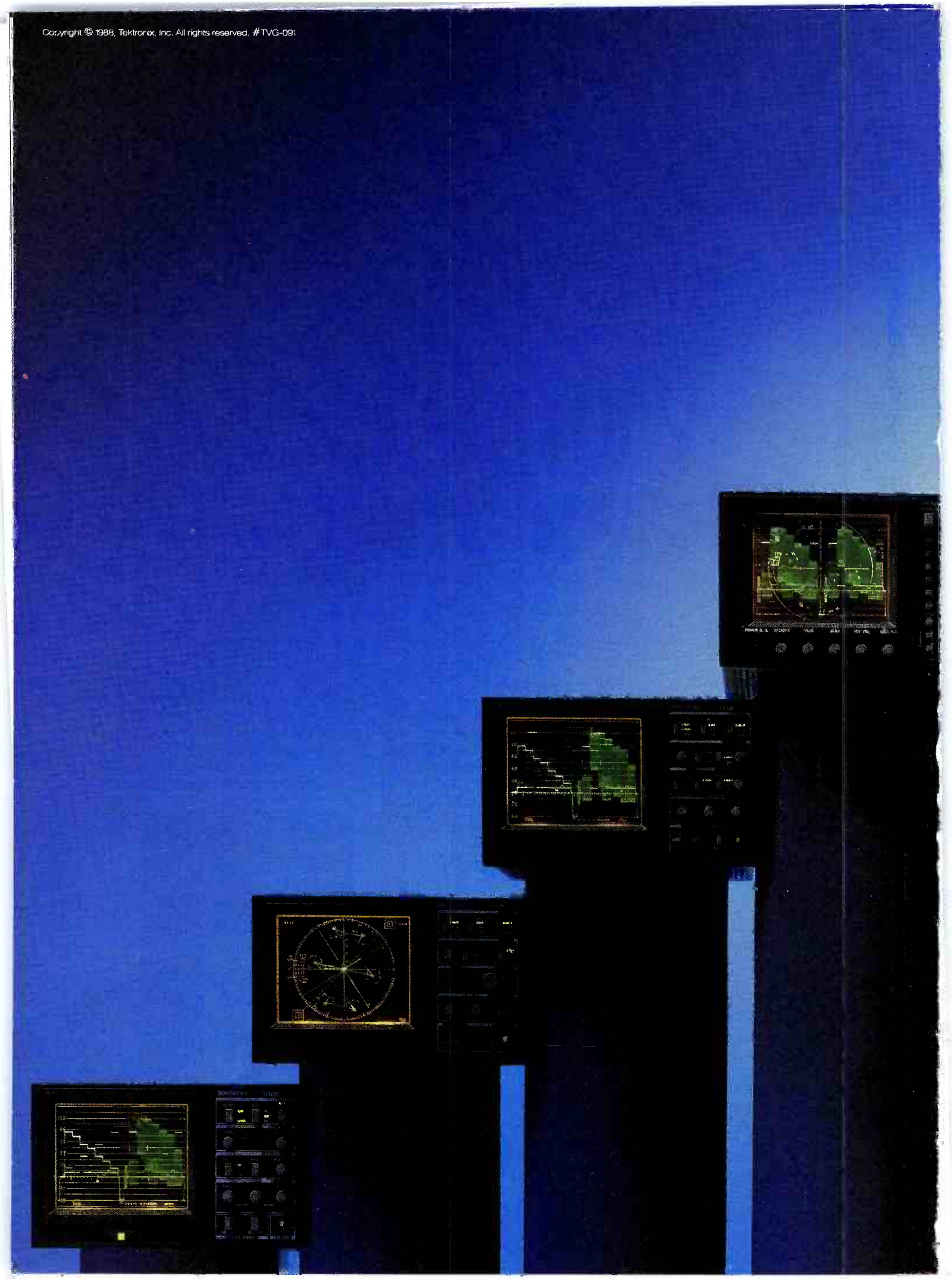
JVC

MULTI-FORMAT INTEGRATION

JVC®

ALWAYS A STEP AHEAD... TO KEEP YOU A STEP AHEAD.

Circle (23) on Reply Card



WELCOME TO THE TOP OF THE LINE

The new Tek 1780R. Today's premier analog video measurement set. It's the latest addition to the 1700 Series family and tops all the competition with unmatched performance for the price. You get all the advantages of separate, interactive waveform and vector monitors, plus the economy and convenience of a single measurement package for multiple tasks.

The 1780R makes even the toughest video measurements easy. And it's at the forefront of a complete line of analog signal monitors, meeting every need and budget.

A benchmark in comprehensive performance. The 1780R offers graphic SCH phase measurement, precision differential phase and gain measurement, operational noise measurement and measurement-grade time and amplitude cursors operational in even highly-expanded display modes.

The 1780R features frequency response to 20 MHz, 100X horizontal magnification, a selection of filters and an exceptionally bright CRT...bright enough for VITS selected from four fields to be seen easily even in a well-lighted room.

Operation is as simple as capabilities are sophisticated. Clearly marked controls, digital readouts, complete front panel presets and pre-programmed measurement modes make the 1780R a pleasure to use.

Call now to see for yourself. Ask your Tektronix representative to demonstrate the advanced features of the 1780R...or any of the complete line of Tek signal monitors. You'll find a perfect match for every need.

Tektronix®
COMMITTED TO EXCELLENCE

Circle (63) on Reply Card

Continued from page 54

Where did the pins go?

Occasionally, you may find yourself in a situation in which a replacement for a 14-lead linear DIP IC comes with only eight leads. In this case, pins 1,2,7,8,13 and 14 are not connected to anything internally in the original package. The 8-pin replacement is, more or less, a direct replacement, and should be installed as shown in Figure 1.

The JEDEC TO-220 outline is a direct retrofit for the JEDEC metal TO-66 case. Likewise, the CP-3 plastic device can be used to replace types in the JEDEC TO-3 metal case. In either situation, make the replacement by cutting the center lead of the plastic device and bending the two outside leads to install the new component. See Figure 2.

Sources of replacement parts

Although finding the right replacement part sometimes seems to be an impossible task, the more suppliers you are familiar with, the more likely you will be able to find the component you need. Some suppliers sell through traditional distributors, others sell via mail order. Check them all out. If the original equipment manufacturer is unable to provide you with the replacement part that you need, perhaps it can suggest alternative parts houses that can help you.

Many popular semiconductors now are available from alternative parts sources, frequently at attractive prices. Most of these vendors are catalog operations. By looking at the catalog, reviewing the sales terms and conditions, and talking to customer service representatives on the phone, you can learn a lot about the operation. Then decide if you want to do business with the company.

Deal with companies that offer you services such as fast delivery and on-line information regarding in- and out-of-stock items. Buy from companies that offer easy return privileges for unacceptable or defective parts.

After receiving an order from the supplier, answer the following questions:

- How long did it take for the order to arrive? If the parts were cheap, but it took more than a week to receive your "rush" order, then *you* are the loser.
- How were the products packaged? The use of paper bags, newspaper and other cheap materials can allow damage.
- How much of what you ordered actually arrived? It should not be less than 70%.
- Is the invoice clear? Are all charges reasonable? Avoid buying from companies that charge for handling or assess surcharges. Reputable companies bill freight only in the amount charged to them by the carrier.
- Is the order accurate? Mistakes do happen, but an excessive number of mistakes is a clear sign of a problem company.

Keep the faith

Does the following phone conversation sound familiar?

"I need to order a high-voltage choke and plate current meter for my BTA-1R transmitter, and I need it ASAP."

"Let me check stock on those items. Yes, we have them, and we can ship today."

"Price?"

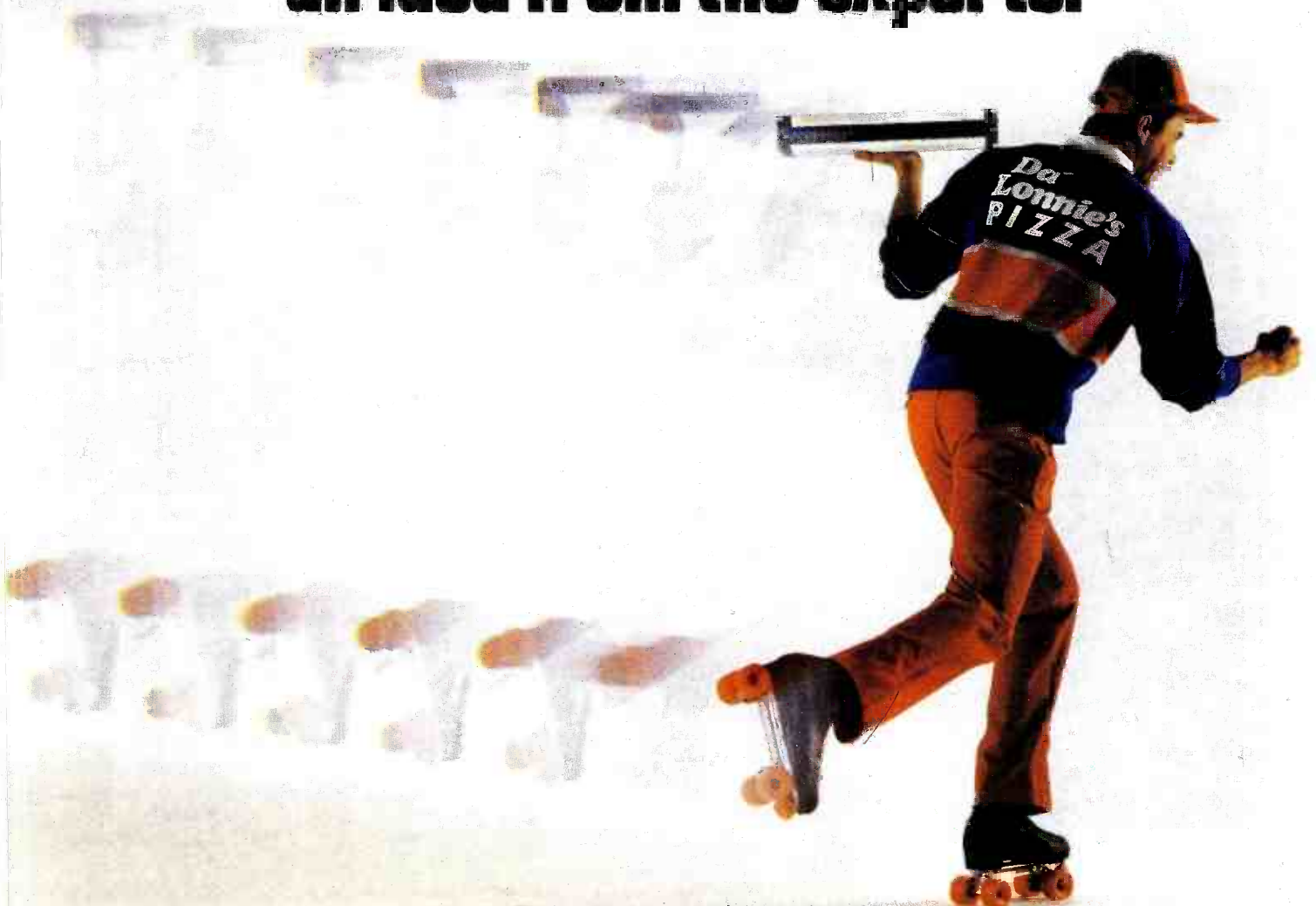
"Well, let's see. The choke is $1,200, and the meter is $345. How do you want to pay for them?"

"Uh, maybe I'll call you back."

Change the type of product to whatever you like. Change the prices accordingly. The lesson is universal. There are few guarantees that the parts you need at some point in the future will be available when you need them. It's even less likely that the prices will be reasonable.

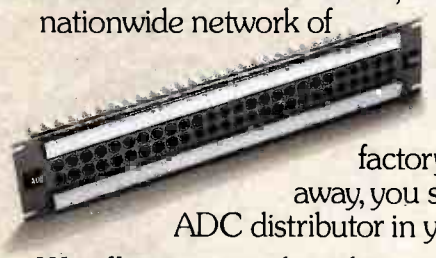
The best advice is to order the spares

To get a bigger slice of your video patching business, we borrowed an idea from the experts.



Quick delivery.

Whether it's a pepperoni pizza or a patchbay, nobody likes waiting for deliveries. And when you order video products from ADC Telecommunications, you don't have to. Because unlike other manufacturers, we sell through a nationwide network of video distributors. So instead of waiting weeks for delivery from a factory a thousand miles away, you simply call the ADC distributor in your area.



We offer toppings the others can't match, too. Our video jacks come in gold or nickel finish, terminating or non-terminating and phase compensated as well.

Circle (65) on Reply Card

But you don't have to order an extra-large with everything to get fast delivery. We'll give you the same service even if you just need a few patch-cords. Because we know if we offer a broad range of quality products at fair prices, and deliver them faster than the competition, we'll get a bigger slice of your business.

We call it the "Domino Theory."

For the name of your local ADC stocking distributor, call **612-893-3126** east of the Mississippi, or call **612-893-3119** west of the Mississippi.

ADC Telecommunications®

"Where Quality Runs Full Circuit."

4900 West 78th Street, Minneapolis, MN 55435

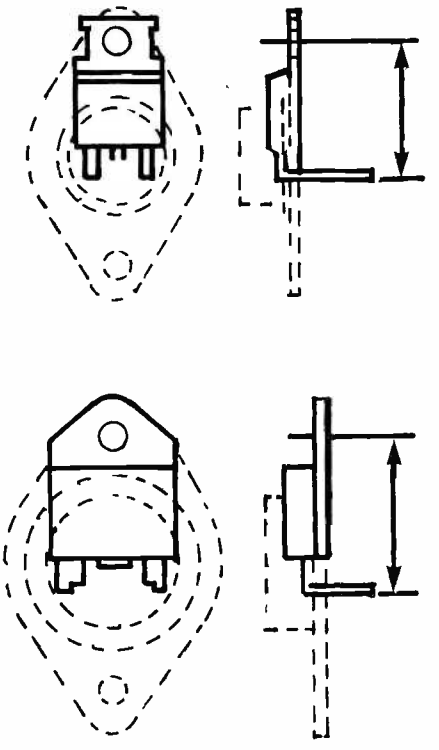


Figure 2. *Some plastic-case devices are direct retrofits for metal-case types. Just cut the center lead of the plastic component, and bend the two outside leads. Check the pinouts of the original device and the replacement to make sure the leads are going where they should. One mistake and you're out!*

kit offered by most equipment manufacturers whenever you buy a new piece of hardware. Also ask for a listing of second-source suppliers for critical elements of the product that are not practical to include in a spares kit.

One day you, or your successor, will be glad the station planned up-front for the day when the product would fail.

Good luck.

Bibliography

"Setting up a Test Bench," by Conrad Persson, editor, *Electronic Servicing and Technology (ES&T)*, March 1987.

"I Only Have Two Hands!" by Conrad Persson, editor, *ES&T*, July 1986.

"When to Buy the Custom Tool Kit," by Sherman Jensen, Jensen Tools, *Microservice Management (MSM)*, February 1988.

"Cleaning Supplies for Computers," by Gil O'Brien, Chemtronics, *MSM*, August 1988.

"Locating Replacement Parts," by Conrad Persson, editor, *ES&T*, December, 1987.

"Choosing an Alternative Vendor," by Gershon Cooper, ORA Electronics, *ES&T*, December 1987.

"Solder: The Tin That Binds," by Conrad Persson, editor, *ES&T*, February 1986.

"PCB Rework," by James Schmerbauch, *MSM*, August 1987.

"Choosing a Soldering Iron," by Christopher Fenton, consultant, *ES&T*, May 1988.

"The Basics of Static Control," by Mike Voss, 3M Static and Electronic Control Division, *ES&T*, July 1988.

"Portable Field Service Kits," Parts 1, 2 and 3, by Dixon Gleeson, 3M Static and Electronic Control Division, *MSM*, October, November, December 1986. |:-)))|

It's a lot easier to be done than to be satisfied.

You've been there—locked in the battle between perfection and reality. There's always one more thing you'd like to try. And the last thing you need to worry about is the tape. So choose ours. Because, in our products and service, 3M is committed to one goal: **We won't be satisfied until you are.**

3M

Circle (67) on Reply Card

Managing a studio maintenance program

By Ronald Balonis

Today's sophisticated equipment demands an organized and scheduled maintenance program.

Today's radio and TV stations are much different from those of 25 years ago. Gone are the days of tube devices and heavy power supplies. Also gone are many of the heat-generated problems associated with tube-based equipment. Today's broadcast systems are more compact, complex, expensive and, fortunately, reliable. These factors have had a dramatic impact on the steps and elements needed in a proper maintenance program.

Maintenance systems

There have been at least three generations of electronic technology: vacuum tubes, transistors and integrated circuits. Each of these devices can be used in the analog and digital design technologies. Because today's broadcast facility may contain equipment that represents more than one design technology, a carefully thought-out maintenance program is necessary.

An effective maintenance program should be designed to accomplish the following goals:

- Eliminate unexpected breakdowns.
- Keep the equipment operating at optimum performance.
- Extend the useful life of the equipment.
- Operate the station and its equipment according to the FCC rules.
- Complete each of these goals in a cost-effective way.

Although the basic goals and the general maintenance needs may be the same, there is no single maintenance system that is best for all stations or all engineers. Because each facility is different, so are the engineer's skills. The best maintenance system is based on the equipment and operational realities of the station and the available engineering talent, whether it's contract, part-time or full-time.

Balonis is chief engineer at WILK-AM, Wilkes-Barre, PA.

Maintenance programs

Conceptually, a maintenance program can be pictured as a triangle. (See Figure 1.) A maintenance program has three basic emphases: crisis maintenance, preventive maintenance and predictive maintenance. Although a station's maintenance program may involve all three areas, one or two will be emphasized more than the others. Let's take a closer look at these aspects:

- *Preventive maintenance* refers to work that is completed on a daily, weekly or monthly schedule, whether or not the equipment needs maintenance. It's a traditional and conservative system that is characterized by a constant level of maintenance activity. The program is one in which routine maintenance tasks may have a high priority, regardless of the amount of engineering time they consume.

This is a good program that can greatly extend the useful life of equipment. This type of maintenance program generally is found at stations where the cost of maintenance is a fixed budgetary item and a fully staffed engineering department allocates sufficient maintenance time.

- *Crisis maintenance* is characterized by work that occurs after the equipment fails. It's only at this point that the equipment receives routine checks, tests and repairs. Maintenance is based on the reliability of the equipment and the trade-off between the cost of preventive maintenance and equipment downtime. Whether this program works depends on the technology of the equipment, its age and condition. Crisis maintenance is common at stations where operational quality is secondary to costs and/or profits. This type of maintenance generally is practiced by engineers with the "leave well enough alone" philosophy.
- *Predictive maintenance* is based on experience, analysis of maintenance records, periodic inspections and performance evaluations. These factors determine the maintenance schedule. Predictive maintenance relies on an overall system analysis that looks at the station's critical equipment and systems to determine the maintenance priorities and scheduling.

Operationally, the system provides a way of achieving an efficient and effective balance between the costs of preventive and crisis maintenance. The system works best at stations where competitive pressures require economical and efficient engineering maintenance without sacrificing quality or operational integrity. A predictive maintenance program is more difficult to implement effectively than the other two programs.

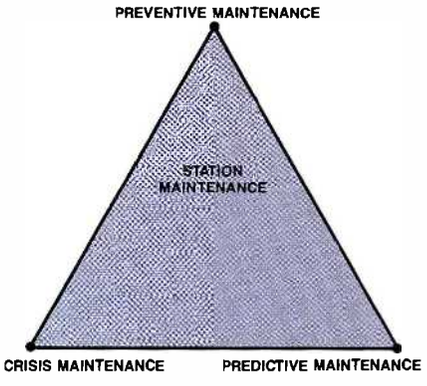
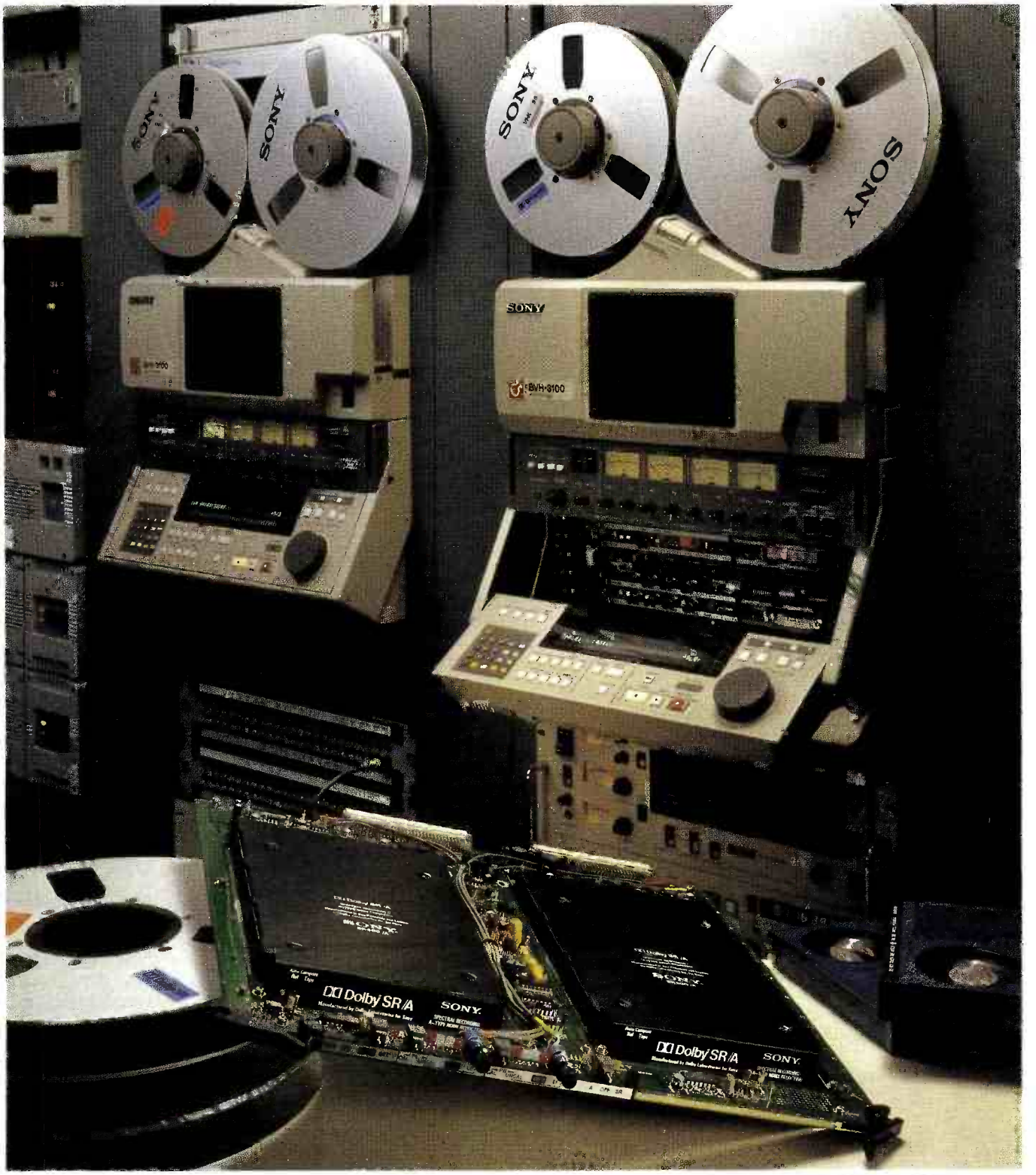


Figure 1. *A studio maintenance program may be thought of as encompassing three different types of maintenance: preventive, crisis and predictive.*

Program building blocks

Although maintenance programs differ in the way they achieve their goals, they all are composed of the same basic building blocks: documentation/analysis and scheduling. The three maintenance programs rely on differing amounts of these components.

Video That Sounds as Good as it Looks.



Photographed at On Tape Productions, San Francisco, CA.

The video industry demands the same uncompromising audio quality the recording industry expects. Dolby SR signal processing and Dolby A-type noise reduction are now available on one processing board for the Sony BVH-3000/3100 VTR. Contact your Sony representative and inquire about the BKH-3080. Find out why recording and film studios around the world rely on Dolby for cleaner, quieter audio.

Dolby® SR
spectral recording

Circle (68) on Reply Card

Proper equipment maintenance always should involve some sort of documentation, even if it's only a check mark on a task list. Documentation provides a logical way to evaluate and maintain the equipment. It also is an effective way to assess true equipment costs. Documentation provides a starting point for future equipment troubleshooting, making the work more efficient and cost-effective.

Documentation, however, is a personal cost to the engineer. It can be the hardest part of a maintenance program because it requires the use of the soft skills of writing and drawing instead of the hard skills of troubleshooting and repair.

Maintenance and trouble logs

Maintenance and trouble logs are effective forms of documentation. Although the FCC no longer requires detailed maintenance logs, such records can be a persuasive way to justify new equipment. The logs also can be useful in scheduling

Continued on page 68

DATE	PROBLEM	INIT.

DATE	FAULT/FIX	INIT.

Figure 2. *Use a trouble log, located near the equipment, to obtain feedback from operators about problems.*

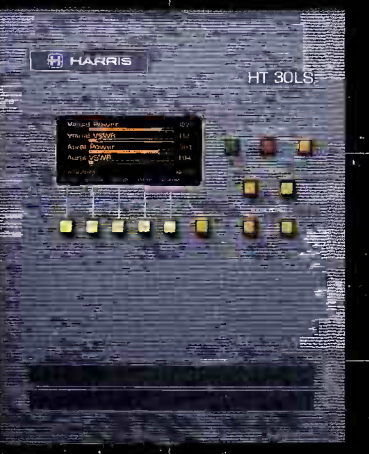
Harris Solid-state VHF TV Transmitters

Setting new standards for VHF technology and reliability

Harris' revolutionary 1 kW through 60 kW ***Platinum Series***™ VHF solid-state transmitters look different because they *are* different. Quite simply, these rugged, modular transmitters provide unequalled system redundancy to keep your station on the air.

Parallel operation of conservatively-rated, solid-state PA modules, multiple power supplies and an exclusive distributed cooling system ensure a level of reliability that questions the need for a standby transmitter.

What's more, these transmitters are the most user-friendly you'll find. Easy-to-use controls and status displays, front access to components, and high stability to minimize adjustment requirements mean that virtually *any* person can operate the transmitter with very little training.



Control Panel/User Display
A central control panel provides straightforward pushbutton control of the entire transmitter. In addition, each transmitter cabinet can be operated independently. The user display offers immediate and comprehensive system status — digitally and with bar graphs.

Solid-state PA Modules
Conservatively-rated 1 kW visual and aural power amplifier modules with individual MTBFs of 280,000 hours are identical and interchangeable. For extended life and reliability, each high-silicon module features a unique heat sink. "Hot-pluggable" modules can be changed easily and safely while the transmitter is operating.

The transmitter shown is Harris' HT 30LS 30 kW low band solid-state model, configured with the optional spare exciter and 20% aural option.

To learn more about Harris solid-state VHF TV transmitters, phone TOLL FREE:

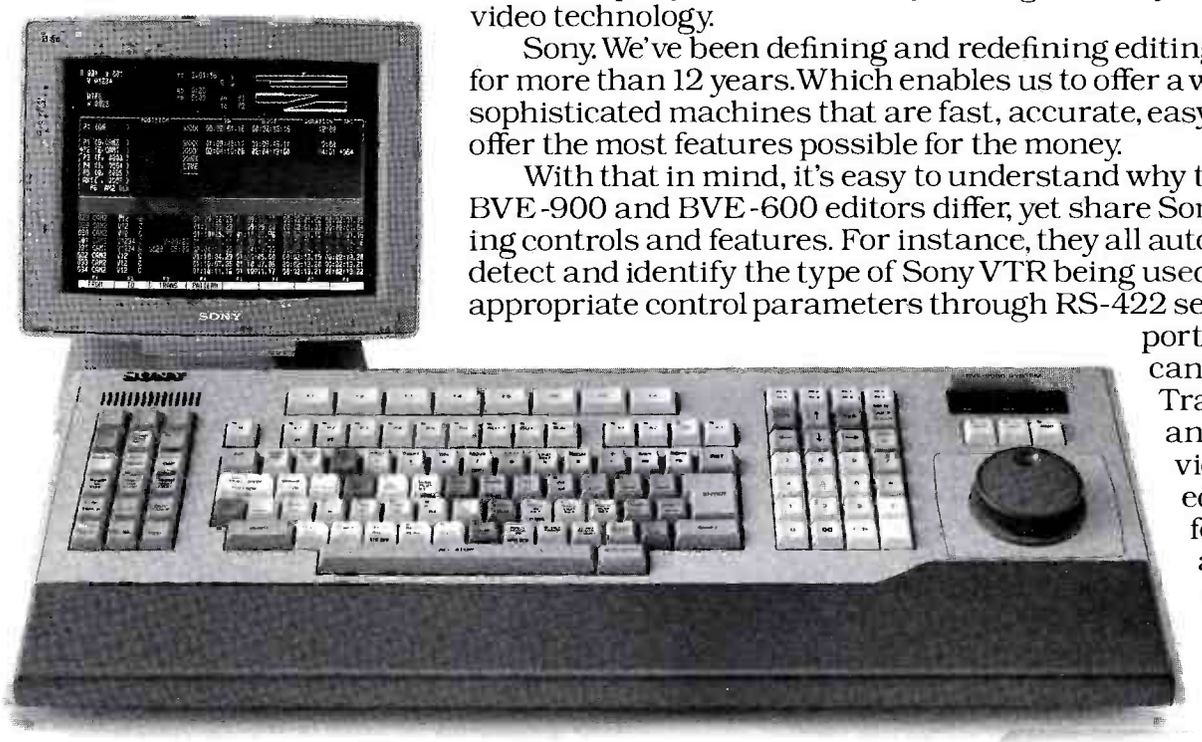
1-800-4-HARRIS
Extension 3017

HARRIS

Circle (71) on Reply Card

Why Sony cutting edge o

BVE-9000



One company has consistently managed to stay at the forefront of video technology.

Sony. We've been defining and redefining editing control units for more than 12 years. Which enables us to offer a wide range of sophisticated machines that are fast, accurate, easy-to-use and offer the most features possible for the money.

With that in mind, it's easy to understand why the BVE-9000, BVE-900 and BVE-600 editors differ, yet share Sony's key operating controls and features. For instance, they all automatically detect and identify the type of Sony VTR being used and set the appropriate control parameters through RS-422 serial control ports. Plus, they can read Control Track, Time Code and perform video/audio split edits. The list of features goes on and on, so by all means, read on.

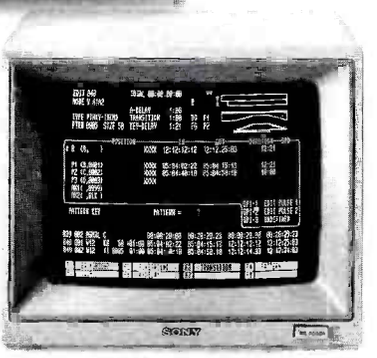
The BVE-9000. State-Of-The-Art That's Top-Of-The-Line.

The Sony BVE-9000 is one of the most flexible and powerful editing systems in the world. It's designed to save the most precious commodity of all: time.

Among its significant innovations are multi-edit preview and full assembly look ahead. This allows you to preview an entire sequence of up to 999 events, before actually having to record a single edit. And then, with the flick of a few key strokes, you can automatically record the entire program.

Of course, there are many other incredible features that help you control your entire editing facility. For one thing, the BVE-9000 can work with 28 separate devices. It also has an optional color menu display that's user friendly and programmable for layout and color.

What's more, our Dynamic Motion Control Learn-With-Create and



BVE-900

is on the f technology.

switcher Learn-With-Create features allow you to record a move without having to re-rehearse it. In addition, the temporary record assignment greatly speeds up multi-layering. And the most complete set of test diagnostics in the industry helps reduce system downtime. No wonder this top-of-the-line editing system can meet all your present and future needs.

The BVE-900. State-Of-The-Art Technology And State-Of-The-Art Economy.

The next best thing to editing on a BVE-9000 is editing on a BVE-900. It, too, is an easy-to-use system and economically offers technical advancements and expandability.

It controls up to four VTR's in any A/B roll edit. So you can perform sync roll and sync play. In addition, the BVE-900 gives you full control of video switchers and audio mixers, including fader selection and VCA control for split audio/video edits.

What's more, its easy-to-use menu driven display puts edit accessibility at your fingertips.

BVE-600

The BVE-600. State-Of-The-Art Technology Even More Economically.

The BVE-600 is our most economical unit. It allows you to control three VTRs (two players and one recorder). Which, depending on your needs, may be more than enough. You have the power to dissolve, wipe, or superimpose editing sequences, without the need for an external video switcher. Our optional built-in component/composite video switcher offers a selection of 10 wipe patterns. That, with our built-in MXP-29 Audio Mixer interface, make A/B roll editing a reality.

Of all the benefits of using Sony editing control units, perhaps the greatest is that they form an easy-to-use system. Which means you can connect them to Sony VTRs, switchers, audio mixers and video monitors. All of which are serviced by Sony.

For more information about Sony's entire line of editors, write to: Sony Information Center, P.O. Box 6185, Union, NJ 07083. Then you'll be able to see even better why Sony is on the cutting edge of technology.

SONY

Broadcast Products
Sony Communications Products Company

Circle (72) on Reply Card

Continued from page 64
preventive maintenance, which may ward off equipment failure.

A maintenance log should include all major failures and repairs that have been completed. You can record personal notes on actions taken, meter readings or troubleshooting tricks you may have picked up while servicing the device. All this information will be helpful if the device fails later and you want to return it to service quickly.

Regardless of the kind of station maintenance or maintenance philosophy, a well-designed system of reporting equipment failures is essential. A reporting system of trouble logs located in each studio or equipment group is effective.

The trouble log may be as simple as that shown in Figure 2. The actual form is not critical; the content and the use are what matters. In the example, the left side of the log is filled out by the announcer or operator when equipment problems are noticed. The right side is completed by the engineer. A notation about repairs performed or planned should be made as

★★★ ENGINEERING ★★★

DAY _____ DATE _____ BY _____

Make a DO LIST by selecting items from:

1. TROUBLE LOGS
   - ☐ Control Room
   - ☐ News Room
   - ☐ Engineering Daybook/Calendar
   - ☐ Production Room
   - ☐ Engineering Room
2. Carry-overs from previous engineering Do Lists ☐
3. Timely items for scheduled maintenance ☐
4. Continuing projects or the Project List ☐

★★★ DO LIST ★★★

Priority [1-6]		Completed [Y/N]
1. ☐	_____	☐
2. ☐	_____	☐

Figure 3. *The engineering do list prioritizes tasks. The list is composed from trouble logs and calendars or daybooks.*

Let Us Give You A Quote On Our Audio Switcher.

"When we designed our new 23,000 square-foot facility at KLBJ AM-FM, a primary goal was to maximize operational flexibility. So, we looked at the alternate ways to route audio signals. We compared features and specs, as well as costs.

"ITC's AUDIO SWITCHER turned out to be an easy choice. One reason is it's designed specifically for audio applications.

"With the AUDIO SWITCHER, we're wired to and from every satellite, network, studio, and workstation. We're even wired to the Program Director's office. And installation was easy.

"That was September '87. Since then? The AUDIO SWITCHER has worked out wonderfully, and staff reaction has been very, very positive. Changes are easy, and when we reconfigure something, we save both time and money. As far as our return on investment goes, it's been excellent."

–Bryan King,
Chief Engineer, KLBJ AM-FM

What more can we say?

If you'd like detailed information on how you, too, can easily and effectively route audio signals, call International Tapetronics, 3M Broadcasting and Related Products Department toll-free at 1-800-447-0414. In Alaska and Illinois, call collect; 309-828-1381.

3M

Circle (74) on Reply Card

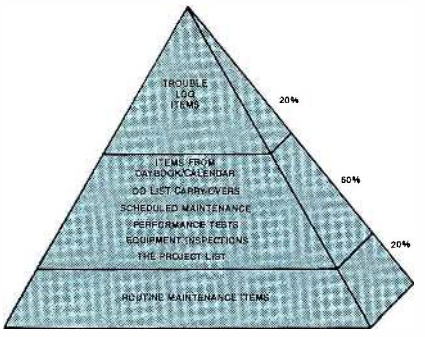


Figure 4. *The time-managed studio maintenance program concentrates engineering resources on areas most in need of attention.*

soon as possible after the problem is logged by the operator.

The notations are directed primarily to the engineering staff. However, because everybody has access to the logs, they also can keep others informed of equipment problems and the steps being taken to correct problems.

Trouble logs also provide several other advantages. They keep operators and the maintenance staff informed of the device's condition. By documenting the engineer's role, the logs can help reduce the finger-pointing that often occurs. When everyone concerned knows the operating status of a piece of equipment, there is less chance of blame being assigned to one party. Persistent problems quickly become apparent, thereby helping those involved to seek solutions.

Finally, trouble logs may help justify replacement or budget increases by documenting failures and repair costs. If you can document high repair costs for a device, then you have a better chance of obtaining management support for replacement.

Use a file cabinet to keep the documentation in proper order. The documentation should include daybooks, do lists, trouble logs and the equipment instruction/operation manuals. Organize the information in a consistent way—by equipment location, manufacturer or model number. The organizational method used is not as important as the consistency with which you keep the documentation updated.

Planning and scheduling

Essential to any effective maintenance program is the planning and scheduling of the needed work. This planning also must be done within the time available. In addition, any work scheduled must take into account the available resources of time, money, parts, equipment and skills. Of these resources, time may be the one factor that the engineer can control.

Today, effective broadcast engineering is more dependent on the *quality* of time spent and much less dependent on the actual *amount* of time spent on engineering activities. The key to maximizing the quality of engineering time is to use effective time-management techniques in the maintenance program.

A daybook or planning calendar is a good first-level approach to effective time management. Because many activities must occur according to a predetermined schedule, a centralized reference point is needed. A daybook or calendar provides a convenient place to record time-dependent activities. By scheduling in advance when certain tasks must be completed, the engineer is forced to allocate time to complete them. This helps prevent the "I didn't have enough time" syndrome.

Another successful time-management technique relies on the use of do lists. These contain an itemized listing of tasks that must be completed on a daily, weekly and monthly basis. The tasks are assigned a priority number, based on their importance to the overall operation of the station.

An example do list is shown in Figure 3. One way to use the list is to transfer data from the trouble logs and daybook or calendar to this list. The equipment problems are assigned a priority number indicating importance from high (do now), to low (do tomorrow), to very low (do next week or later). This scheme, using the information from trouble logs, daybooks and calendars as the keystone, produces a non-rigid schedule. The daily priorities are reset as needed, based on input from other sources.

Time management

Time management in a maintenance program can be visualized in the shape of a task pyramid. (See Figure 4.) The engineering resources of time and money are directed to the tasks listed in the middle of the pyramid. The top-priority tasks are the current trouble log problems. The pyramid base lists all the routine maintenance tasks that must be performed on a regular, daily, weekly, monthly or yearly basis. These tasks often are recorded originally in daybooks or calendars.

Such a system is dynamic, with maintenance priorities subject to the operational realities of the station. Depending on what's happening, tasks bubble up and down the task pyramid. In practice, the system tends to spread out the engineering maintenance tasks so that the workload is more evenly distributed. It forces an allocation of engineering effort and time to the weakest areas or most troublesome equipment within a station.

Perhaps most important is that the system improves the productivity and helps to achieve a smooth-running station. After all, wouldn't you like your job to be just a little less hectic? |:-)))|

CLASSIC SIMPLICITY

To make something that works – and works well – is craftsmanship. To create a product which redefines its purpose and yet retains an essential simplicity is a work of art.

There are many intercoms on the market... and then there is the McCurdy Digital Intercom.

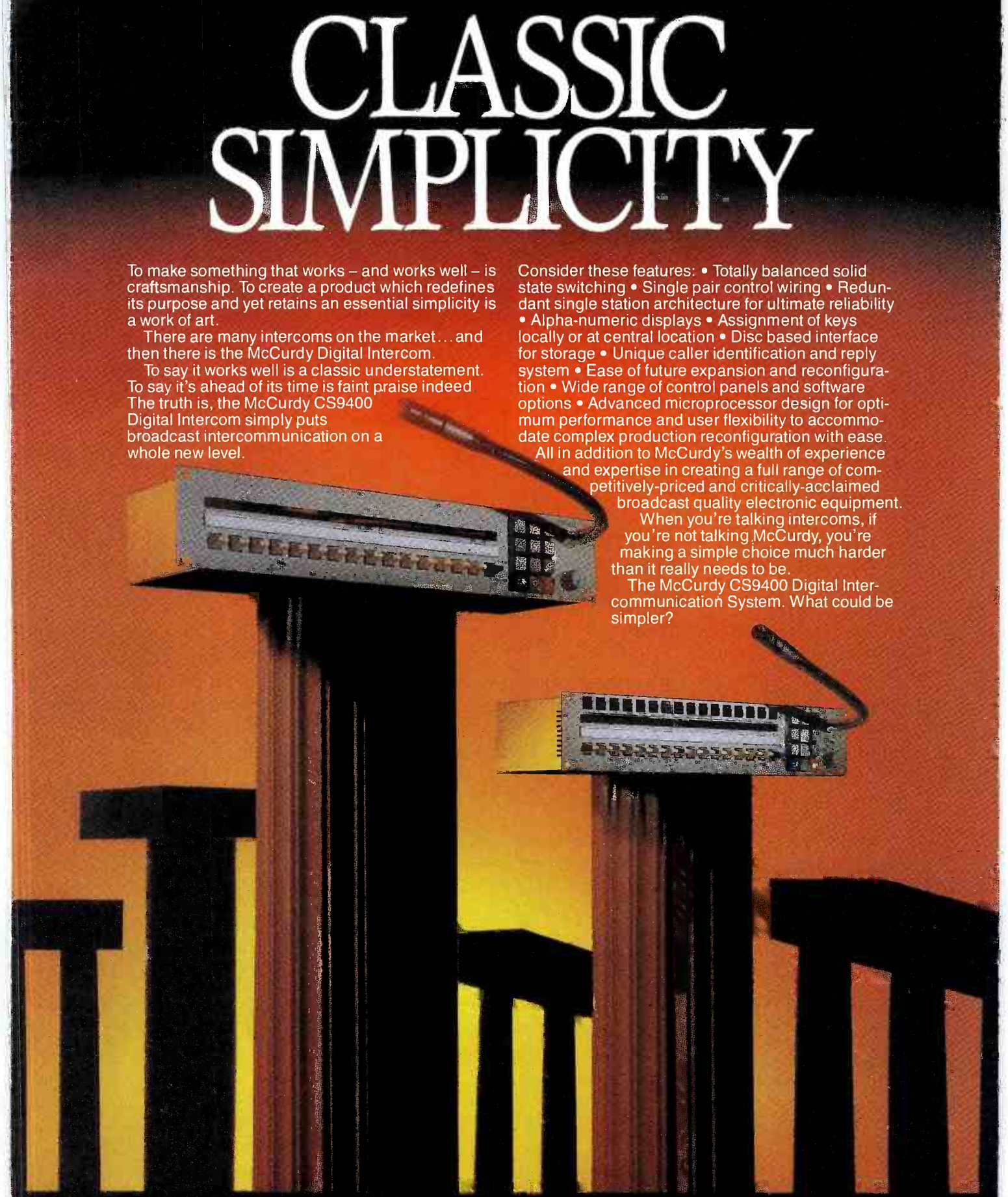
To say it works well is a classic understatement. To say it's ahead of its time is faint praise indeed The truth is, the McCurdy CS9400 Digital Intercom simply puts broadcast intercommunication on a whole new level.

Consider these features: • Totally balanced solid state switching • Single pair control wiring • Redundant single station architecture for ultimate reliability • Alpha-numeric displays • Assignment of keys locally or at central location • Disc based interface for storage • Unique caller identification and reply system • Ease of future expansion and reconfiguration • Wide range of control panels and software options • Advanced microprocessor design for optimum performance and user flexibility to accommodate complex production reconfiguration with ease.

All in addition to McCurdy's wealth of experience and expertise in creating a full range of competitively-priced and critically-acclaimed broadcast quality electronic equipment.

When you're talking intercoms, if you're not talking McCurdy, you're making a simple choice much harder than it really needs to be.

The McCurdy CS9400 Digital Intercommunication System. What could be simpler?



McCurdy

Circle (76) on Reply Card

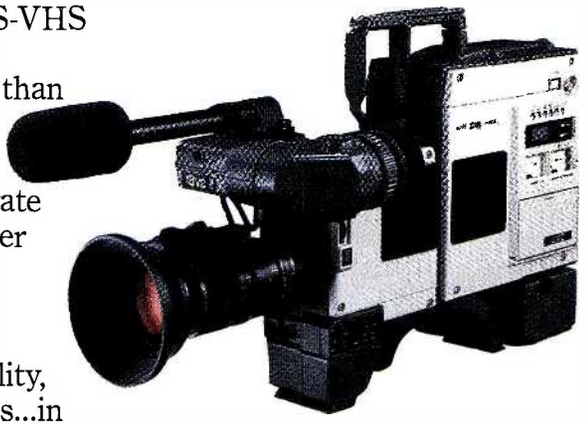
McCurdy Radio Industries

108 Carnforth Road, Toronto, Ontario, Canada M4A 2L4 Tel: (416)751-6262 Telex: 06-963533 1051 Clinton Street, Buffalo, New York 14206 Tel: (212)772-0719

WHAT YOU SHOULD KNOW ABOUT JVC's S-VHS

You've got to see S-VHS to believe it.
There's far more here than meets the eye.

Now with JVC's S-VHS you have separate Y/C video signals, wider bandwidth, and better than 400 lines of horizontal resolution to give you higher quality, sharper, clearer images...in short, better pictures.



In fact, JVC developed S-VHS to be one of the most powerful, versatile and economical formats for the video professional. But that's what you would expect from the company that also developed VHS.

For field applications, JVC designed a series of S-VHS camcorders especially for you. Take them anywhere, without the burden of separate battery packs, belts, wires and other inconveniences. And they're lightweight, compact and well-balanced. These camcorders record in Y/C mode eliminating NTSC artifacts to deliver outstanding professional performance with unmatched ENG convenience.

They're the true camcorders you've always hoped for.

JVC's S-VHS camcorder series consists of the BR-S410UN, S-VHS recorder/player and any of JVC's KY or BY series color CCD cameras. And of course you have a choice of lenses.

The BR-S410UN is the most versatile VCR available in the market today.
It's a dockable VCR.
It's a portable VCR.
It's an editing source VCR.

The BR-S410UN is a true portable VCR which can be used with your existing composite color camera or any Y/C camera.

Consider the additional benefit. The BR-S410UN is the only S-VHS portable which can be used as a source VCR in an editing system. Of course, JVC supplies an editing controller, the RM-G410U and combined with the BR-S810U editing VCR you have a cuts only editing system.
Now that's versatility...

For production and post production applications, JVC's BR-S610U recorder/player and BR-S810U editing recorder/player gives you all the features you would expect.

Post-production features like: variable speed dial search from still to 10 times normal speed, bi-directional jog shuttle control to locate exact in and out edit points, Y/C 3.58 and Y/C 629 inputs and outputs, two channels of longitudinal audio with Dolby noise reduction. Not to mention, one audio channel which can be used for SMPTE time code, die-cast chassis construction and, when using the JVC RM-G810U editing controller, JVC's half loading mechanism will read CTL pulses in fast forward and rewind modes. These are just a few advantages designed for the professional.

For production, when looking for a recorder/player which can be used as a source in an editing system, as well as a production VCR, the BR-S610U is the one for you.

Mastering is made easy with the BR-S810U editing recorder/player. Additional production features like built-in self-diagnostics and full assemble and insert editing of video/audio have also been included.

The BR-S810U editing VCR combined with the RM-G810U editing controller tackles the most demanding post-production applications with ease.

When your project is complete, JVC's BR-S711U duplicator will add the finishing touches. It's built for professional service, with parallel or looping serial remote control, heavy duty tape transport mechanism with direct drive motors and a durable die-cast chassis, as well as many other valuable features.

And of course, JVC supports its S-VHS products with brilliant, high-resolution monitors ranging in size from 9-in to 20-in. The TM-200SU 20″ color monitor incorporates JVC's extraordinary deflection yokes and solid-state circuit technology to produce more than 500 lines of picture perfect horizontal resolution.

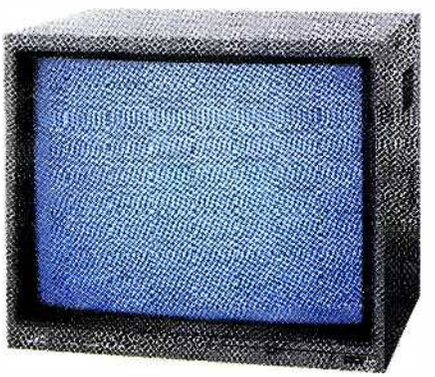
S-VHS technology is complemented by the finest video tape. This precision tape features a dense magnetic particle layer coupled with a new undercoating and extremely smooth base-film layers. The result is a breathtaking increase in signal reproduction.

Add a full line of accessories, including time-base correctors, battery chargers, cables, and you have everything you need for the most demanding professional applications.

And don't forget, S-VHS also forms the foundation of Multi-Format Integration — the most cost-effective way to get the best from your existing video equipment.

S-VHS. You've got to see it to believe it. Call JVC PROFESSIONAL PRODUCTS COMPANY, 1-800-JVC-5825 for literature, a complete set of specifications and a demonstration of how S-VHS can be integrated into your existing video system today.

S-VHS. Linking your past, present, and future video technologies.



MULTI-FORMAT INTEGRATION

JVC®

ALWAYS A STEP AHEAD... TO KEEP YOU A STEP AHEAD.

Circle (77) on Reply Card

Maintaining the studio environment

By Eric Neil Angevine, P.E.

Without proper attention, a room's acoustical properties will deteriorate with age.

A TV chief once told me, while I was engaged in the design of his new studio facility, that he wanted the facility to be a monument to him, because it was unlikely that he would ever have the opportunity to be involved in another new studio project. When the project was completed, it was a magnificent state-of-the-art facility. And, indeed, it was a credit to all involved, if not a "monument" to the engineer.

In the 10 or so years that have transpired since this studio was finished, it has been well-cared-for. But the facility is no longer truly state-of-the-art, nor do all of the building systems function as well as they did when they were new. One of the facts of life we learn as children is that all things grow old and wear out.

Light fixture maintenance

Several factors influence the amount of light a fixture delivers to the work surface. The factors that can be controlled are dirt build-up on the fixture (luminaire), the reduction of lumen output of the lamps with age and the reflectance of room surfaces.

Luminaire surfaces can become dirty, worn, rusty and yellowed. A regular program of cleaning luminaires should involve dusting or washing reflecting surfaces, as well as light-transmitting materials. The frequency of cleaning depends on the type of luminaire and the cleanliness of the environment, but should not be less than once every three years.

Angevine is an associate professor at the School of Architecture, Oklahoma State University, Stillwater, OK.

Lighting designers normally assume that the long-term deterioration of luminaire surfaces, such as rusted metal and yellowed lenses, cannot be recovered. There comes a time when elements of a deteriorated fixture should be replaced, or the entire luminaire should be replaced.

Also, the lumen output of all lamps diminishes with age. This problem is more serious in some lamp types than in others. In general, however, you should replace lamps before they burn out. Group relamping programs can reduce maintenance costs over the long term as well as increase light levels.

Room surface deterioration

Because humans are visually oriented, the most noticeable deterioration of any facility is the accumulation of dirt on room surfaces. The effect of dirt accumulation on lighting fixtures and acoustical materials generally is not considered.

The deterioration of room surfaces due to dirt, as well as to abrasion and other forms of abuse, usually reduces the light reflectance of walls, ceilings and floors. Depending on the type of light source and the style of luminaire, the decrease in light reflectance can reduce work surface illuminance by 10% to 30%.

This reduction in illumination usually is not critical, and it is recoverable. Light levels can increase as surface reflectances are increased by washing, repainting or carpet cleaning.

Plaster and dry wall surfaces lend themselves to regular cleaning and restoration by washing and painting. However, surfaces that were created to be acoustically absorptive must be treated differently.

Care of acoustical materials

Materials that provide significant acoustical absorption are usually porous or fibrous. The physical properties that make these materials acoustically absorptive are compromised by painting and other forms of refinishing. Even the build-up of dirt in the porosities of the material can reduce the amount of sound absorption.

Some acoustical materials are more easily cleaned than others. Certain acoustical tiles have a thin film facing that can be washed with soap and water. Fabric-faced acoustical panels can be cleaned or recovered. Perforated metal and other grillwork used to protect acoustical absorption can be repainted if you take care not to fill the open perforations.

Most acoustical materials cannot be painted without destroying their effectiveness. However, there are methods of cleaning these products and actually restoring their original acoustical properties, as well as their finish. The most common method is a mist-extraction process similar to that of a do-it-yourself carpet-cleaning machine.

Unlike carpet, acoustical ceilings should be cleaned only by qualified, experienced contractors. The use of inappropriate methods or tools can destroy many acoustical materials. Contact a building maintenance company or an acoustical ceiling

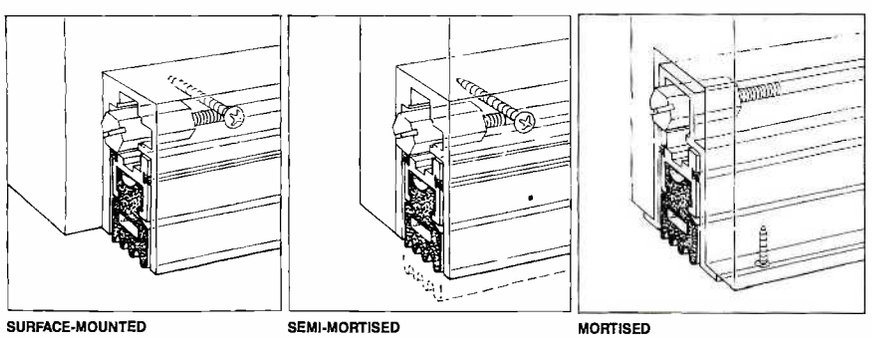
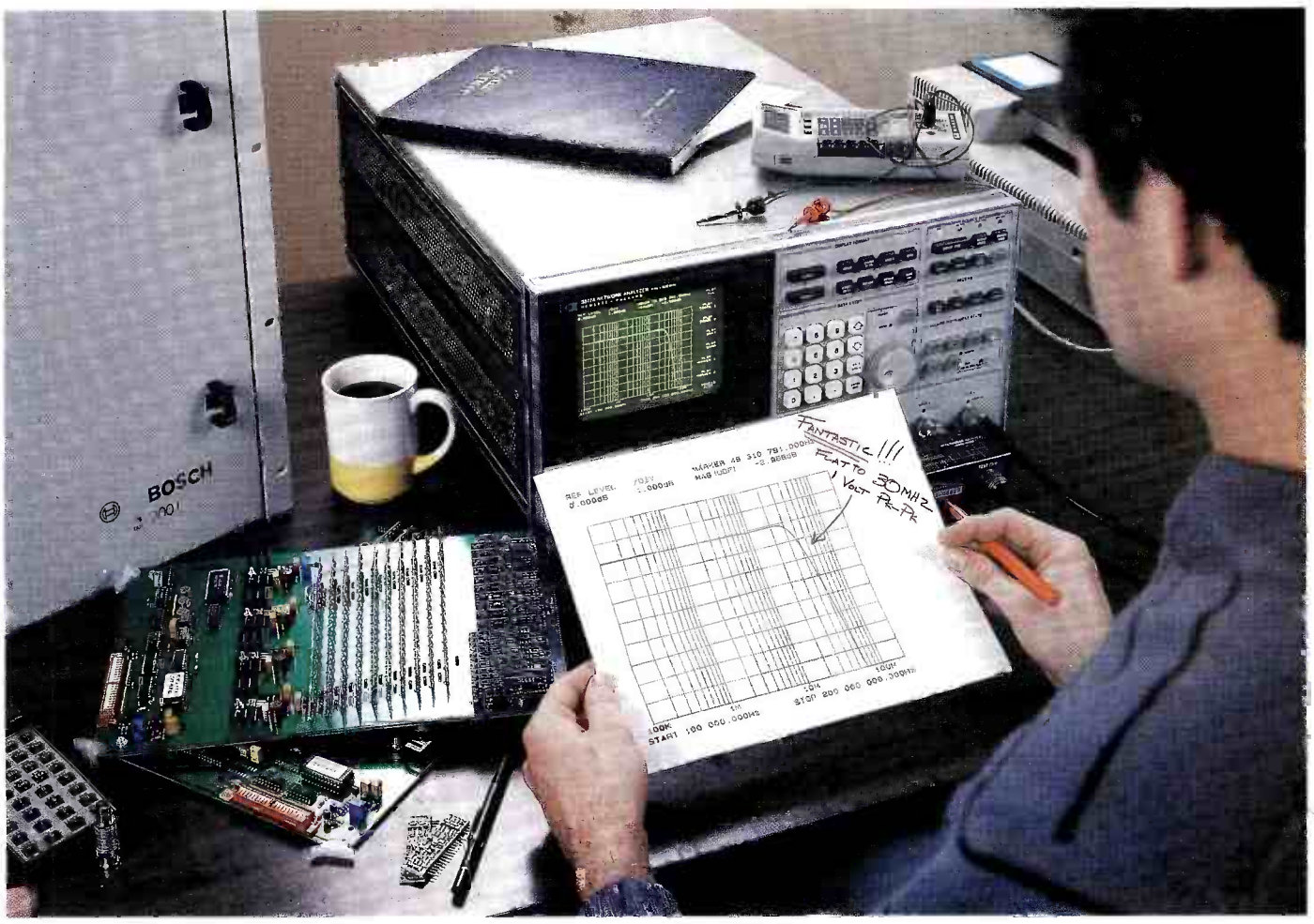


Figure 1. *The acoustical seal, shown here in three different mounting configurations, should be inspected monthly to ensure maximum performance.*

2001 is here, now!



(Chart/image on analyzer is actual output from the 2001 switcher.)

Wide band switchers for *any* size system.

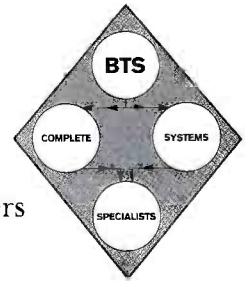
The new Bosch TVS/TAS-2001 Video/Audio Routing Switcher demonstrates a video bandwidth of more than 30 MHz — measured with a **full-amplitude** (1 V P-P) sine wave or video signal.

The TVS-2001 takes advantage of the newest technology to reduce signal path length, providing the flattest possible response through every stage. The resulting overall bandpass, as plotted by a HP3577A Network Analyzer, is shown above.

With a completely new approach to switcher bus architecture, and a companion line of 30 MHz distribution amplifiers, the TVS/TAS-2001 is designed to deliver wide band performance with matrix sizes of 200 inputs x 200 outputs or more.

Whether for composite/component switching today, or high definition tomorrow, your best choice is TVS/TAS-2001: the ***Precision*** router.

BTS Inc.
P.O. Box 30816
Salt Lake City, Utah
84130-0816
Phone: (801) 972-8000
Sales and Service Headquarters
Phone: (201) 529-1550



BTS **Broadcast Television Systems**

A joint company of Bosch and Philips

Regional Sales Offices

New York City	Midwest	Northeast	Allegheny	Mid-Atlantic	Southeast	Southwest	Great Plains	California	Intermountain
(201) 529-1550	(312) 803-8060	(207) 283-0777	(201) 529-1550	(703) 461-0188	(904) 492-1600	(512) 335-1481	(507) 334-1891	(818) 766-8184	(801) 972-8000

Circle (78) on Reply Card

installer for the name of a qualified ceiling cleaner.

Occasionally, the only alternative to replacing acoustical tile is to repaint the existing worn tile. Finishes advertised as *acoustical paint* or that claim to improve acoustical absorption should be avoided, because such products seldom work effectively.

If you must paint, apply only a minimum of thin coats of spray-applied paint. Be content to just tint the surface, and try to avoid filling fissures or perforations in the tile. Do not apply paint with a roller or a brush. Remember that any painting will reduce the acoustical absorption provided by the material.

Maintenance of sound seals

The sound transmission loss of any enclosure is limited by sound leaks that may exist in the enclosure. It is common for doors and windows to provide less sound absorption than the walls in which they are installed. But, more important, the sound attenuation provided by an operable window or door is limited by the effectiveness of the seals that assure a complete closure.

Many doors employ drop seals to close the opening at the bottom of the door. These drop seals require regular maintenance so that they seal properly when the door is closed. Each seal has an adjusting screw that determines the amount of protrusion when the door is closed. (See Figure 1.) Inspection is required at least once a month to keep drop seals properly adjusted.

Stationary seals occasionally require adjustment when doors or windows warp, but this is rare. However, because most seals are made of soft materials, the seals will dry out and/or shrink slightly with age.

You can slow the deterioration of rubber and soft plastic materials by working a small amount of lubricant into the material occasionally. Annual inspection and lubrication of rubber seals usually is sufficient to keep them soft without over-lubricating, which can accelerate the deterioration of synthetic materials.

The interior surfaces of inoperable double-glazed windows must be cleaned periodically if the windows are not permanently sealed. After cleaning, the pane should be reset carefully to minimize sound leaks around the glass.

Mechanical system noise

One of the major concerns in the design of a studio facility is the control of mechanical equipment noise. This noise propagates down ducts and pipes into studio and control rooms if left unimpeded. Mechanical equipment typically generates more noise as it ages. Without a program of regular maintenance, wear and tear slowly increases the noise that radiates into studios.

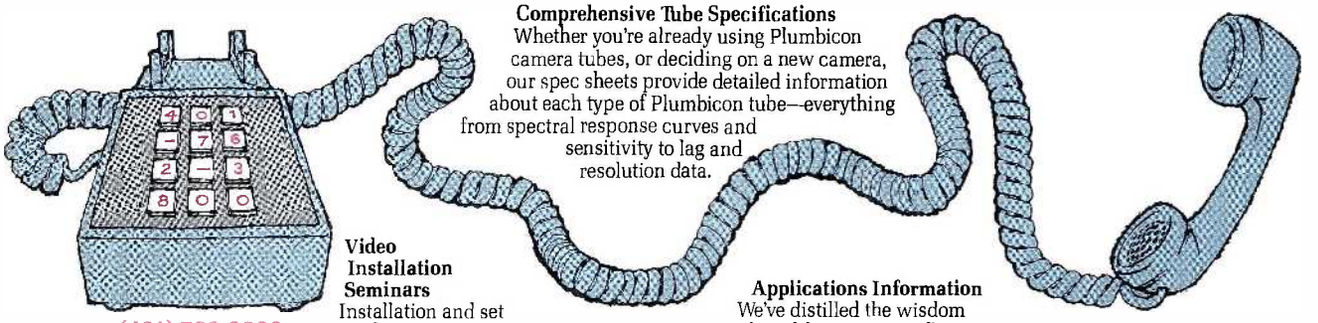
Items that should be inspected regularly include bearings, gears, sheaves and vibration isolators. State-of-the-art test equipment allows non-intrusive testing of large machines by analyzing their vibration spectra. As is usually the case, a good program of preventive maintenance will pay for itself over time.

Air quality and comfort

A program designed to maintain mechanical equipment in "like new" condition will have the added benefit of maximizing efficiency, therefore ensuring thermal comfort throughout the facility.

Performing other common-sense tasks, such as cleaning air filters and replacing broken controls, will maximize air quality as well as thermal comfort. Improved air quality will minimize the dirt build-up on luminaires and room surfaces.

The facility constructed to be state-of-the-art can remain so only with regular maintenance. Not only does the art change as new technology offers new equipment and techniques of application, but the state in which the art is maintained is up to you.



Comprehensive Tube Specifications
Whether you're already using Plumbicon camera tubes, or deciding on a new camera, our spec sheets provide detailed information about each type of Plumbicon tube—everything from spectral response curves and sensitivity to lag and resolution data.

(401) 762-3800

Video Installation Seminars
Installation and set up of Plumbicon camera tubes are simply and graphically explained in our series of Video Seminars for training and quick review.

Applications Information
We've distilled the wisdom gathered from our installation and field service experience into a series of concise "Optical Perceptions" written by and for TV professionals.

ONE TELEPHONE NUMBER GIVES YOU ALL THIS INFORMATION ABOUT AMPEREX PLUMBICON® TV CAMERA TUBES.

When you specify Amperex Plumbicon TV Camera Tubes: you're never more than a phone call away from competent technical assistance, 24 hours a day, 365 days a year. So you never have to worry about winding up "in the dark"—faced with a technical riddle you can't solve.

Of course, we have a generous warranty, (company policy and our own engineers insist we interpret it in the customer's favor!) But more important, we're here when you need us. On the phone to talk you through minor technical problems. On a plane if your problem is more than just routine. At your desk with a print and video library of technical applications, specifications, training and troubleshooting seminars.

Amperex Plumbicon TV Camera Tubes are made in Rhode Island, U.S.A. Delivered to you in twenty-four hours or less.

One telephone number is all you have to remember.

For more information call or write Imaging Products Group, Amperex Electronic Company, Slatersville, Rhode Island 02876. (401) 762-3800. A Division of North American Philips Corporation. Outside the U.S.A. contact: Philips Electronic Components and Materials Division, 5600 MD Eindhoven, The Netherlands.

Amperex®
IMAGING PRODUCTS GROUP
PHILIPS

Amperex Electronic Company, A Division of North American Philips Corporation, 1 Providence Pike, Slatersville, RI 02876
(401) 762-3800 In Canada: Philips Electronics Ltd., 601 Milner Ave., Scarborough, Ontario M1B 1M8 (416) 292-5161

Circle (80) on Reply Card

The National Electrical Code: What's in it for us?

By Elmer Smalling III

Back to electrical basics.

During the last years of the 19th century, when the use of commercially produced electricity as a power and heating source was new, a National Electrical Code (NEC) was devised. Diverse groups, representing the interests of architects, electrical contractors, engineers and insurance companies, pooled their talents to create the code, which was designed to deal with general specifications for electrical installation and safety procedures. In 1911, the National Fire Protection Association (NFPA) assumed sponsorship and control over the NEC. Today, along with other groups such as the American National Standards Institute (ANSI), NFPA continues in this capacity.

The present version of the code, approved in 1986, is known as ANSI/NFPA 70-1987. The purpose of the code is "the practical safeguarding of persons and property from hazards arising from the use of electricity." It is for this reason that the code is used by so many entities, such as insurance firms, municipalities, corporations and the United States government, as a standard of practice. A broadcast or communications facility most likely will have to conform to the NEC to be approved by any of these groups.

Smalling, BE's consultant on cable/satellite systems, is president of Jenel Systems and Design, Dallas.

Broadcasters rely on the NEC more than most employers because of the high percentage of their employees who work with electrical and electronic equipment.

The code is divided into articles, from the introduction (Article 90) to community antenna systems (Article 820). Many sections of the 1,100-plus pages of the code do not apply to broadcasters or communications facilities. For this reason, let's examine only those portions of the code that directly affect broadcasters.

This is meant as a general tutorial. If you have questions about code interpretation, electrical safety or building or updating a facility, seek the advice of a registered electrician or engineering professional.

• *Article 110—Requirements for electrical installations:*

This is one of the more important articles because it deals with the general and basic safety elements of an electrical installation. It elaborates on insulation, sizing of fuses, wire termination, types of wiring and clearances around electrical equipment. It contains the nitty-gritty procedures to be followed by an electrical contractor. When necessary, it refers to other sections of the code for more detailed information. (See Figure 1.)

Topics such as the proper use of aluminum wiring and recommended soldering or crimping of power cables are covered, as well as mounting and positioning of circuit-breaker panels, distribution panels and disconnect switches. A special section covers conductors and equipment that operate at more than 600V. These requirements could apply to transmitter facilities where high secondary voltages are routed within a working space.

• *Article 200—Use and identification of grounded conductors:*

This item discusses the size and color coding of ground conductors. Identifying ground conductors is critical within the plant for determining system and electrical grounds. It also is vitally important when mobile or satellite news-gathering vehicles are being connected to shore power. Improper grounding of a remote vehicle can cause high voltages between a vehicle and the "shore power" electrical service. Contrary to a popular belief where low voltage is concerned, the power ground conductor is not black or green!

• *Article 210—Branch circuits:*

A branch circuit is defined as "the circuit conductors between the final overcurrent device protecting the circuit and the outlet." In other words, circuits that run from a circuit breaker panel to individual devices or outlets are branch circuits. Almost all the circuits broadcasters deal with in the studio or transmitter facility are of this type. The other type of circuit, the feeder circuit, supplies the circuit breaker panel from the main distribution panel or

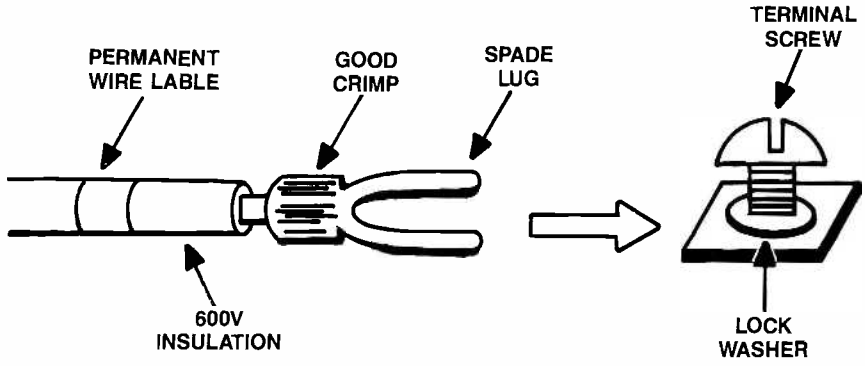


Figure 1. The NEC provides broadcasters with time-tested, approved, standard practices for installation and wiring of station equipment. Consult the NEC before undertaking any project involving electrical work.

LEITCH LISTENS

It's the reason why these three new Leitch test generators are tailored to your needs.

These three new test generators may look alike. But the software inside tells another story. Before they were designed, we sat down with transmitter, studio and transmission people to find out what they needed and wanted.

With these new Leitch 2500 NTSC test generators, you get digital generation for accuracy and stability. The Transmitter and Transmission generators deliver up to 60 signals while the Studio generator provides 56 different signals. All with 10 bit precision.

Upgradeable EPROMs allow you to have the unit adapted to meet new signal requirements. And you get Leitch ease of operation.

If you want further information, just write or call. You'll find we're not only good listeners, we're good providers.

LEITCH

Leitch Video International Inc., 10 Dyas Road, Don Mills, Ontario, Canada M3B 1V5. Tel.: (416) 445-9640 or 1-800-387-0233, Telex: 06 986 241
Leitch Video of America, Inc., 825K Greenbrier Circle, Chesapeake, VA, U.S.A. 23320. Tel.: (804) 424-7920 or 1-800-231-9673, Telex: 710 882 4342

Circle (81) on Reply Card

disconnect switch, and is not readily accessible to the broadcaster.

Grounding fault protection of equipment and personnel is discussed, along with proper methods of grounding. Ground fault current interrupters (GFCIs) are required in areas where equipment users are prone to shocks due to poor grounding. Although not required in connection with studio equipment, GFCIs can be quite effective on remote vans, EFP/ENG/SNV vehicles and other shooting locations where dampness or water may be encountered. The GFCI monitors the current in both conductors of a circuit. When there is an imbalance in one conductor caused by contact with a grounded object, the imbalance is sensed, causing the GFCI to trip and open the circuit.

Branch circuit conductor rating and overload protection also is covered in detail under this section. Although the article refers to dwelling units, this specification would apply in studio areas such as green rooms, make-up and toilet areas, dressing rooms and offices.

• *Article 215—Feeders:*

Here, the size and rating of feeder circuits is specified. A feeder connects the main distribution panel or disconnect switch to the individual circuit breaker panels. The broadcast engineer usually comes in contact with feeder circuitry when dealing with studio lighting or transmitter systems where a large load (10kW or more) requires a direct connection to the power system distribution panel or transformer secondary point.

• *Article 220—Calculations:*

This section deals with the calculation of various loads on both branch and feeder circuits and includes formulas for calculating the maximum number of outlets or loads on various circuits. Although this article deals with domestic circuits, it can be interpolated to apply to broadcast applications. Demand factors ("the ratio of the maximum demand of the system, or part of a system, to the total connected load of the system or part of the system under consideration") for various types of systems are covered in detail. As an example of demand factor, if a studio facility has a total connected equipment load of 75kW and a maximum demand of 50kW, the demand factor for the facility is 66%.

A standard equipment rack has a plugmold with a rating of 20A. Depending upon the quantity and type of equipment housed in the rack, the demand factor might range from 5% (1A) to 95% (19A, although using this much current on a 20A circuit is poor engineering practice). It is important to know the demand factor of a facility that contains many equipment racks, for sizing air conditioning, emergency power or circuit breakers.

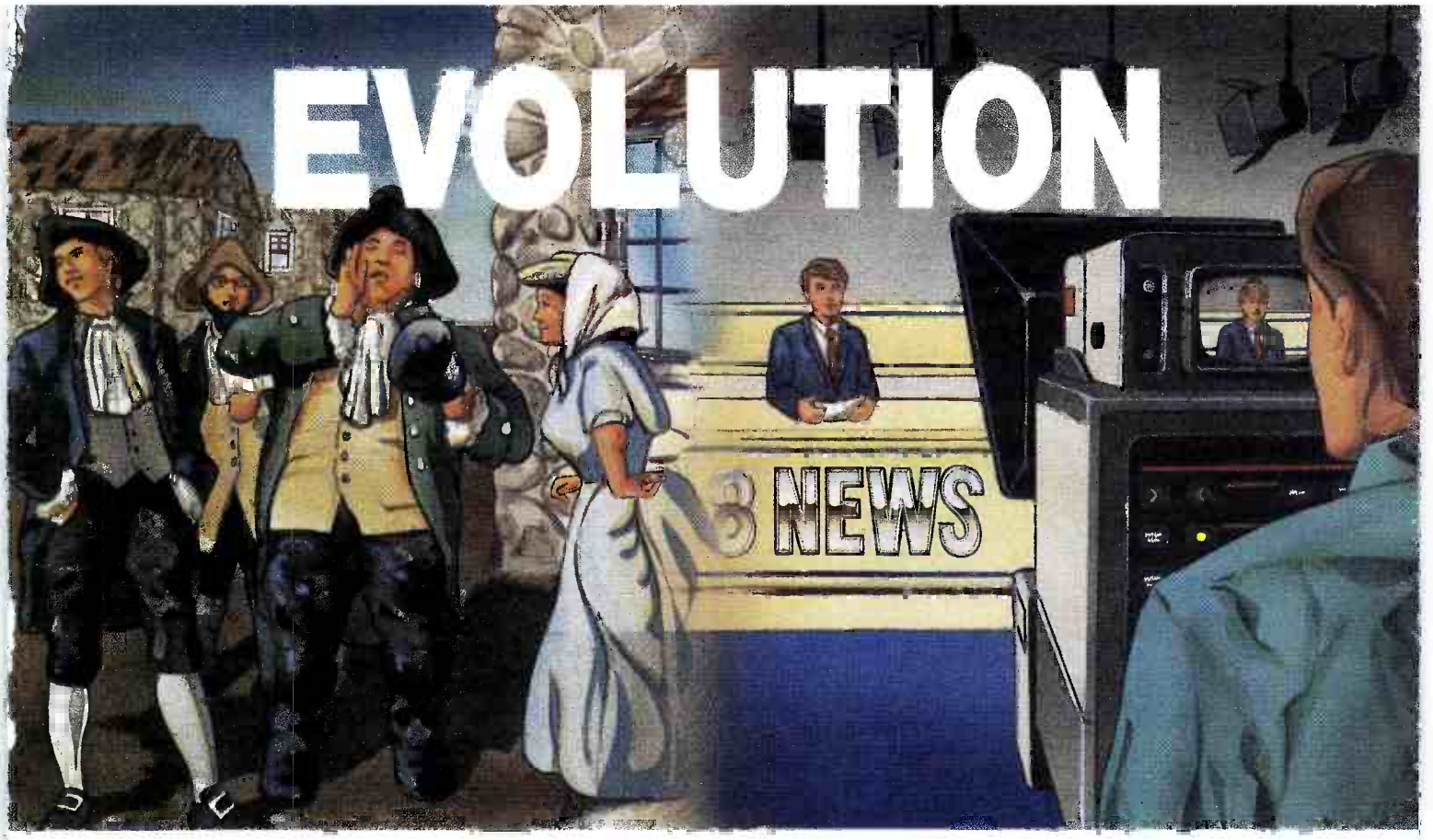
• *Article 225—Outside branch circuits and feeders:*

Broadcasters who are concerned with external wiring to towers or with cabling that runs between buildings may find this section of interest. Cable clearances and spans are specified, as are supports and conductor sizing.

• *Article 320—Services:*

A service is defined as "the conductors and equipment for delivering energy from the electricity supply system to the wiring system of the premises served." This section covers every type of service access, such as overhead and underground, as well as distribution and disconnect systems. The broadcast engineer deals with service when planning a new facili-

Continued on page 84



HEAR YE! HEAR YE!

Long before the reality of instant global communications, the town crier served people's information needs. He delivered the day's news, announced the time, and kept the citizenry up to date. You could say the town crier was the world's first anchorman.

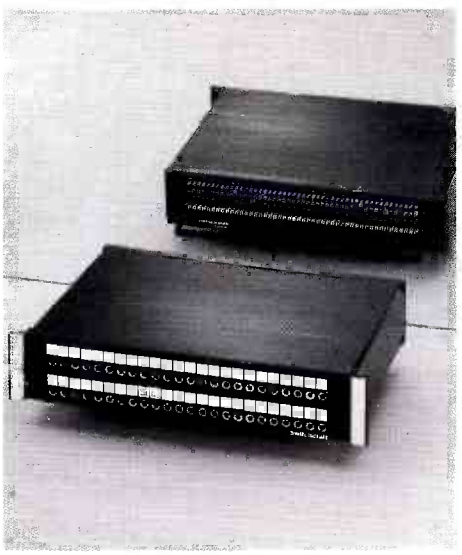
The broadcast industry now satisfies the world's ravenous appetite for news and entertainment via the airwaves. Today, virtually everyone has access to a radio or television set. With the advent of satellite broadcasting, news can now be transmitted and received instantaneously anywhere on the planet.

AND NOW, A LATE-BREAKING STORY FROM SWITCHCRAFT

Switchcraft keeps in step with the fast pace of broadcast technology with our new APP Series of audio patch panels. The APP Series is fully enclosed to contain all internal wiring. This protects jacks from shorts or damage caused by bending or breaking. The rear panel is removable and allows in-service maintenance.

The real story takes place behind the scenes. In back, the new audio patch panels come equipped with innovative punch-down blocks. They eliminate the need for wire soldering and make termination a breeze. Cable trimming and stripping are no longer necessary. Color coded punch-down blocks and convenient plastic "organizers" provide easy cable management.

With attention to detail, we've also improved the designation strip of our new patch panel series by making it larger for easier labeling and identification. The adhesive that holds the strip in place makes for effortless removal and replacement.



Circle (83) on Reply Card

NOW HEAR THIS

If you require an innovative audio patch panel that outperforms the others, specify Switchcraft. The name of the game in patch panels is jacks, and Switchcraft jacks are world renowned for quality and reliability. Fill out and mail the attached coupon for more information on our new APP Series audio patch panels and our other outstanding broadcast and audio components.

Send me information on your quality components:

☐ Please have a representative contact me.
☐ Please send me your General Line Catalog

My area(s) of interest is:

☐ Switches ☐ Connectors ☐ Power Cords
☐ EAC Receptacles ☐ Jacks/Plugs
☐ Molded Cable Assemblies ☐ Patch Panels

My application is ☐ Current
☐ Future (date)_____

Name _____
Company _____
Title _____
Address _____
City _____ State _____ Zip _____
Telephone ( ) _____

Mail To: Marketing Communications Dept., Switchcraft, Inc.
5555 N. Elston Ave.,
Chicago, IL 60630

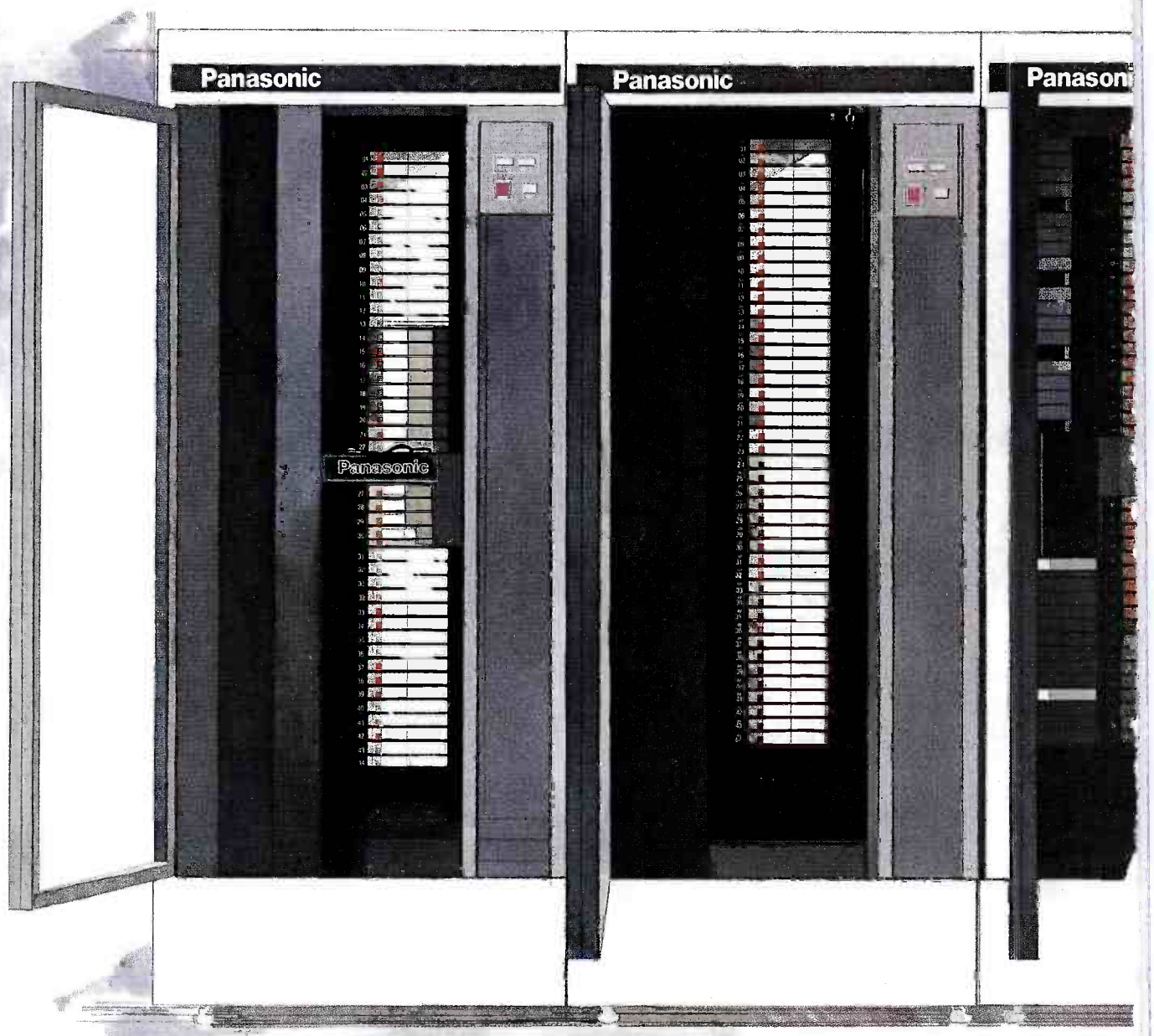
BE 11-88

Switchcraft

A Raytheon Company

5555 N. Elston Ave.
Chicago, IL 60630
(312) 792-2700

It pays for itself...
The Panasonic MII Cart

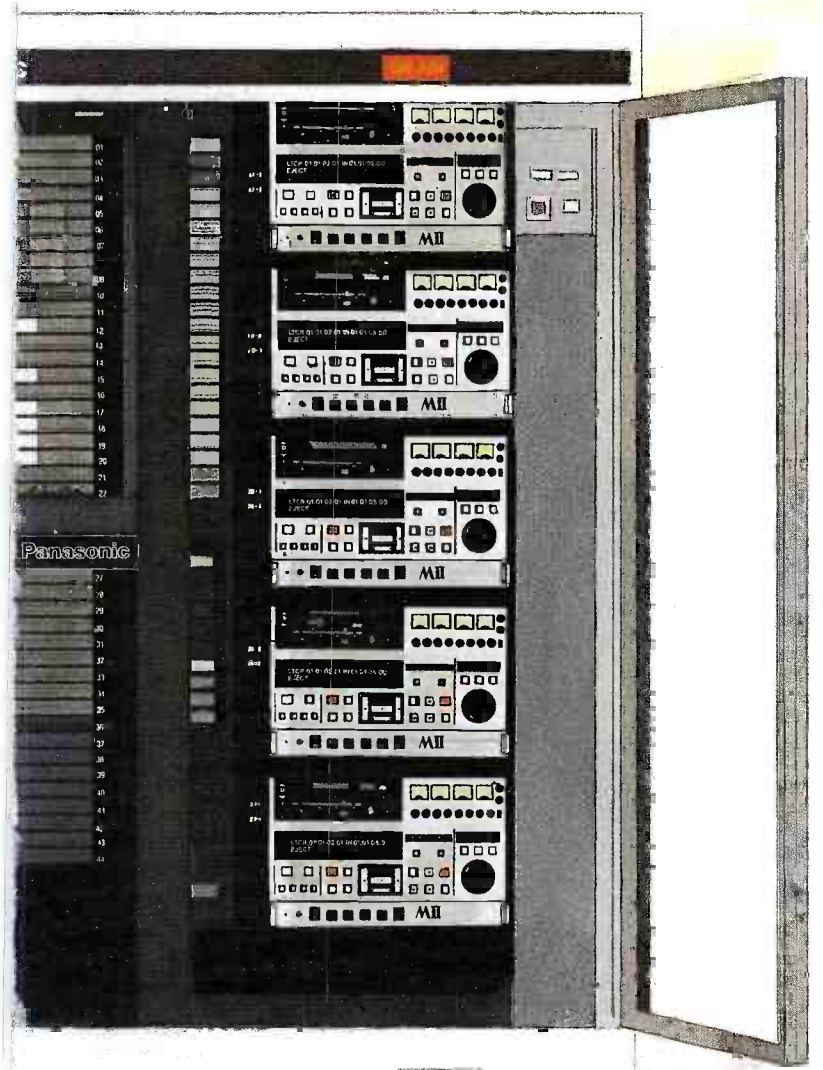


Panasonic
MII

Official Video Equipment Of
The 1988 Olympic Games

Title 36 United States Code Section 380.

automatically.
Machine. Available now.



Now our most technologically advanced cart machine is also one of the most versatile. Presenting the Panasonic MII cart machine.

- From 10-second spots back to back, continuously, to two months of 24-hour automatic program airing.
- Uses 10-, 20-, 30-, 60- or 90-minute cassettes in any desired mix.
- Capable of record and playback of single or multiple events on the same cassette.
- Uses up to 5 standard MII studio VTR's plus 3 optional outside sources.
- Modular design—various configurations to suit user's needs and budget.
- Expandable—from 120 cassettes up to 3 rotary libraries that can hold over 1,150 cassettes.
- User-friendly software and hardware tailored to customer needs.
- Cost-effective operation and ease of maintenance and access.
- Backed by Panasonic MII 24-hour service support system.

MII

MII Panasonic
Broadcast Systems Company

Call our field offices now:

Northeast: One Panasonic Way, Secaucus, NJ 07094; (201) 348-7671.

Washington, D.C.; (703) 759-6900.

Southeast: 1854 Shackleford Court, Suite 250, Norcross, GA 30093; (404) 925-6772.

Midwest: 425 E. Algonquin Road, Arlington Heights, IL 60005; (312) 981-7325/(317) 852-3715.

Southwest: 4500 Amon Carter Blvd., Fort Worth, TX 76155; (817) 685-1132.

Western: 6550 Katella Avenue, Cypress, CA 90630; (714) 895-7209.
Northwest: (408) 866-7974.

Circle (84) on Reply Card

Continued from page 80
ty or expanding an existing one. Transmitter facilities will have outside transformer pads with large feeders to the building, which must be protected from the weather and inadvertent human contact. Underground and overhead clearances are covered in this section along with overcurrent protection.

• *Article 240—Overcurrent protection:*
Overcurrent protection generally consists of circuit breakers or fuses. Fuses normally are used to protect large primary distribution circuits such as the main studio or transmitter feeds. These may have values from 50A to 200A, depending upon the peak load current at which they operate. Resettable circuit breakers are used for secondary circuits such as technical, utility and lighting power. Article 240 covers feeder and distribution conductor sizing as well as proper installation of fuses and circuit breakers. Single-pole and multiple-pole circuit breaker installations are defined, including delta and wye transformer windings for those concerned with balancing multiple-phase loads.

• *Article 250—Grounding:*
This may be one of the most important sections in the NEC Handbook. When grounding is mentioned, most broadcasters think of signal grounding. Proper signal grounding can prevent noise and hum and is a must in studio facility design. For proper grounding of electrical equipment throughout the plant, all grounds must be at the same potential (low resistance paths between equipment). Proper electrical grounding may prevent lightning damage, electrical shock and fires caused by frayed wires touching other conductors. In some instances, it significantly reduces hum and noise in the signal path. All cables in a station should include a hot, neutral and ground wire, and all equipment and outlets should be properly grounded. It is wise for the station engineer to measure and confirm all ground circuits, whether they're on equipment or power connectors and outlets. The NEC describes means to provide a minimum path for "hot" power to ground through the grounding of conduits, circuit breaker cabinets, lighting and electrical fixtures. Securely bond the ground system within a structure to a good, low-resistance earth ground such as a water main or electrode ground. Do not rely on metal structures to carry ground potential; over time, these structures tend to corrode and become imperfect ground paths.

• *Article 300—Wiring methods:*
Broadcasters use buried power cable in many instances—from studio to transmitter, from transmitter to tower and from studio to microwave. Simply placing cable within a conduit and burying it may cause more problems than overhead routing. This section of the code serves as a tutorial on proper insulation of buried cable and creating sheathes and terminations.

The higher the voltage on an underground conductor, the more care is required during engineering and installation. An adequate number of pull boxes and access ports will make it easier to locate underground trouble or pull additional cable in the future. Routing cable throughout a plant using conduit and non-metallic sheathed cables, is covered in detail. Recommendations are given for routing cable in environmental air spaces (plenums), which may require special cable that does not emit toxic gases when exposed to high temperatures.

• *Article 310—Conductors for general wiring:*
This part of the code deals with the sizes

Get in sync with Videotek's versatile team of timing devices.

No matter what your application, Videotek has a range of feature-rich timing devices to suit it—and your budget.

Take our new **VDP-8000 Frame Store/Synchronizer** with independent Freeze Field capability. Or our two blackburst generators—each with individual horizontal and subcarrier timing correction for up to six sources. The **Times Six Plus** model offers manual or automatic operation and automatically compensates for cable length and equipment drift.

Our new drift-free **VSG-201 digital sync generator** with six isolated blackburst outputs, audio test tone and "textbook" SMPTE color bar outputs can drive the whole show. And all units feature front-panel gen lock input loss/presence indicators.

Don't waste any time! See your Videotek dealer for details!

VIDEOTEK INC.
Designed for real needs.
Priced for real budgets.

243 Shoemaker Road, Pottstown,
Pennsylvania 19464 • (215) 327-2292
TWX 710-653-0125 • FAX (215) 327-9295

Circle (86) on Reply Card

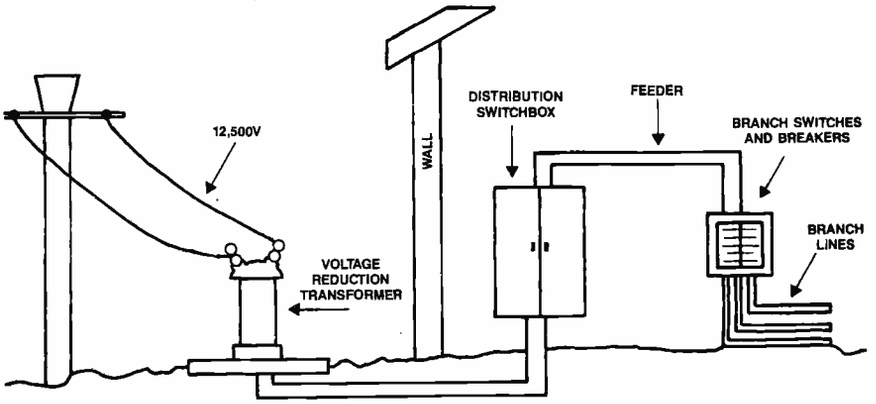


Figure 2. *Broadcasters frequently require extraordinary electrical service. High-voltage mains may be reduced by a site-mounted transformer or electrical substation. Multiple phases and usable voltages (480V/240V/120V) then are distributed throughout the plant.*

and types of conductors required for various wiring systems. Although contractors are obliged to know the code specifications and install the correct wire size, the broadcast engineer should have a general knowledge of this section to be able to assess the facility for new equipment installation.

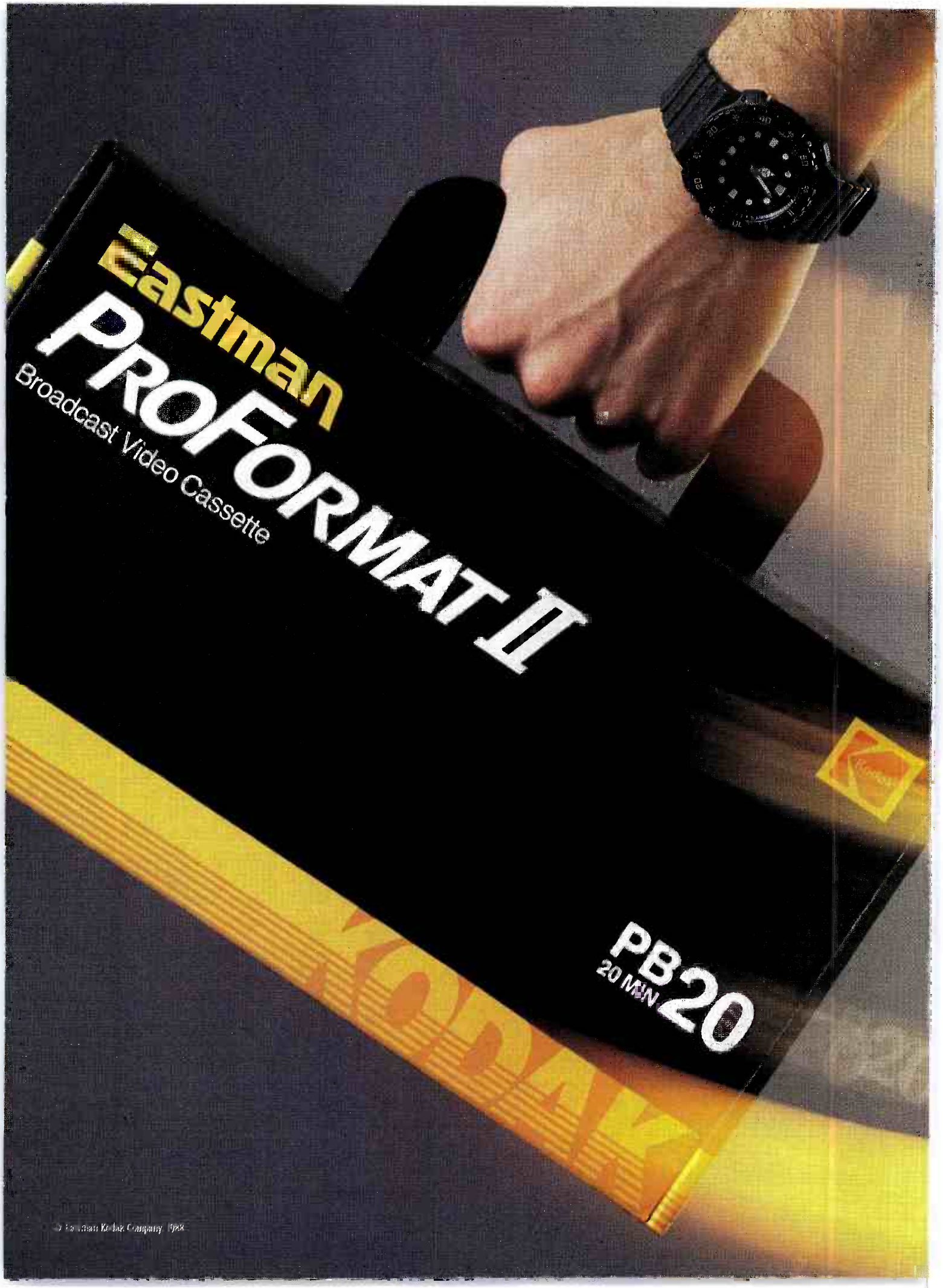
• *Article 352—Surface raceways:*
Surface raceways usually are installed as an afterthought or as a facility add-on. Nearly every facility has at least one semi-round conduit run from a light switch or outlet to power some piece of equipment. This section deals with the types, sizes and ratings of both metallic and non-metallic raceways.

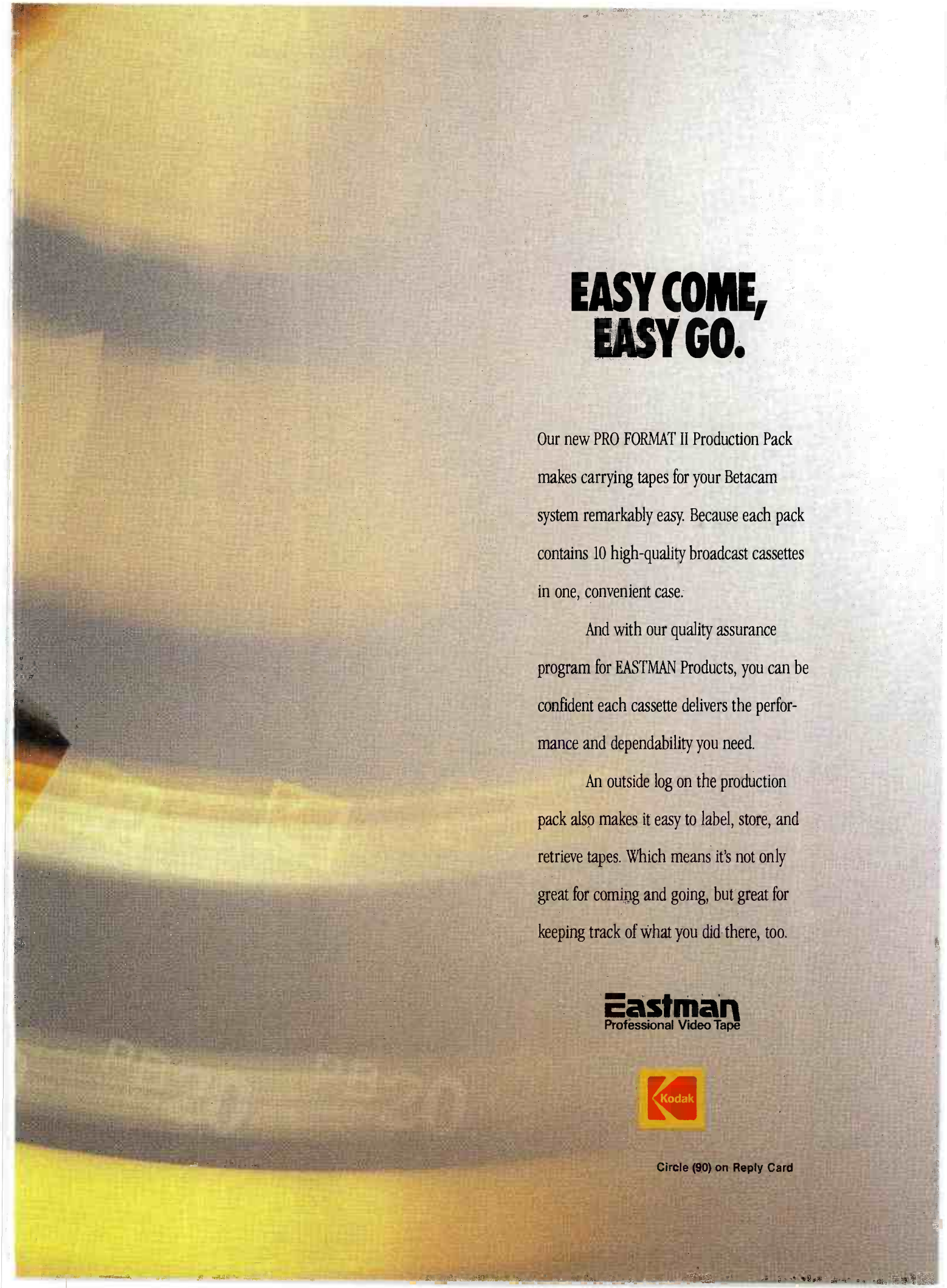
• *Article 354—Underfloor raceways:*
Many older facilities that do not incorporate above-the-ceiling wire trays or computer-type flooring use raceways poured or cut into the floor slab. Although this type of construction for a broadcast plant has disadvantages, such as collecting trash, water and dirt, this information may be of interest to those who, for one reason or another, must live with this type of raceway.

• *Article 362—Wireways:*
Broadcast engineers deal with wireways and cable trays whether these are used for power or signal cable routing. When used for power cable (or power and signal cable), they must conform to the NEC. Methods of connecting and mounting wireways, along with boxes and busways, are covered in this and in the next few articles. According to this section, communications cables should not be run in power conduits or wireways for reasons of safety, and to forestall possible induction of noise and hum from the power cables to the signal cable.

• *Article 384—Switchboards:*
Every facility has main and branch power panels that include switches, circuit breakers and fuses. This article addresses the location and rating of panels as well as loads served. All panels (whether small

Continued on page 118





EASY COME, EASY GO.

Our new PRO FORMAT II Production Pack makes carrying tapes for your Betacam system remarkably easy. Because each pack contains 10 high-quality broadcast cassettes in one, convenient case.

And with our quality assurance program for EASTMAN Products, you can be confident each cassette delivers the performance and dependability you need.

An outside log on the production pack also makes it easy to label, store, and retrieve tapes. Which means it's not only great for coming and going, but great for keeping track of what you did there, too.

Eastman
Professional Video Tape

Kodak

Circle (90) on Reply Card

Otari MX-55 tape recorder

By Bill Ruck

The Otari MX-55 represents a new generation of reel-to-reel tape recorders. Because I was experienced with the Otari MTR-10 series, of which KFOG-FM owns five, and had used the older MX-5050 and ARS-1000 tape decks at other stations, I was asked by Otari to put one of its new MX-55 machines through an evaluation.

The recorder is designed as a mid-level machine, placed between the MX-5050 series and the MTR-10 series. Its features make it more useful in some situations than the MTR-10, and it is less expensive.

Basic features

Available in a tabletop or rack-mount package, the basic 2-channel machine is 17.3 inches (440mm) wide, 8.7 inches (222mm) deep and 19.2 inches (488mm) high. Although it looks small, it is not a lightweight recorder. It weighs 67 pounds. Heed the manual's warning about needing two people to put the recorder into a rack! This is definitely not a portable tape recorder.

The transport will handle up to 12-inch DIN reels, although machines supplied in the United States meeting NAB standards come with standard NAB 10-inch reel adapters. It is not a constant-tension machine, so the use of 5-inch hub reels is marginal.

Otari's 10-inch reel holders always have been one of the machine's weak points. The reel hubs on the recorder have built-in EIA 3-spoke clamps, and you are provided with plastic 10-inch adapters, which are held in place with the built-in clamps. These reel holders clamp a 10-inch reel securely to the reel table, yet allow for easy reel change, including a change from NAB hub to EIA hub. This is a great improvement compared with the reel holders the company has supplied with their other machines.

The basic transport controls (record, play, stop, fast forward and rewind) are located on the right-hand side of the recorder. There also is an edit button, which enables the dump editing mode, and a cue button, which puts the tape against the heads in fast motion as long as you depress the button. The cue button has a toggle action. If you tap it, the tape will stay against the heads until the button is tapped again. This mode resets when stop is pressed. Consequently, the problem of the tape always being against the heads, which occurs in the company's other machines, has been eliminated. The line and monitor outputs are dropped by 16dB in the cue mode to save your hearing and to save the speakers.

If you press the stop button, even while the tape safety arms are down, it causes the take-up reel to slowly take up the slack. This is the first time I have seen this feature on any machine, and it is quite useful for editing. In the short time the machine was available to me, I got used to this feature, and I wish it was included in other machines.

To the left of the transport controls are three buttons that select speed, supply reel size and take-up reel size. These three buttons are alternate-action buttons that toggle between high and low (or large and small). The design makes it difficult for you to accidentally change speed or tape reel size. You have to either depress the button while both indicator LEDs flash, or tap the button twice to change modes. If you accidentally bump the switch, it will flash, but it will remain in the previously set mode.

On the left of the control panel is a display showing tape time in hours, minutes and seconds; the tape speed in inches per second; and the tape speed as a percentage of true speed. Below the display are buttons that are used for the search to zero or three other points, as well as a repeat mode. The functions of

Performance at a glance

- *Frequency response: 15ips, 30Hz to 20kHz ±2dB*
  7½ips, 20Hz to 18kHz ±2dB
  3¾ips 20Hz to 10kHz ±2dB
- *Distortion: <0.3%*
- *Wow and flutter: 15ips, < ±0.06% peak weighted, DIN 45507*
  7½ips, <±0.08% IEC Pnb. 386
  3¾ips, < ±0.12%
- *dc capstan, servo-controlled*
- *Variable speed, ±20%*
- *Active-balanced input/output*
- *XLR connectors*

Ruck is the engineering manager at KFOG-FM, Susquehanna Broadcasting Company, San Francisco.

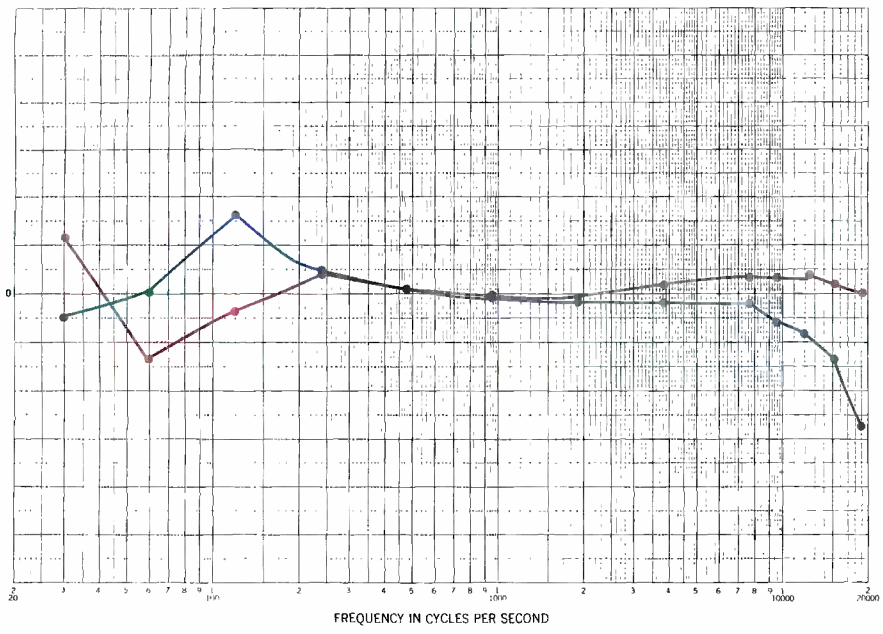


Figure 1. *Channel 1 playback frequency response at 7½ips and 15ips.*

HME Intercom Systems:

Full-Featured, Frugal and Friendly

HME intercoms are fast becoming the favorite of studios, theatres and churches everywhere.

First of all, HME manufactures the only fully integrated cabled and wireless systems available anywhere. You can expand an HME cabled system to achieve the communication freedom of a wireless system either now or in the future.

HME intercoms are truly built with the user in mind, from form-fitting belt packs to compact wireless transmitters, and from hands-off power stations to models with IFB, stage announce, telephone interface, and up to 6×12 matrix switching.

They're unbeatable for reliability. Current foldback in the power supplies eliminate damage to components from short circuits, and acts as an exclusive built-in fault locator to help you find shorted cables quickly. HME's years of wireless microphone experience has helped develop the most rugged electronics packaging this side of space.

There's no more complete intercom offering than HME's full-featured line of 3-wire headset, speaker and power stations, including all the accessories you'll need for your specific requirement. Call your HME dealer/distributor now for all the details.

hme®

HM ELECTRONICS, INC.

6675 Mesa Ridge Road
San Diego, CA 92121, USA
Phone: (619) 535-6060
Telex: 350-771
FAX: 619-452-7207

Circle (91) on Reply Card

HME Products are distributed internationally:
In Canada—GERRAUDIO Distribution Inc. • PH: (416) 868-0528 FAX: 416-868-6419
In Central and South America—Servicios Electronicos al Espectaculo • PH: (905) 544-1345 FAX: 549-6509
All other countries—Global Representatives, Inc. • PH: (201) 492-8140 FAX: 201-492-2566

these buttons aren't obvious, so read the instructions to learn the proper sequence to enable these functions.

All the transport settings are retained with the power to the machine shutoff. Therefore, when you turn the machine back on, you will be at the same speed, reel size and tape time that were displayed before the machine was shut down.

The lower amplifier control panel has, from left, a microphone input, two VU-type meters with peak LED, indicators for flux levels and equalization standards, input level controls with set (SRL) switches, record/safe switches, output mode switches, output level controls and set (SRL) switches, a monitor level control, channel-select buttons and headphone jack. Below the amplifier control panel is a drop-down trim panel exposing virtually all the setup and calibration adjustments.

The microphone input is unique in that it is a third input to the machine. It can be selected to channel 1, both or channel 2 (but not panned). It also can be selected off or operated with a selectable 20dB pad.

The meters do not appear to be true ANSI VU meters, but they are accurate, both in level and response with sine waves. The peak LED can be set to any point and is normally configured to 1,040nWb/m. Depending on how the back-panel switches are set, 0VU might be 370nWb/m, 250nWb/m or 185nWb/m for the NAB version. Equalization can be either IEC or NAB. The position of these back-panel switches are echoed on the front panel with illuminated LEDs.

Both the input and output level controls have a separate SRL calibrated switch. I used to prefer the detent at full counter-clockwise, but the separate switch allows a user to switch easily between standard calibrated levels and a temporary reference.

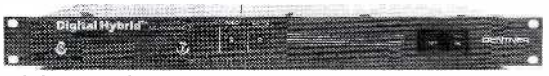
The monitor function includes a lot of features in just a volume control and two switches. Plug a headphone into the jack, and the speaker is disconnected, and the level control changes the headphone level. If only one of the two select buttons is depressed, you hear that single channel in both ears of the headphone. If both are depressed, you hear one channel in one ear and the other channel in the other ear. If you remove the headphone plug from the jack, it enables the (mono sum) speaker. If both monitor switches are out, the monitor function is muted. Although the speaker in the deck isn't designed for quality monitoring, it is more than adequate for editing or quick cuing.

UNCOMMON STOCK

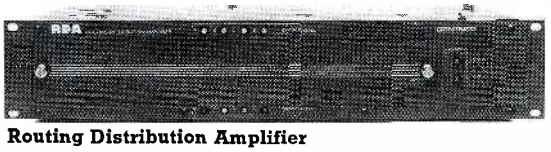
If you could solve the lion's share of your equipment needs in one place, you could spend less time running from dealer to dealer, catalog to catalog, and more time running your operation. That's why Gentner Electronics, with over 72 high performance products in stock, is an uncommon company providing innovative solutions to your common problems.

Solutions like the VRC-1000 Remote Control which has allowed countless engineers to monitor and operate their transmitters through any Touch-Tone™ phone. A preprogrammed synthesized voice gives you the parameters, you make the adjustments with the touch of a button. Nothing is simpler or more dependable.

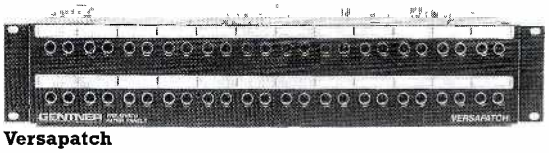
VRC 1000



Digital Hybrid



Routing Distribution Amplifier



Versapatch

Our Digital Hybrid™ is another example of innovation in our line of telephone interface products. It is an auto-nulling telephone hybrid with precision filtering and noise reduction. It solves your interface problems and uses advanced digital signal processing to analyze, isolate and stop leakage between receive and send signals. This greatly reduces the "hollow" sound that plagues broadcast or teleconferencing applications.

Our Audio Division, with its track record for developing unparalleled products, has taken the sting out of common audio DAs. Our unique flexible Routing Distribution Amplifier has overcome the typical DA's input and output limitations by giving you 8 inputs and 28 outputs. Any input, or combination of inputs, can be routed to any output. And, with the simple flip of a dip switch, you can reconfigure the RDA to meet changing needs.

Gentner is setting new standards in patch panels, too. Our Versapatch, a chassis-enclosed audio patch panel, is hand-wired to your specifications and can be terminated to our Flexiblock or telco-type '66' punch block. For prewired patch panels, no one has the edge on Gentner. With a wide variety of bay fronts and terminations in stock, you're guaranteed fast delivery.

The bottom line is this–before you place a buy order for your next equipment purchase take a look at what Gentner has to offer. You'll find our uncommon stock is stable, dependable and will pay you dividends for years to come. Gentner Electronics, a sound investment in your future.

GENTNER
ELECTRONICS
CORPORATION

P.O. Box 27647 · Salt Lake City, UT 84127-0647
(801) 975-7200 · FAX (801) 977-0087

Gentner Electronics Corporation is publically traded over the counter and is listed in the "pink sheets."

Circle (94) on Reply Card

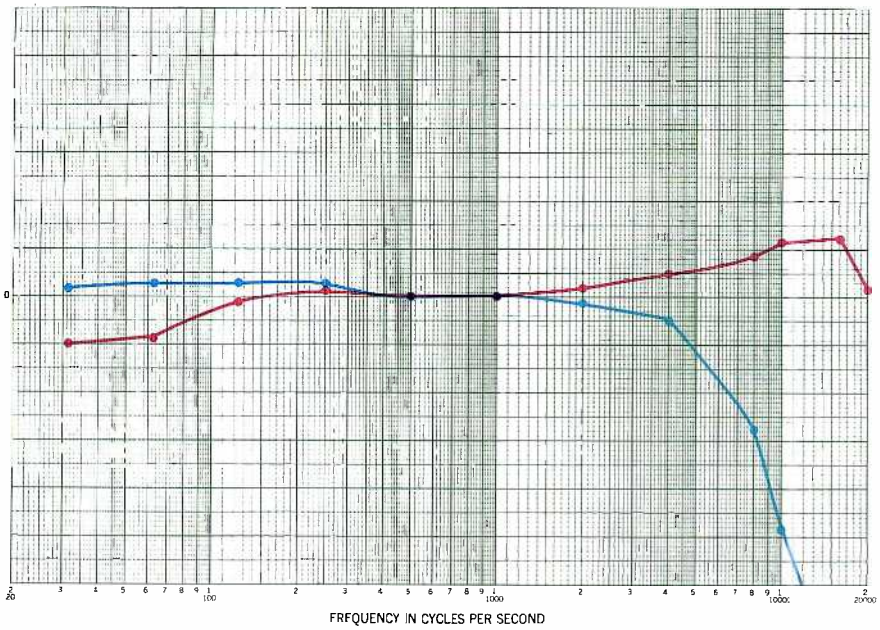


Figure 2. *Frequency response of channel 1, measured in the SEL-REP mode at both 7½ips and 15ips.*

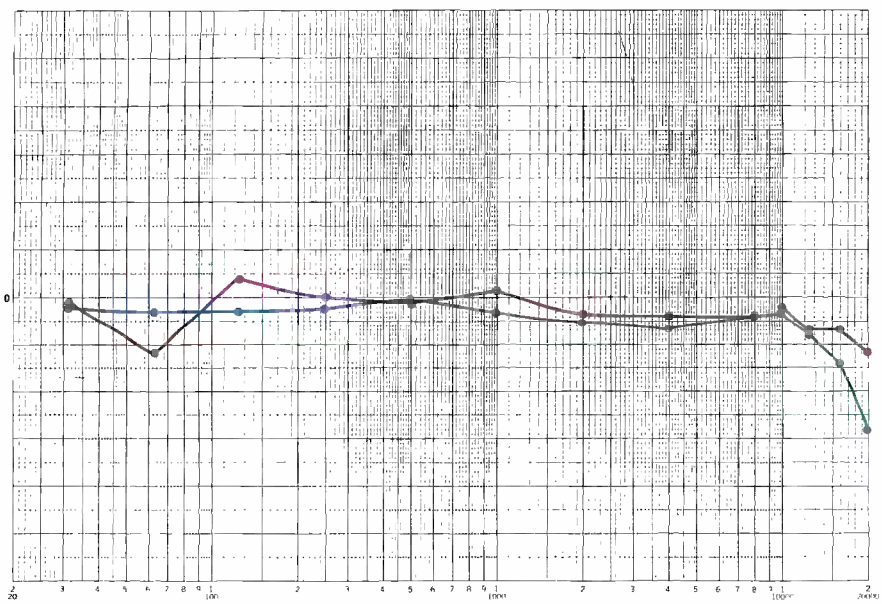
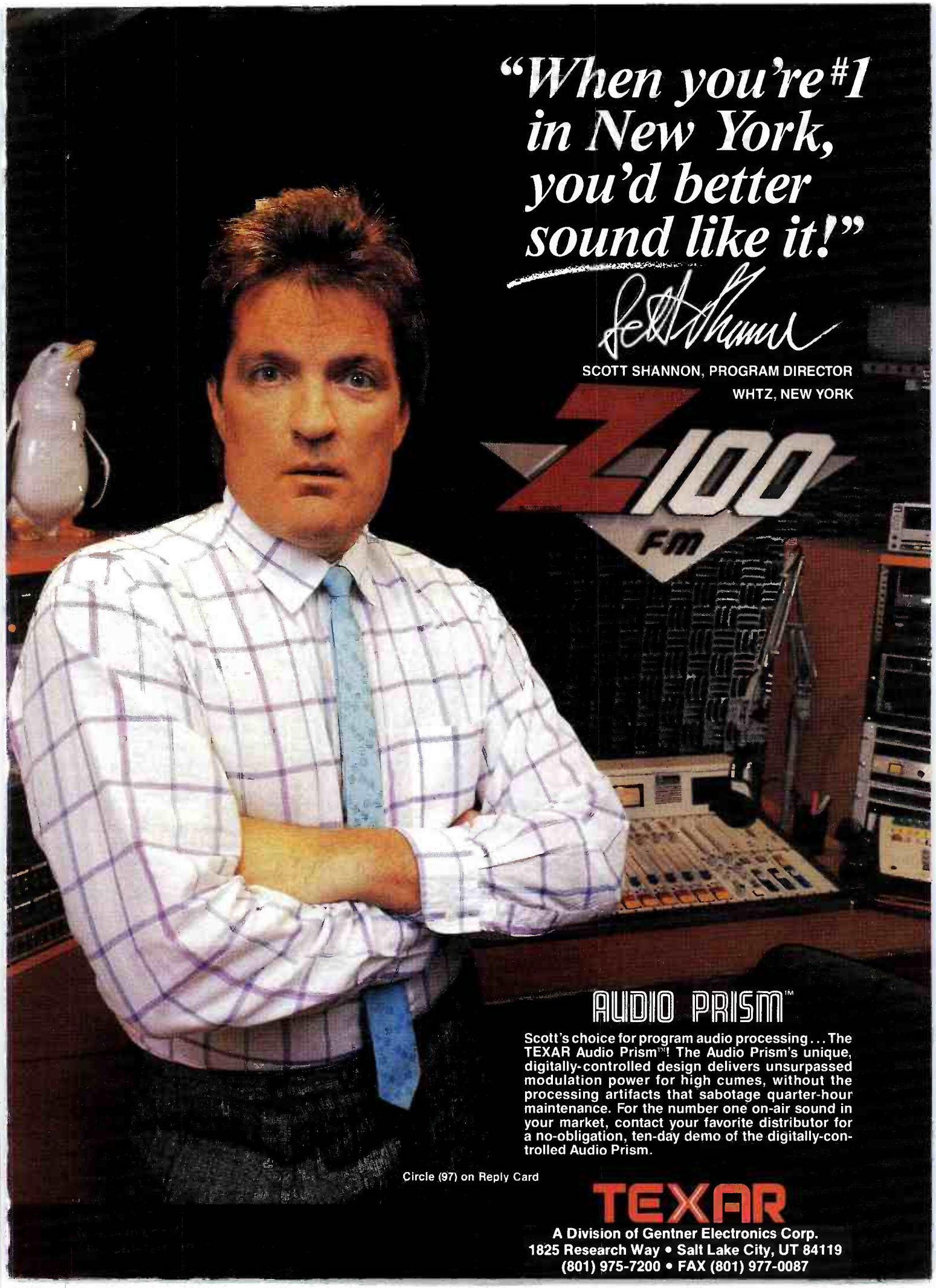


Figure 3. *Record/play frequency response of channel 1 at 7½ips and 15ips after rebiasing for 3M 226 tape.*

User manual

The manual refers to several options that are not yet available. There will be a foot switch that can be programmed to do one of several functions, a fader start that can lock out the front-panel controls and a foil tape sensor. Although the manual contains a lot of information, it is not organized or indexed so that the answer to a specific question can be found easily. Also, the layout of the schematics is difficult to follow, and the manual does not include PCB layouts.

I had the tabletop version for the tests, but now there is an overbridge version that moves the meters and level controls to above the reels. Both the tabletop and overbridge versions are now available



with a center-track SMPTE time-code option.

The transport appears to be designed for reliability and low maintenance. The transport deckplate is made out of thick, machined aluminum. The heads are mounted on massive and stable head blocks. There seems to be little use for stamped metal assemblies or plastic in the moving parts on the transport.

One design feature that should indicate good electrical reliability is the use of logic switches and opto-isolated triacs for almost all switching functions. The only relay that I could find was the record-head relay. Every other function is performed with solid-state switching.

All audio mode and equalization switching is performed with discrete FETs or CMOS gates; transport mode switching is done with logic. Reel motor ac supplies use opto-isolated triacs, switching different taps on the power transformer. In addition to being more efficient than series resistors, the design also should be more stable and reliable.

The only incandescent lamps in the machine illuminate the two VU meters. All the other status indicators are LEDs.

Measured performance

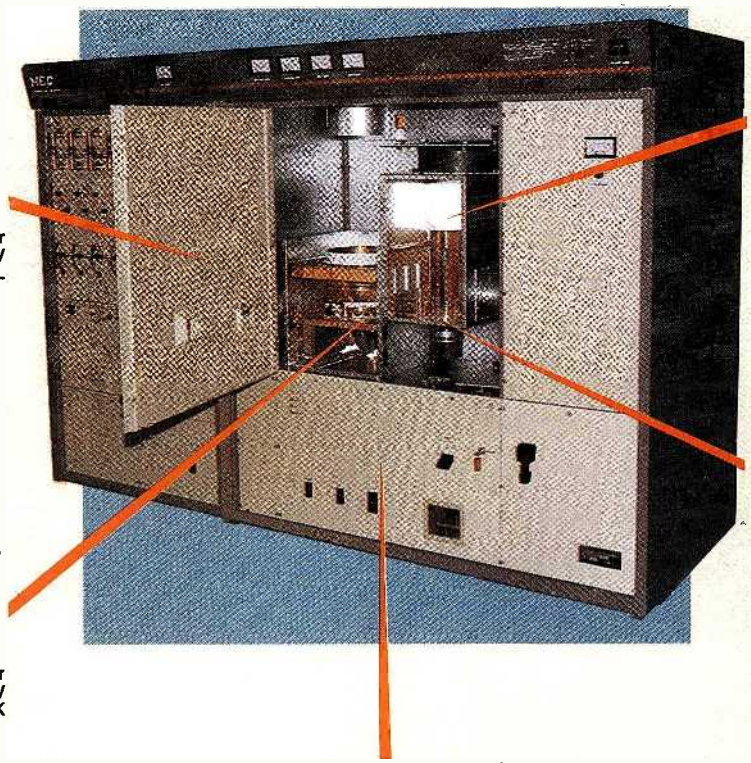
Electrical measurements made on the machine are good by analog tape standards. The play frequency response, including low-frequency head bumps, was still within ±2dB from 31.5Hz to 20kHz at 7½ips, and within ±1dB from 31.5Hz to 20kHz at 15ips. (See Figure 1.)

More impressive was the SEL-REP playback response, which was ±2dB from 31.5Hz to 20kHz at 15ips. At 7½ips, the response suffered somewhat, but was down by only about 5dB at 10kHz. (See Figure 2.)

The tape recorder comes set up for Ampex 456 tape. When the recorder was delivered to me, the record response with Ampex 456 was within a few decibels of the play response. The 3% THD+N point was at +14dB VU (where 0VU = +4dBm = 185nWb/m, or at +18dBm). With a broadband noise floor of −48dBm (30kHz low-pass filter, unweighted), this machine has a dynamic range of 66dB at 15ips. Because the noise floor dropped 3dB at 7½ips, and the 3% point remained about the same, the dynamic range of the recorder at this speed was better at 69dB.

The standard tape used at KFOG-FM is 3M 226. I rebiased the machine for 3M 226 using the recommended procedures (4dB overbias at 10kHz). The 3% THD+N point improved to +16dB VU or +20dBm. With a 15ips noise floor of −48dBm and a 7½ips noise floor of −51dBm, the ATR showed a dynamic range of 71dB at 7½ips and 68dB at 15ips. The record-play fre-

WE'RE AS GOOD AS THEIR WORD.



"The NEC transmitter has superior reliability and stability. Breakdown is not a problem."
Bob Morgan, Chief Engineer
WCTV-TV
Tallahassee, FL

"It's got reliability and stability. There've simply been 'no bugs' with the transmitter since we started. We're very satisfied, very happy."
Lacy Worrel, Chief Engineer
WMAZ-TV
Macon, GA

"Its reliability is phenomenal. There are no moving parts in the cavity, and breakdown has not been a problem. This transmitter's been perfect. We've been amazed."
Jim Lockerd, Chief Engineer
KSWO-TV
Lawton, OK

"We were looking for modern technology, and we liked NEC's approach. We have had no problems at all with our transmitter. Power consumption has gone way down from our older transmitter. The transmitter's very stable."
Don Luchsinger, Chief Engineer
KVOS-TV
Bellingham, WA

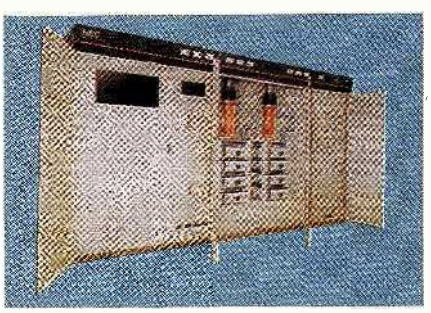
"We've had very, very, very few breakdowns with this system. It's been almost trouble-free. It's that reliable."
David Williams, Chief Engineer
WTVM-TV
Columbus, GA

If you want a clear picture of just how good an NEC VHF transmitter is, take a look at what people who use them are saying. They're talking about reliability. Stability. Excellence in design. Low cost operation. And there's no comparison when it comes to maintenance. They require very little attention.

They're also saying that NEC people are always there when needed. With suggestions. Ideas. Answers to questions. Replacement parts. Or whatever it takes to keep a transmitter running smoothly.

What they're telling us is what we'd like to tell you. If you need a transmitter that's built to be reliable year after year, that's known for stability, and that's not power hungry, take a look at what NEC is offering. Better yet, take a user's word for it.

Here's why there's no comparison:
- 100% solid state to 10 kW; one tube to 50 kW
- Power ranges from 1 to 60 kW (parallel running) Band I, to 100 kW (parallel running) Band III
- 30% reduction in exciter parts for 50% increase in MTBF (to 30,000 hours)
- Ready for stereo without modification



PCU-900 Series UHF Transmitters also available. Power sizes 10 kW to 240 kW (parallel running).

- Regulated power supplies throughout transmitter (including filament of final tube)
- No finger stock in cavity
- Only two controls on cavity
- Over 20,000 hours on final tube
- All solid state aural and visual drivers

Emergency parts are available 24 hours a day, 365 days a year in Wood Dale, IL, 30 minutes from O'Hare Airport. Simply call 1-800-323-6656.

For more information about NEC transmitters, contact NEC America, Inc., Broadcast Equipment Division, 1255 Michael Drive, Wood Dale, IL 60191. Phone: 312/860-7600.

NEC

Circle (99) on Reply Card

C&C
Computers and Communications

650-106

7½ips PERFORMANCE	15ips PERFORMANCE
Machine aligned to 3M 226 tape for minimum THD (12dB overbias at 10kHz)	(+5.6dB overbias at 10kHz)
3% THD at +20.7dBm output	3% THD at +26.2dBm output
1% THD at +19.2dBm output	Distortion at 0VU/+4 = 0.3%
Clipping point = +24dBm output	Noise = −48dBm
	Dynamic range = 74dB
Distortion at 0VU/+4 = 0.3%	
Noise = −51dBm	
Dynamic range = 72dB	

Table 1. *Distortion and noise performance after alignment with 3M 226 tape.*

quency response could be trimmed to within ±1dB of the play response. (See Figure 3.)

I normally set bias for a distortion null, and on the second try with 3M 226, I found a distinct distortion null. At 7½ips, the distortion null occurred at 12dB overbias at 10kHz and increased the 3% THD+N point another decibel. Even with that amount of bias, there was still enough range in the equalizers to bring the high-frequency response in line. The reason for the large amount of bias is the extremely narrow gap record head necessary for good SEL-REP frequency response.

At 15ips, the distortion null occurred at 6dB overbias at 10kHz. Set up this way, the machine's 3% THD+N point was at +26dBm output (+22dB VU), giving the machine a dynamic range of 74dB (based on a noise floor of −48dBm). This particular setting worked almost as well at 7½ips, although the 3% THD+N point dropped back to +20dBm (+16dB VU). See Table 1.

One compromise made in the machine's design is that there is only one bias adjustment and record level calibrate for both speeds, so it is not possible to optimize the machine exactly for both speeds. However, in my experience, considering the differences were on the order of tenths of a decibel, it is not a major drawback.

All the adjustments were made conveniently from the front of the machine. The recorder can be aligned easily even while mounted in a rack. Try doing that with a lot of other machines.

It was difficult for me to return the machine to the factory. I would have liked to take one home, but couldn't afford it. If you're shopping for a new analog tape recorder, take a look at the Otari MX-55.

Editor's note: The field report is an exclusive **BE** feature for broadcasters. Each report is prepared by the staff of a broadcast station, production facility or consulting firm.

In essence, these reports are prepared *by* the industry and *for* the industry. Manufacturer's support is limited to providing loan equipment and to aiding the author if support is requested in some area.

It is the responsibility of **Broadcast Engineering** to publish the results of any piece tested, whether positive or negative. No report should be considered an endorsement or disapproval by **Broadcast Engineering** magazine.

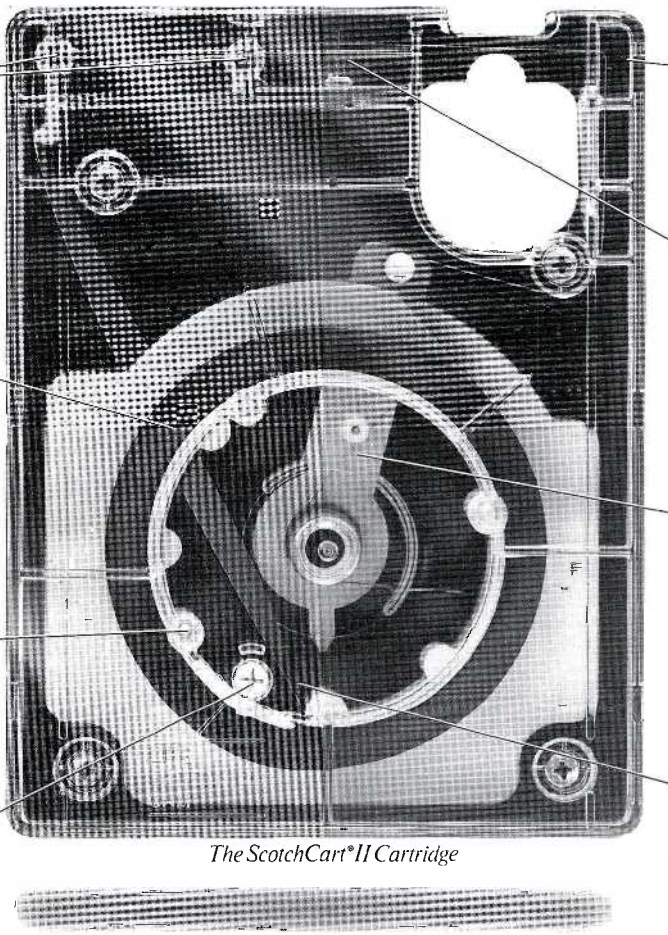
HOW REDUCING STRESS IMPROVES JOB PERFORMANCE.

Naturally lubricated concave guides gently position tape to allow cartridge machine to perform critical guidance.

High-output, low-noise, 100% laser-inspected tape delivers impressive frequency response and higher recording levels for better signal-to-noise performance.

Non-rotating hub reduces wow and flutter, eliminates annoying rotating hub rattle and minimizes stop cue overshoot.

Adjustable cam to control tape loop for maximum life.



The ScotchCart® II Cartridge

Cover constructed of polycarbonate materials for long-lasting, break-resistant use.

No pressure pads to cause troublesome tape steering and wear or induce modulation noise.

Patented dynamic tension control system ensures proper tape-to-head contact, provides constant tape tension and controls tape looping.

Tape exits from the hub's center instead of twisting and curling over the pack, reducing edge stress and debris to prolong life.

The reason most broadcast cartridges quickly become unreliable and self-destruct isn't because they're overused. Poor designs that create too much friction and tape stress can cause more headaches than anything. But as you can see, the revolutionary design of ScotchCart® II cartridges makes them noticeably superior to other carts.

They also sound better because of 3M's extensive audio tape experience—over 40 years of successful innovation and product development.

So if you measure a cart's value by how much trouble-free performance it provides in the long run, talk to your professional audio dealer or local 3M sales office about the advantages of using ScotchCart® II cartridges. Or for a free sample, call International Tapetronics, 3M Broadcasting and Related Products Department at 800-447-0414. (In Alaska or Illinois, call collect 309-828-1381.)

The ScotchCart® II cartridge from 3M. The one you can depend on to keep things running smoothly.

3M

Circle (101) on Reply Card

News

Continued from page 4

casting networks. MTV wishes to increase the number of households receiving its programs transmitted via Intelsat 5. The possibility of leasing 3-SAT music-only transponders has been discussed.

UK broadcasters question future of commercial TV

The British Independent Television Company (ITV) and several other UK-based satellite broadcasters have appealed to the British government to oppose the new advertising policy proposed by the Council of Europe. ITV claims that if the proposal receives parliamentary approval, the future of commercial television in the United Kingdom will be jeopardized because of a substantial loss of advertising income.

European DBS planned

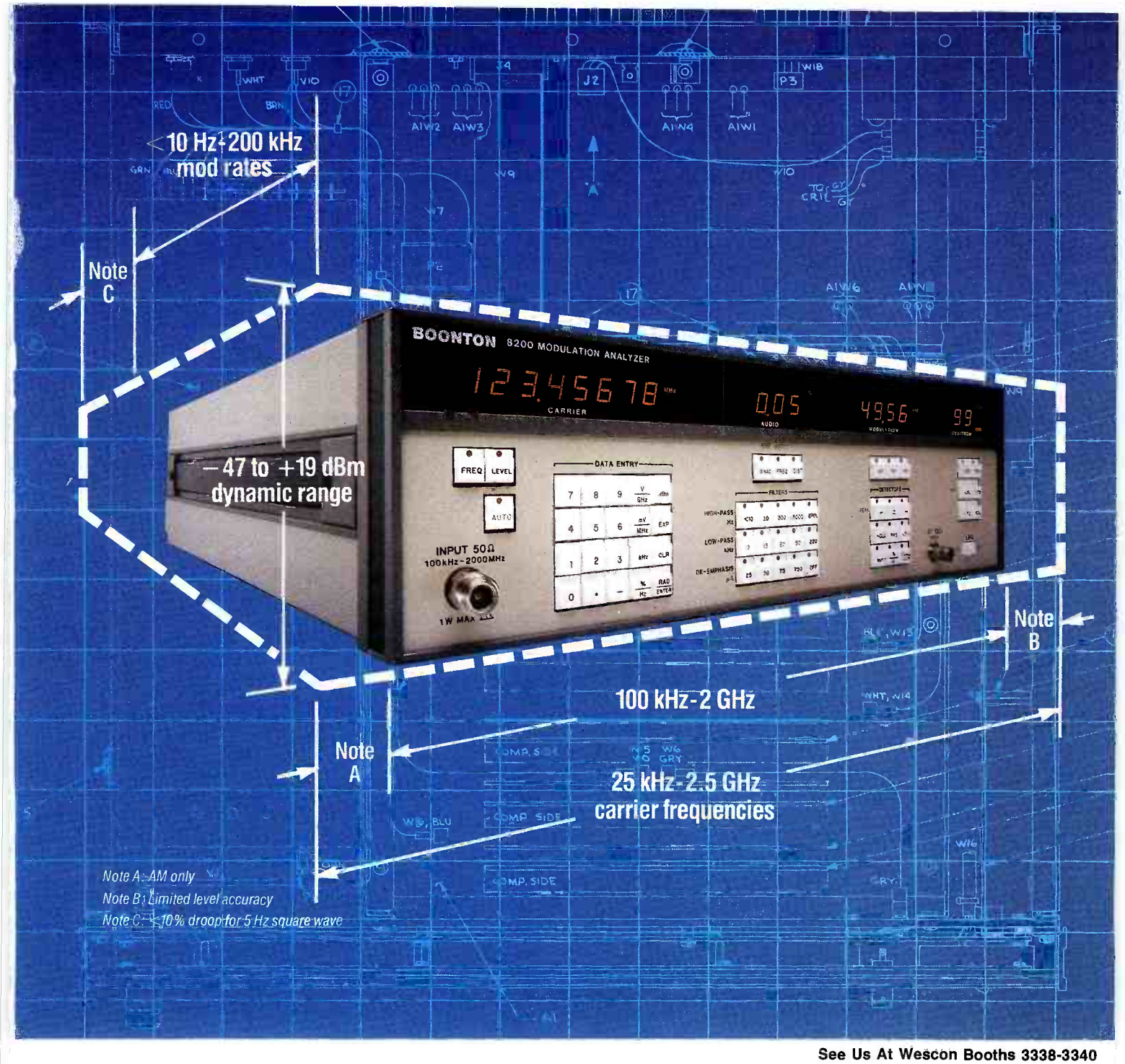
Eutelsat, the European organization for satellite telecommunications, has announced plans to build a multinational, second-generation direct broadcast satellite.

Europesat will be a medium-power satellite with 100W to 120W transmission capacity. It will be equipped with 14 transponders assigned to various transmitting antennas with partially overlapping illumination zones. This antenna arrangement, designed for greater flexibility, can be changed in orbit.

The German Bundespost, whose long-term commitment to DBS seems to be strong despite the failed mission of TV-SAT 1, supports a second-generation system involving Eutelsat. From a financial viewpoint, its participation is crucial. Currently, only the leading industrial nations in Europe are interested in the project. If the other European members choose not to participate, Eutelsat may look outside the organization for additional support.

Bundespost may increase satellite TV distribution

The German Bundespost is reviewing the possibility of dedicating one of its two scheduled DFS Kopernikus satellites totally to TV distribution. The satellite could carry 13 TV channels for telecommunications uses, allowing the Bundespost to cut back on its use of Intelsat.



See Us At Wescon Booths 3338-3340

BOONTON RE-DIMENSIONS MODULATION MEASUREMENTS!

BOONTON

Boonton's 8200 Modulation Analyzer out-performs the competition with the widest measurement range by far. Automatic or manual acquisition and display of carrier frequencies and levels. Measures modulation frequencies from <10 Hz to 200 kHz. True peak measurements to 99% a.m. and 500 kHz f.m. with accuracies of 1% of reading. Phase modulation to 500 radians. True rms detection of residuals. Automatic audio distortion measurements from 0.01% to 100% THD or 0 to 80 dB SINAD at baseband frequencies between 20 Hz to 20 kHz. Plus a full complement of low-pass and high-pass filters and de-emphasis networks.

Check with your local representative or contact Boonton directly for the full dimensions of the 8200.

Boonton Electronics Corp.
791 Route 10, Randolph, NJ 07869
Telephone (201) 584-1077

Signal Generators ■ Modulation Analyzers ■ RF Power Meters ■ RF Millivoltmeters ■ Capacitance Meters and Bridges ■ Audio Test Instruments

Circle (104) on Reply Card

Using a computer for engineering

By Russell Brown

Brown is an engineer at KTSF-TV, San Francisco.

If you aren't using a computer in your daily engineering work, you're missing out on one of the most useful devices available. Many engineers still think of the computer as a tool of the business office or the automation system. A number of software packages are available, however, that make the computer valuable to the broadcast engineer.

I have been using a Macintosh computer at KTSF-TV for approximately two years, and it has been much more useful than I ever anticipated. The computer was purchased to aid in schematic drawing. We soon found out, however, that it was useful for many other tasks. In a relatively short time, the computer was being used for printed circuit board design, circuit simulations, architectural and studio drawings, and even foreign language subtitling.

Proven value

I had previously purchased another computer to aid my work in building a small TV studio. Later, I began using the system and a computer-aided design (CAD) program to design and document a 1-inch VTR remote-control system. After the success I encountered with the CAD program, I could not return to pencil-and-paper drawings.

The station would not purchase a com-

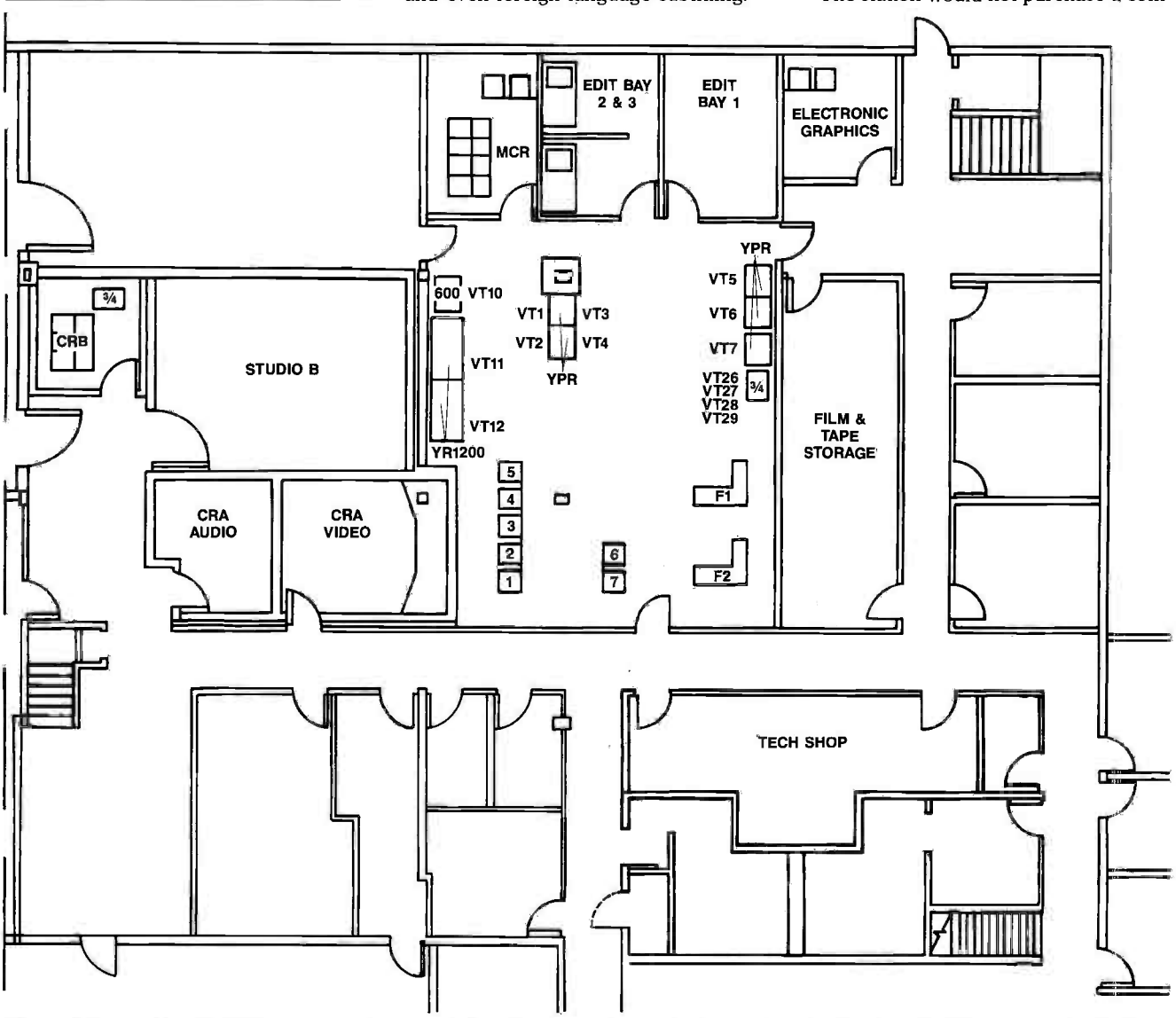
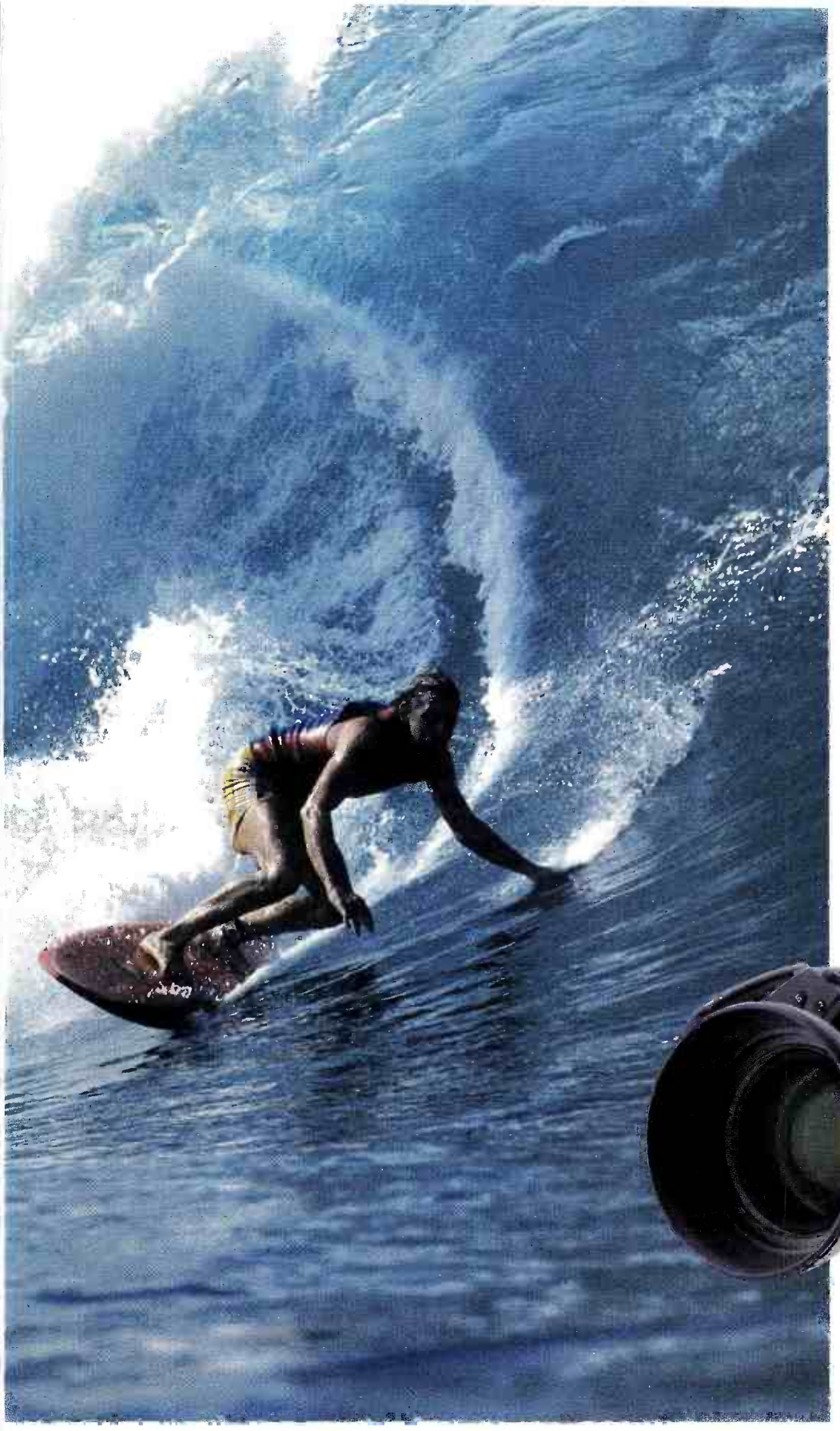


Figure 1. *Coupled with a CAD program, a computer can assist the design process of a new facility. This is part of a larger drawing that was composed using the structural limitations imposed by an existing facility.*



Canon is proud to introduce a lens designed to perform flawlessly in a wide range of broadcast applications, whether in the field or in the studio. And despite the J15X9.5B IRS' compact size, it boasts a long list of impressive features. Like a powerful 15X zoom with built-in 2X extender and macro focusing as close as half-an-inch. And full compatibility with all 2/3" CCD cameras. Yet this incredible lens is affordable too, making it the perfect choice for any size TV station, the educational marketplace and everyone else in between.

However, the new J15X9.5B IRS can do more. An optional positional focus control system and a zoom shot box allow you to customize the lens to specific broadcasting requirements. And like every Canon broadcast television lens, the J15X9.5B IRS provides years of dependable service thanks to superior optical and mechanical design and construction.

When you need a lens of uncompromising performance at an affordable price, it has to be the Canon J15X9.5B IRS. (A high performance version of the J15, the J15X9.5IRS-HP, is available and features a rugged, rain-proof drive unit.)

SPECIFICATIONS:

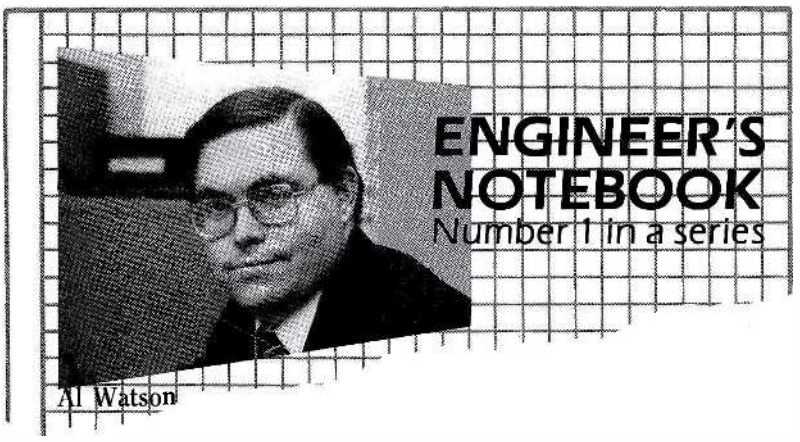
Focal Length: 9.5-143mm (19-286mm w/2X extender)
Max. Relative Aperture: 1:1.8 (9.5-121mm), 1:3.6 (19-242mm)
Angular Field of View: 49.7° at 9.5mm, 26.1° at 19mm 3.5° at 143mm, 1.8° at 286mm
Minimum Object Distance: .95 meters

AFFORDABLE HIGH PERFORMANCE FROM CANON.

Circle (105) on Reply Card

Canon USA, Inc., New York Office: One Jericho Plaza, Jericho, NY 11753 (516) 933-6300. Dallas Office: 3200 Regent Blvd., Irving, TX 75063 (214) 830-9600
Chicago Office: 100 Park Blvd., Itasca, IL 60143 (312) 250-6200. West Coast Office: 123 Paularino Avenue East, Costa Mesa, CA 92626 (714) 979-6000
Canon Canada, Inc., 6390 Dixie Road, Mississauga, Ontario L5T1P7, Canada (416) 678-2730

COME SEE US AT THE SMPTE SHOW BOOTH 1106



N/DYM™ Technology Comes to Broadcast Microphones

By Alan Watson, Director of Engineering
Electro-Voice, Inc.

Those familiar with the benefits enjoyed by musicians through the new neodymium-magnet microphones have no doubt predicted that the new technology would soon be available in broadcast microphones. And now, with the advent of the Electro-Voice RE45N/D hand-held shotgun microphone, the prediction has come true.

The advantages N/DYM™ technology brings to broadcasting are significant. Above all, it gives us a microphone with the high output previously available only from condenser mics—but without the problems of dead batteries, noises caused by poor ground connections in phantom-powering, humidity damage, static electricity, and poor rf rejection.

The Alnico magnets used in most dynamic mics yield a sensitivity of 6 dB less than would be possible if the steel parts of the magnetic structure could be completely saturated with the field. Increasing the Alnico magnet size does not work since the added size interferes with the acoustic design of the mic. Neodymium magnets, however, are so powerful that the magnet can be far smaller and still provide the "lost" 6 dB of sensitivity.

N/DYM Technology extends far beyond a mere substitution of magnetic material. To maximize the new opportunities, Electro- Voice engineers found that the ideal neodymium magnet shape is one with a thin, wafer-like configuration.

This permitted using a voice coil and attached dome of far larger diameter while reducing the surround—yielding important added advantages for broadcast engineers: a smoother, more evenly contoured pickup pattern with extended high- and low-frequency response and better rejection of unwanted noise from the sides.

For more information, please write to us for the specification sheet and brochure on the RE45N/D—the broadcast industry's first N/DYM dynamic shotgun microphone.

600 Cecil Street • Buchanan, MI 49107 • 616/695-6831
In Canada:
Electro-Voice Div., Gulton Industries (Canada) Ltd.
P.O. Box 520 • Gananoque, Ont. K7G2V1 • 613/382-2141

Electro-Voice®
a MARK IV company

BROADCAST/PRODUCTION MICROPHONES
Quality-made in the U.S.A. since 1927

Advertisement

Circle (106) on Reply Card

puter until the chief engineer, Bob Snow, was convinced of its value in the work place. Therefore, I began bringing my computer to work to create the drawings for the VTR project. It wasn't long before he was impressed with the speed of the work and the quality of the drawings. Soon thereafter, the station purchased a similar computer for the engineering department. As is often the case with a computer, once it was put to use, the new applications created the need for expansion. Additional memory, an extra floppy disk and provision for a hard disk were added. Each new feature enhanced the operational and performance capabilities of the original system.

Practical example

It wasn't long before the engineering staff had the opportunity to really put the computer system to work. The station purchased a building to be remodeled for a new studio. As anyone who's been through such a project knows, trying to remodel an existing building involves many design trade-offs. One of the major limiting criteria was the need to restrict the number of walls to be moved. Moving walls, especially supporting walls, is expensive.

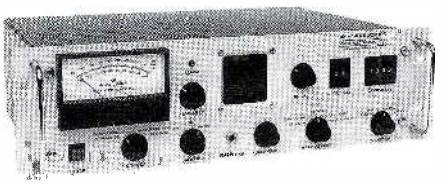
The existing building dimensions, wall positions and other physical parameters were entered into the CAD program. The program allowed walls to be moved or eliminated as different floor plans were developed. A portion of one floor plan is shown in Figure 1. The computer allowed us to examine many alternative floor designs, all without an architect.

Because each proposed floor plan was drawn to scale, it was much easier to spot potential problem areas. Room dimensions, hallways and door widths all affect the final design. The computer kept track of these parameters and allowed us to model many alternatives without the cost of hiring an architect at this early planning stage. During the project's design phase, more than 10 different floor plans were examined before the final selection was made.

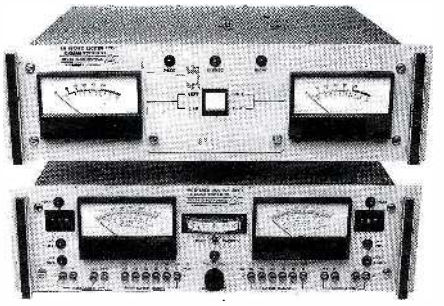
Using the same drafting program, we made scaled drawings for all the planned and current equipment. An example control panel designed with the program is shown in Figure 2. We glued the scaled drawings to cardboard to produce templates that could be used to test each floor plan. Planning traffic patterns around the equipment was much easier with scaled drawings and movable templates. Although much of this work might normally be completed in conjunction with an architect, having the equipment to do it provided a great deal of freedom. Such advance planning also may reduce architectural fees.

Adhere to Broadcast Standards.

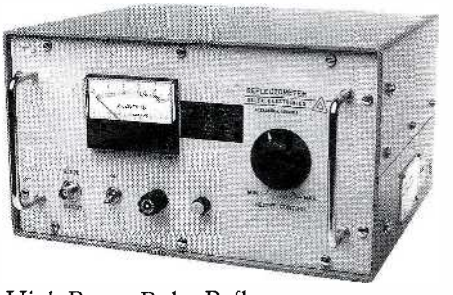
Every day, all over the world, Delta's full line of products make sure the most important broadcasting standard of all is met—your total satisfaction.



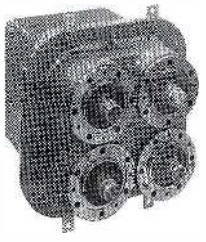
AM Splatter Monitor — Spectrum analyzer performance at a significantly reduced price! An inexpensive means of verifying FCC and NRSC spectral compliance. This frequency agile instrument tunes from 1700 kHz down to 450 kHz, with 9 or 10 kHz channel spacing. The monitor also measures incidental phase modulation (IPM). Designed to be rack-mounted or operated from a vehicle's 12 volt supply using an optional antenna.



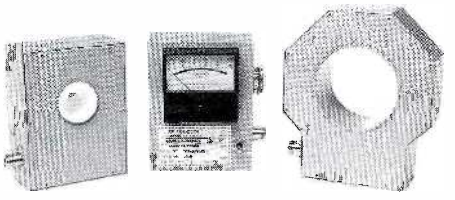
C-QUAM® AM Stereo — The Above Standard Industry Standard is easy to install and maintain with its modular design and construction. Offers standard features other manufacturers charge as options. A sound value, built to last.



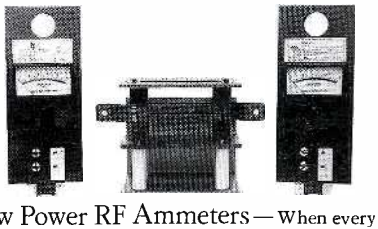
High Power Pulse Reflectometer — Strong interfering fields that would destroy time domain reflectometers are virtually ignored by the PRH-1. This instrument can handle up to 1,000 watts of induced power on an intermittent basis as it locates faults on transmission lines. Provides a visual representation of the transmission or sample line, STL coax, or antenna, using your oscilloscope.



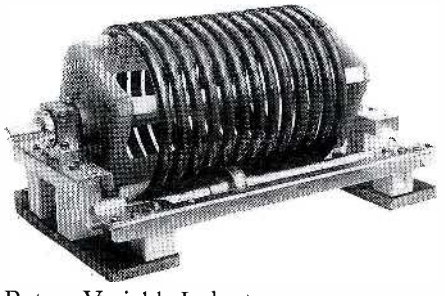
Coaxial Transfer Switches — These 1⅝" and 3⅛" motorized four port switches are designed to switch between antennas, transmitters, or dummy loads both quickly and efficiently. The switches can also be operated manually and are fully interlocked.



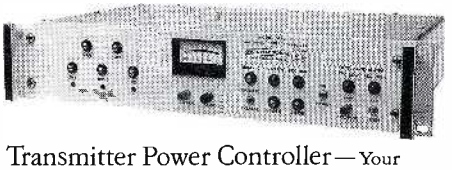
RF Ammeters and Sampling Toroids — Precision toroidal current transformers (TCTs) provide stable antenna monitor sampling while eliminating the problems associated with loops. TCTs also work well in supplying additional modulation monitor or test sample RF outputs. The transformer coupled ammeter (TCA) offers stable base or common point current readings, independent of modulation. The dual and single scale meters also provide remote DC outputs.



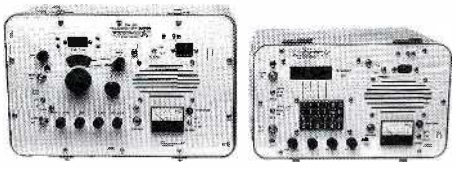
Low Power RF Ammeters — When every milliamp of current counts, depend on the accuracy of the TCA-Jr. This portable RF ammeter is designed to plug into either a Delta MJ-50 Meter Jack (pictured above), or a standard J-plug jack. Two current ranges are available: 0.2 to 1.0 Ampere, or 0.4 to 2.0 Amperes.



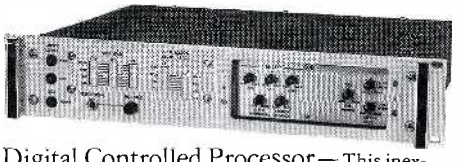
Rotary Variable Inductor — Where long life and high reliability are required, specify the RVI Designed to provide long life, even under continuous rotation, the RVI is available in either 12 μH or 10 μH versions (maximum inductance). Other values by special order.



Transmitter Power Controller — Your insurance against over- and under-power citations. Continuously monitors transmitter power levels, compensating for AC power line sag by adjusting the transmitter to 100% power.



RF Receiver/Generator — A rugged, high output (2 watts) generator and correlation detector receiver virtually eliminate false nulls caused by interfering signals. The RG-3A operates from 0.5 to 1.65 MHz, and the expanded range of the RG-4 generates signals from 100 kHz to 30 MHz.



Digital Controlled Processor — This inexpensive, stereo tri-band processor boasts user-friendly controls and an aggressive sound. Mono stations can take a step toward AM Stereo, at a price that won't break the budget.

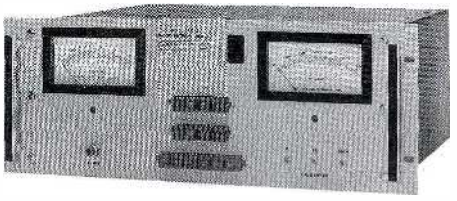
Impedance Bridges — At last, a means of measuring your impedance under full power. Both portable and in-line bridges are available, with a variety of features, for both AM broadcast and HF applications. The in-line Common Point Bridge can be supplied with a TCA RF Ammeter to permit precise current and impedance measurements.

The Above Standard Industry Standards.

DELTA ELECTRONICS

Delta Electronics, Inc. • 5730 General Washington Dr.
P.O. Box 11268 • Alexandria, VA 22312 • U.S.A.
Telephone: 703-354-3350
FAX: 703-354-0216 • Telex: 90-1963

Circle (107) on Reply Card



AM Antenna Monitors — These are true ratio monitors which deliver a ratio reading without the need to continually reset the reference tower to 1.000. This simple operation reduces errors by non-technical personnel and makes tuning an array easier.

I think our station got the best possible floor plan by using the computer in the planning phase. Performing the early design work allowed us to produce designs that could be reviewed by the operations and production departments. Because whole walls and rooms could be changed in a few seconds and a finished drawing produced in a few minutes, we could consider many more alternatives than might otherwise have been possible.

Designing video and audio systems

Once the floor plans were finished, we began work on the audio and video system layout. Again, the computer and CAD program made this task much easier. Because the chief engineer was tied up with the construction of the plant and normal station business, I was in charge of the design and documentation for the audio-video wiring.

The chief and department engineers used the computer to propose ideas and draw them for approval. It was easy to convey my ideas to the other engineers and to present their ideas when I had clean, precise drawings for everyone to see. When changes were suggested, they were made on the computer and printed. Another big advantage of using the computer is that different versions of a single drawing can be made and stored without having to redraw the entire plan. You can just modify the first drawing and save it under a different name. This makes it possible to go back and see what the original idea looked like.

Design process

I began the equipment design by drawing the equipment input/output schematics. A portion of one drawing is shown in Figure 3. These drawings detailed the connections among all the equipment we either owned or planned to purchase. Once the interconnection drawings were completed, the schematics for the audio and video DAs, the routing switcher, master control and studio A were made. When these drawings were completed, all the interconnect lines were entered into a wire number database.

The overall wire number database is broken up into several smaller ones: video cables, sync, RF, control and six data files for audio. Because the source and destination names used for each database are different, six files are required for the audio equipment. For example, in the terminal-blocks-to-terminal-blocks database, it's possible to separate the block number from the terminal number. This structure makes it much easier to sort the information contained within the database.

When the cable terminates, however, such as in a VTR where you typically would specify the equipment and connector name, these definitions don't match. The database for the multiconductor cables is linked to all the other databases so that reports can be generated based on what wires are in each cable. To keep the audio database and the wires separate, each database has its own wire number range. After the from/to data was entered, the computer assigned numbers to all the wires, preventing any duplication of wire numbers. These wire numbers were entered onto each drawing. The wire database allowed me to group common wire runs and enter the length required for each run. The computer totaled the cable lengths, and I knew how much wire to order.

Schematic drawings

All the benefits of a computer also apply to creating schematics. The program I use provides libraries of ICs and other electronic symbols. This allows digital circuits to be designed on the computer screen. Individual devices (symbols) can be moved on the screen with the signal lines still connected.

In addition, the integrated database ties to a printed circuit board layout program that generates a list showing, for example, that U2 pin 3 is connected to U4 pin 7. This feature is useful when you begin building the circuit because it details every connection. You no longer have to wonder whether you've forgotten some connection as the device is constructed.

For engineers who need to design digital circuits, several circuit simulation programs are available. Although the one I use will simulate only digital logic, analog components still can be used. They simply are treated as symbols and do not affect the simulation. The program has a library of more than 200 7400-series devices and about 50 CMOS devices. Each device can be used in on-screen circuit design. A portion of a TBC circuit, designed with the program, is shown in Figure 4.

After a circuit is designed, a printed circuit board often is needed. Computers can help here, too. One program will design single- or double-sided boards up to 32"×32". The boards can be plotted on acetate for photo etching. At least one PC board layout program even provides a manufacturing service. With this service, you can design the board and submit it by modem to the company for construction.

Circuits that used to seem too complicated to build can be simulated and tested in a few minutes or a few hours on the computer. And there's no expense for parts. Best of all, engineers can gain a better knowledge and understanding of the digital circuits they create, use and repair.

Maintenance uses

Although I haven't used the computer

Continued on page 110

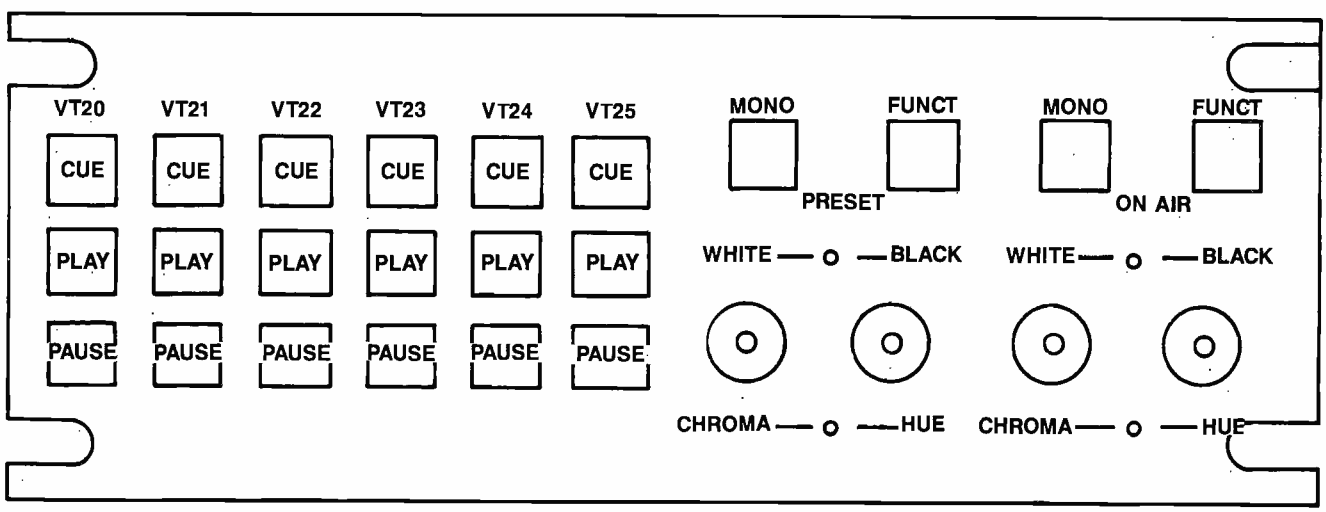


Figure 2. *Designing control panels is often difficult. The CAD program allows full-scale drawings to be developed for prototyping and final production.*

If you think this is just another add-on...

...try adding these up.

1. Both Luminance and Linear Keys
2. Four Fill and Four Cut inputs with accumulative latching
3. Key Mix and Fade to Black frame accurate Automatic Transitions
4. Standard Matte and Mask Generators
5. Full "Look Ahead" Preview Monitoring
6. Optional Linear BORDERLINE® Borders. Drop Shadows, Outlines, and Transparent Shadows. All with variable widths

Grass Valley Group's new low cost linear keyer (DSK-101) gives you many major functions found only on large switchers. That means a big addition of production power to your suite.

If the new linear keyer looks familiar it's because it combines the compact design of the GVG® Model 100 switcher with the sophisticated keying circuits of the Model 200. The optional Borderline module is also based on the Model 200.

High quality keys include linear keying for anti-aliased characters and digital video effects units.

SOFTSET™ software comes as standard, and is a typical GVG extra, enabling operators to program GPI selection, E-MEM® system registers, and self diagnostics.

In fact the only thing about the DSK-101 that doesn't add up to much is the price.

Grass Valley Group®

A TEKTRONIX COMPANY

THE GRASS VALLEY GROUP INC.

P.O. Box 1114, Grass Valley, CA 95945 USA
Telephone (916) 478-3000
TRT: 160432

OFFICES: New York (201) 845-7988; District of Columbia (301) 622-6313; Atlanta (404) 493-1255; Chicago (219) 264-0931; Minneapolis (612) 483-2594; Dallas/Fort Worth (817) 483-7447; Los Angeles (818) 999-2303; San Francisco (415) 968-6680; GVG International Ltd. (U.K.) +44-962-843939; Grass Valley Group Asia (HK) +852-3-7396632

Circle (108) on Reply Card

LEGENDARY HANDLING. NOW WITH FINANCING THAT'S JUST AS MANEUVERABLE.

Horsepower. Handling. High speed stability. A Centro satellite news vehicle is as pleasurable to drive as it is to work in.

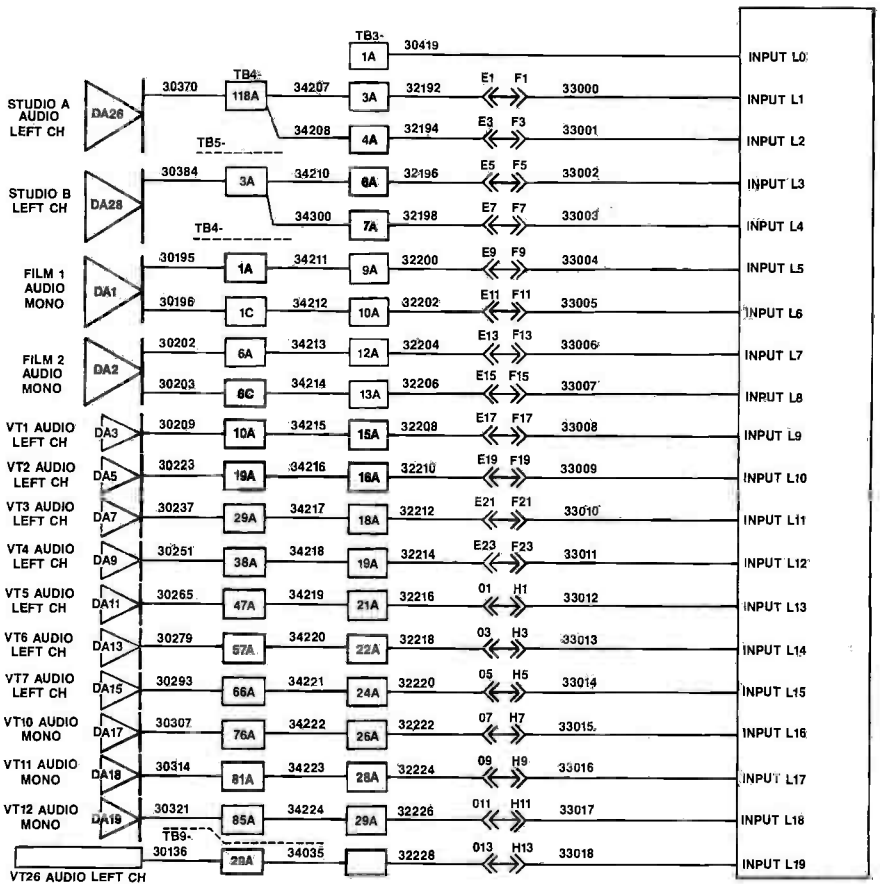
But the real news is our new leasing program. It's designed to put you into a Centro SNV right now, at very attractive rates. Just ask John Field, president of Discovery Satellite Services, "Centro put us on the road without a major cash outlay. We were fully booked and generating revenue before the first payment was due. One month later we ordered a second truck."

Centro SNVs are known throughout the industry for their superb engineering, exquisite craftsmanship, and unparalleled support. Chassis and drive trains are backed by a three year *unlimited mileage* Client Protection Plan. Service is available nationwide at any Ford dealer. And our technical support specialists are on call 24 hours a day, seven days a week.

So if there's an SNV in your plans, call today. We can get you off to a fast start—and a profitable one.

Centro. 369 Billy Mitchell Road.
Salt Lake City, Utah 84116
(801) 537-7779.

Please call me, I'm interested. Circle (109) on Reply Card.
Please send literature. Circle (110) on Reply Card.



Continued from page 106

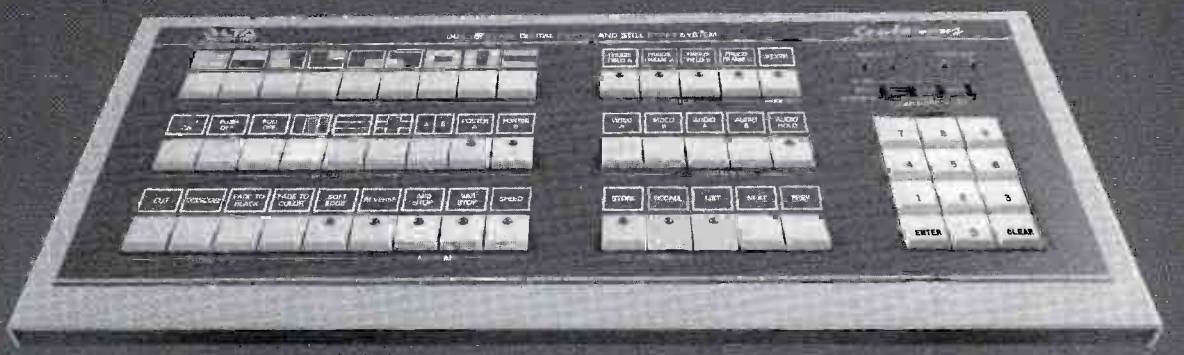
for this purpose, it's possible to use a database program for maintenance log records. Such a database could allow recurring problems to be tracked easily and quickly. The computer could generate maintenance reports that tell you what repair steps were taken last time, which might speed servicing and reduce downtime.

A spare parts inventory could be maintained in a database as well. If tied to the maintenance log, any parts used in repairs would be deducted automatically from the inventory. Reports could list the items used, thereby creating an accurate order list. I know of a station that uses a computer to track inventory parts for the routing switcher. At a large station, effective tracking of crucial spare parts is a real time-saver.

Microprocessor troubleshooting

Much of today's broadcast equipment relies on microprocessors. Although these

Figure 3. *Documenting the interconnection wiring within a station is tedious and error-prone. A CAD program can keep track of wiring numbers and interconnection points, helping reduce the chance of errors.*



One Still Store Does More Than Just Store Pictures

Simply Storing Pictures Isn't Enough Anymore.

Your still store had better deliver absolutely pristine images and be a multitasking production center, or you're not getting your money's worth.

Can Any Still Store Really Do This?

One can. ALTA's Centaurus. Look at our bandwidth for example. We don't just meet broadcast specs. We exceed them with high-speed component processing throughout. That means you get the sharpest image possible.

Store More For Your Money!

Now compare Centaurus' storage capacity. All on-line, for instant recall at the lowest cost per picture.

And when your storage requirements grow, we'll grow with you. With additional on-line storage, and a digital tape cartridge for unlimited off-line storage.

No Other Options Needed!

Our dual synchronizers and TBCs are built right in. So you can work directly with images from tape, camera, microwave and satellite feeds, whatever. All without having to invest in additional equipment.

Becomes a Master of Effects in Minutes!

Put some polish on your productions. Centaurus gives you more effects to work with, on a keyboard that's simple to operate. Plus its built-in switcher and dual TBCs let this still store stand alone, so you won't tie up your entire studio.

How Can This Be?

How can we make a full-featured, dual channel still store for less than the cost of other single-channel systems? Simple. We've been doing it for years. In fact, ALTA engineers were among the pioneers of the digital still store. That's why our warranty is twice as long, and our still store gives you twice the value.

So if you're looking for a still store that does more than just store pictures, choose the one that does more for your money.

Choose Centaurus.

Specifications	ABEKAS A42	ALTA Centaurus	AMPEX ESS-5	HARRIS ESP II
Bandwidth	4.2 MHz (±0.25 dB)	**5.5 MHz (-3 dB)**	5.9 MHz (±5 dB)	5.0 MHz (±0.5 dB)
Signal to Noise	52 dB	**58 dB**	?	56 dB
Storage Capacity*	200 fields 100 frames	**250 fields 125 frames**	207 fields 207 frames	200 fields 200 frames
Synchronizer	—	**Dual**	—	Dual
TBC	—	**Dual**	—	—
Production Effects	1 wipe dissolve —	**9 wipes dissolve 7 digital**	1 wipe dissolve —	3 wipes dissolve 3 digital
Warranty	1 year	**2 years**	1 year	1 year
Single Channel Dual Channel	$19,900 $24,900	— **$16,900**	— $31,500	$26,333 $30,995

*Basic System

Based on available data as of June, 1988.

ALTA GROUP, INC

535 Race Street, San Jose, CA 95126 • FAX 408-297-1206 • Tel. 408-297-ALTA

Circle (112) on Reply Card

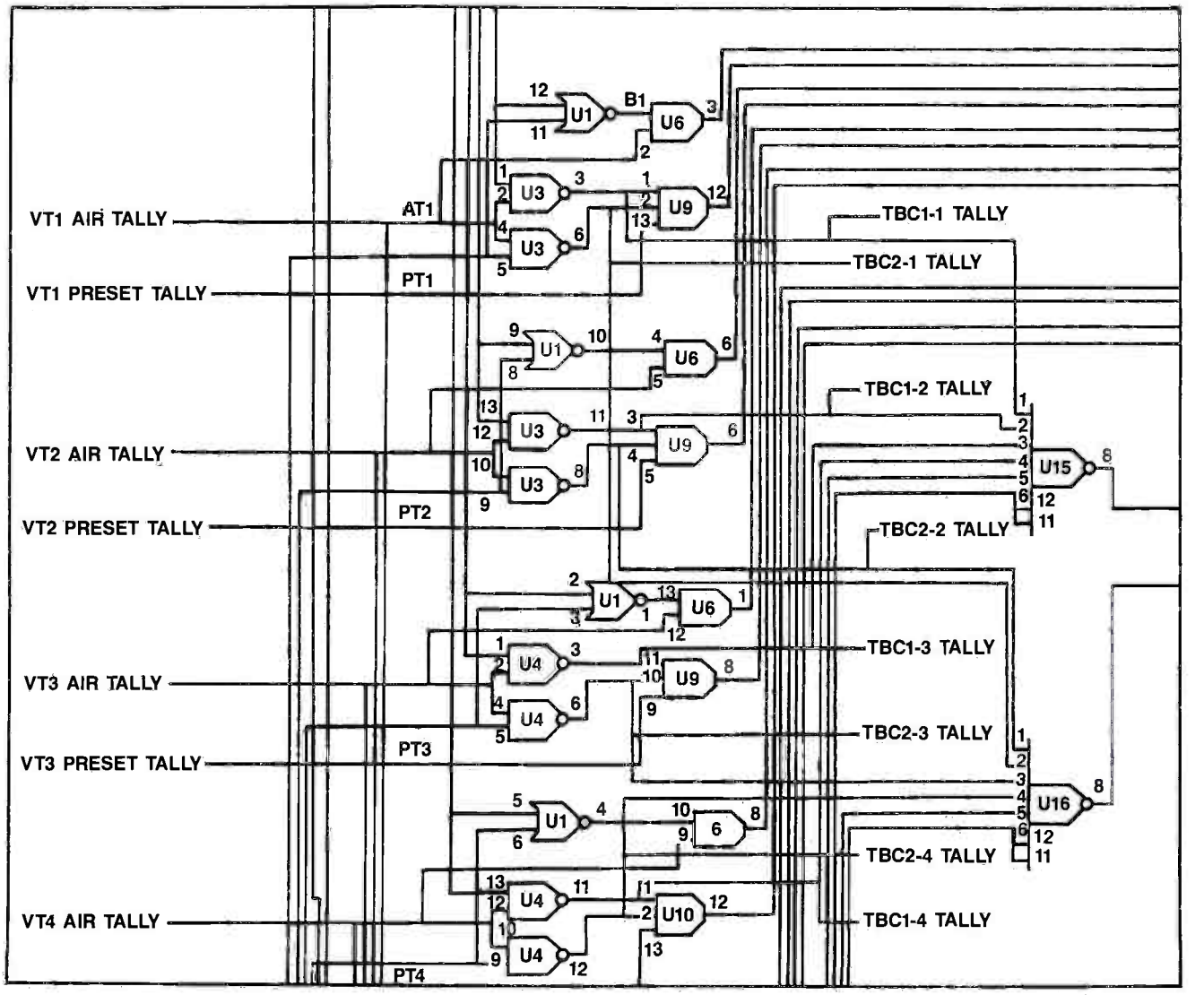


Figure 4. *Digital simulation programs allow digital circuits to be "designed" right on the computer screen. Timing waveforms and actual IC pinouts make the design process quick and cost-effective.*

devices make equipment operation easier and more automatic, they make troubleshooting more complex. This is especially true when microprocessor-controlled machines are connected together to work as a system.

Again, the computer can be used as a maintenance aid. It's possible to program a computer to test such equipment by simulating control and data functions. This allows an individual machine to be tested while it is out of the system interconnection loop.

Such maintenance techniques require that you write your own programs to test the equipment. George Dickinson, at KRON-TV, wrote a BASIC program that records certain registers (memory locations) within Sony 1-inch VTRs. When this program spots differences between the current and original contents of the registers, it flags them by displaying the contents in bold letters on the screen. Without a computer to peer into the internal data registers, many troubleshooting tests would be impossible. Computers also can be used to troubleshoot serial machine control lines, such as the ES-bus. With these types of networks, it can be difficult to trace a problem back to its source. Was the error generated in the control panel or in the machine receiving the message or even in the bus controller? Was a complete message sent? Decoding these signals is difficult. But with a computer and a little programming, it's not impossible.

Production applications

One of the first production applications of the computer was to generate forms. Production departments use many different types of forms: work orders, translation orders, storyboards and production graphics. The computer allowed us to quickly generate professional-looking forms. Because of the low cost of making new forms, we could make changes without the expense and delay of typesetting and printing. After the computer had been at the station for a few months, the operations manager asked me if he could use it to make up the weekly personnel schedule. It wasn't long before the satellite schedule also was being handled by the computer.

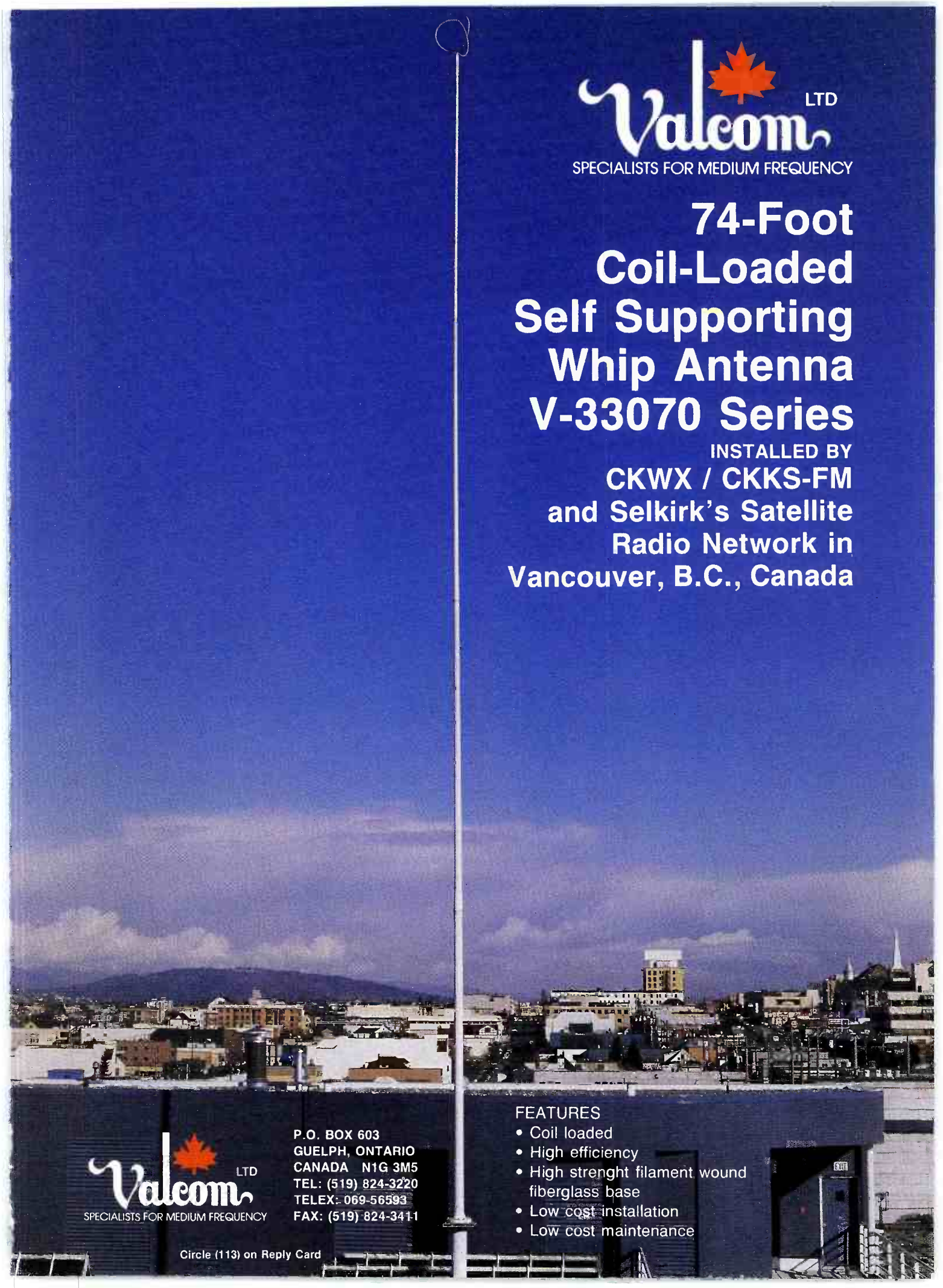
A unique use of the Macintosh, however, is the creation of Japanese subtitles. A program is available that allows us to type in the English spelling of a Japanese word, which the program translates into the appropriate Japanese character.

The Japanese characters are printed out in high-quality mode, shot with a copy camera and transmitted to the graphics machine. The graphics machine cleans up the characters, adding smoothing and edging. The graphic is then ready for keying over commercials or programs. Because our station does so much Japanese subtitling, the computer has saved us time.

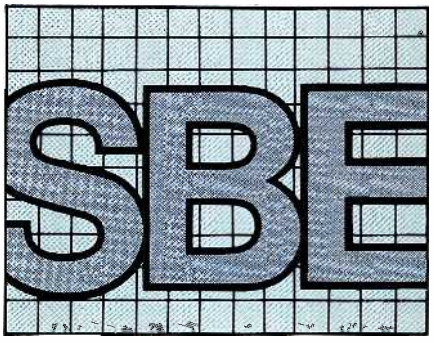
Unlimited applications

Although the computer was purchased for use by the engineering department to develop drawings, its applications have expanded greatly. If your station is like ours, acquiring one computer may lead to the purchase of additional ones.

If your station is not yet using a computer in non-business applications, consider the advantages. It should be easy to justify the use of one for engineering applications. With a little thought, you also may be able to show how other departments within your station could benefit from it. |:-)))|



SBE Update



Convention rates high marks

By Bob Van Buhler

The 1988 SBE convention and **Broadcast Engineering** conference was a success. According to figures released by the convention core committee, the event was attended by 3,297 people, more than at either of the previous conventions.

Satisfied attendees and exhibitors

The convention was held Sept. 22-25 at the Currigan Hall and Convention Center in Denver, with 187 vendors and 340 booth spaces. An overwhelming majority of the exhibitors expressed satisfaction with the show and traffic in the exhibit hall. Attendees polled through a written questionnaire at the end of the convention also gave it high marks. This year's show was rated "as good as" or "better than" last year's show by 85% of the respondents. The seminars were rated "good" to "excellent" by 79% of the attendees. The exhibits received a "good" to "excellent" rating from 94% of the respondents. A total of 96% of the attendees indicated they were taking home practical information that would benefit them in their jobs.

The Denver convention hall food did not fare as well. The food service at the convention center was rated "poor" by 34%, "fair" by 39%, "good" by 22% and "excellent" by only 5% of the attendees. The food service was controlled by the convention center, not the show manager, Eddie Barker. Barker indicated that a similar situation will not occur in Kansas City, MO, next year. The society will select the food service, so attendees can expect to eat well.

Members and exhibitors rated the convention "worth repeating" in 1989. The survey indicated that 78% of those who attended the Denver show will be coming to Kansas City in 1989 for the fourth annual convention. The 1989 event will highlight the observance of the society's silver anniversary.

Exhibitors also showed support for the 1989 convention. Barker said that even before this year's show had concluded he had received paid commitments from many of the exhibitors for next year's convention.

People are the key

The success of the third annual convention is due to the important contributions of the members. Those who should be singled out include Andy Butler, core committee chairman, from WFAN-AM, New York. Butler has been at the center of planning activities for all the conventions. Robert Goza, SBE director, and Sam Caputa have been involved with the operational and financial planning for all three conventions as members of the core committee.

Committee members who handled much of the advance planning, registration and site coordination were Paul Montoya and Bill Harris, treasurer. Nonmembers who deserve recognition for the many long hours they spent working behind the scenes with registration and other duties are Montoya's wife, Lynn, and Harris' wife, Garneth.

The engineering sessions were coordinated on site by Fellow Brad Dick, technical editor for **BE**. The attendee survey indicated a high degree of satisfaction with Dick's work at the conference. The conference was organized by John Battison, chairman, who also will organize the technical sessions for next year's convention. Executive planning for the conference was provided by Jerry Whitaker, **BE** editorial director.

Professional management of the exhibition hall was contracted to Eddie Barker and Associates, Dallas. This is Barker's first year of a 3-year contract to manage the show.

Election results

In the fall election, all four of the officers were re-elected by the membership. President Jack McKain, vice president Robert Van Buhler, secretary Richard Farquhar and treasurer William Harris will serve for one more year.

Incumbents for the board positions were treated favorably by voters, with six current directors elected to serve 3-year terms. Steve Brown, director of technical operations at WLTE-FM, Minneapolis, has served as chapter liaison chairman and was elected to the board after serving a 1-year appointed term. Others serving an appointed term and confirmed to a second term by vote of the membership were Robert L. Goza, operations supervisor at KMOV-TV, St. Louis; and Edward J. Roos, engineering manager of WPTV-TV, Palm Beach, FL.

Also re-elected to a second full term were Mary Beth Leidman of Indiana University of Pennsylvania; Jeff Baker, an independent engineering contractor in Rochester, NY; and Joseph J. Manning, engineering manager of KAET-TV, Arizona State University. (Manning also served 18 months as an appointed director before election to his first full term.)

This is the first group of directors to be elected since the bylaws revision. The terms of the director's office have been increased from two years to three. Also, the prohibition against more than two consecutive terms of service was lifted.

Board meeting

The board of directors met on Sept. 22 to consider a variety of issues and reports from several committees. The meeting was attended by president Jack McKain, vice president Bob Van Buhler, secretary Richard Farquhar and treasurer Bill Harris. Directors in attendance included Terrence Baun, Steven Brown, Robert Goza, Phil Aaland, Edward Roos, David Harry, Dane Erickson, Larry White and Joe Manning.

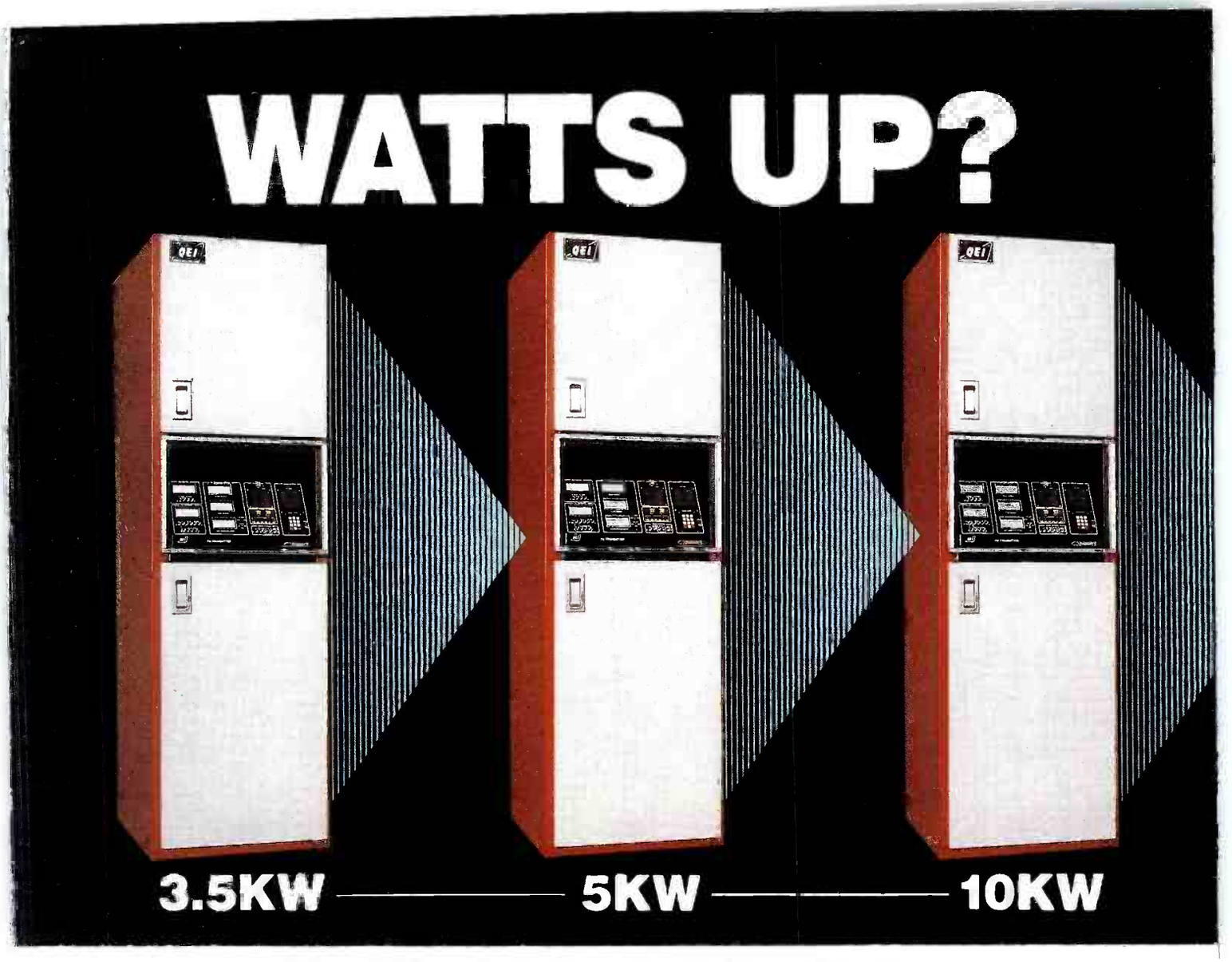
Others at the meeting were SBE executive director Andy Butler, immediate past president Richard Rudman and Ennes Foundation executive director Jim Wulliman. Also attending the board of directors meeting were Paul Montoya, a key player in the Denver national convention, and Paul Lentz. Directors who did not attend the board meeting included Baker, Leidman and Tom Weems.

Office changes

The national office has a new postal mailing address. Please address all correspondence to SBE, P.O. Box 20450, Indianapolis, IN 46220. Shipping and Federal Express items should be sent to 7002 Graham Road, Suite 216, Indianapolis, IN 46220.

Van Buhler is chief engineer for WBAL-AM and WIYY-FM, Baltimore.

WATTS UP?



When-and-if you're ready to UP your transmitting power, will your FM transmitter be ready too? If it's one of the QEI "New Reliables" FMQ series, the answer is YES!

Our new 3.5KW, 5KW and 10KW transmitters were designed to give you a clear upgrade path to higher power. In just a few hours, your 3.5KW or 5KW QEI FM transmitter can be upgraded to a factory-equivalent 5KW or 10KW unit, right in the field. QEI's unique modular solid state drivers and interchangeable P.A. assembly make these power upgrades easy...and very economical.

15000 HOUR TUBE WARRANTY

If you're shopping for a 10KW unit in the first place, the QEI FMQ-10000 has lots to recommend it. No other FM transmitter packs this much power, reliability and performance into a single 24" wide rack cabinet. And the FMQ-10000 is designed to operate on single-phase power, so there's no need to pay for installing new three-phase electric service.

What's more, for upgrades to power levels beyond 10KW, each of these FMQ series transmitters can serve as the driver section for QEI's 20, 30 or 60KW transmitters, again resulting in major cost savings.

Every QEI "New Reliables" FM transmitter is built to deliver ultra-dependability and performance. So—whether your station is thinking of upping its power down the road, or if the power you start with is the power you stay with—you'll be glad you chose QEI. Call us toll-free at (800) 334-9154 for the full story.

QEI CORPORATION

The New Reliables

One Airport Drive, P.O. Box D
Williamstown, NJ, 08094 (609) 728-2020

Circle (114) on Reply Card

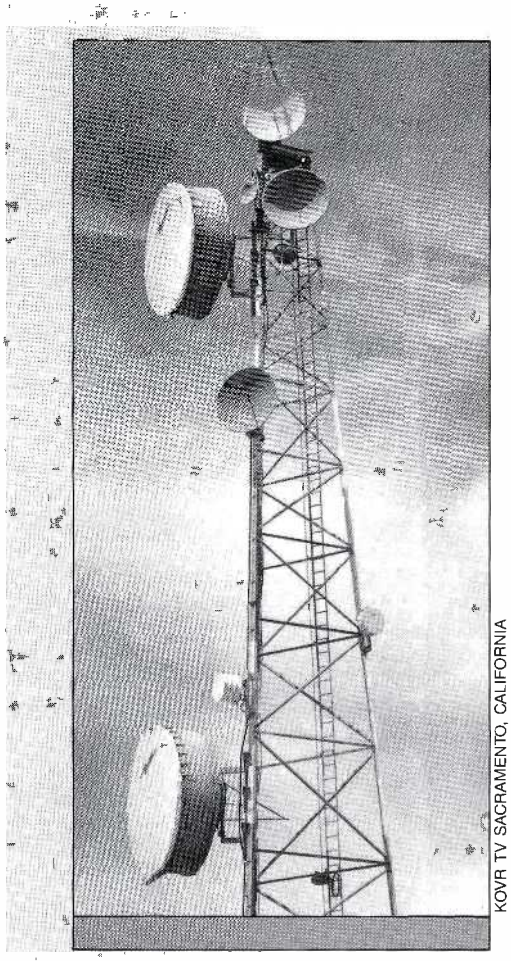
Statement of Ownership, Management and Circulation (Act of August 12, 1970; Section 3685, Title 39, United States Code).

1A. Title of publication: Broadcast Engineering
1B. 338-130
2. Date of filing: Sept. 30, 1988
3. Frequency of issue: Monthly except in the fall, when 2 issues are published.
3A. Number of issues published annually: 13
3B. Annual subscription price: _____
4. Complete mailing address of known office of publication (Street, city, county, state, zip code): 9221 Quivira Road, Overland Park, Johnson County, KS 66215.
5. Location of the headquarters or general business offices of the publisher (not printers): 9221 Quivira Road, Overland Park, Johnson County, KS 66215.
6. Names and complete addresses of publisher, editor, and managing editor. Publisher (Name and Address): Duane N. Hefner, 9221 Quivira Road, Overland Park, KS 66215. Editor (Name and Address): Jerry Whitaker, 9221 Quivira Rd., Overland Park, KS 66215. Managing Editor (Name and Address): Tom Cook, 9221 Quivira Road, Overland Park, KS 66215.
7. Owner (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given. If the publication is published by a nonprofit organization, its name and address must be stated.) Intertec Publishing Corp., a Macmillan Inc., company, 9221 Quivira Road, Overland Park, KS 66215.
8. Known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages or other securities (If there are none, so state): Macmillan Inc., 866 Third Ave., New York, NY 10022.

	Average No. Copies Each Issue During Preceding 12 Months	Single Issue Nearest To Filing Date
A. Total No. Copies Printed (Net Press Run)	39,960	39,500
B. Paid Circulation		
1. Sales through dealers and carriers, street vendors and counter sales	--	--
2. Mail subscriptions	35,786	35,815
C. Total Paid Circulation	35,786	35,815
D. Free Distribution (including samples) by mail, carrier delivery or other means	2,131	2,115
E. Total Distribution (Sum of C and D)	38,007	37,930
F. Copies Not Distributed		
1. Office use, left-over, unaccounted spoiled after printing	1,953	1,570
2. Return from News Agents	--	--
G. Total (Sum of E and F should equal net press run shown in A)	39,960	39,500

I certify that the statements made by me above are correct. (Signature of editor, publisher, business manager, or owner.)

DUANE HEFNER
Publisher



KOVR TV SACRAMENTO, CALIFORNIA

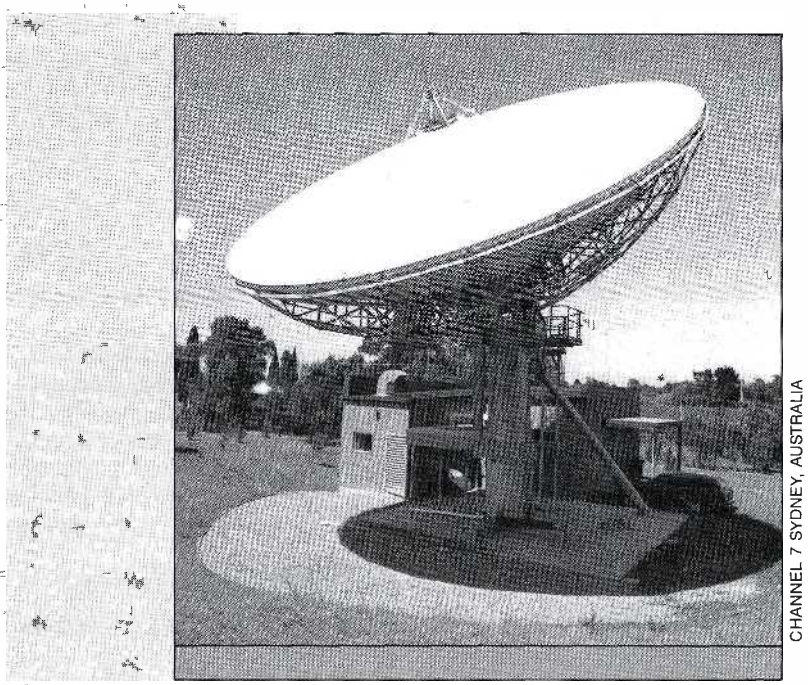
Digital Audio For Your STL . . .

At last . . . a reasonably priced broadcast-quality system to upgrade the audio on your STL path.

VAMP is a system designed to allow the carriage of digital audio, data, or a combination of both, on a wideband subcarrier placed above video in a transmission path.

VAMP is ideal for applications like video or audio STLs, relays and other point-to-point transmission links, as well as satellite distribution of programming. There are numerous audio and data coding techniques available for use with VAMP.

VAMP™



CHANNEL 7 SYDNEY, AUSTRALIA

VAMP equipment costs roughly the same, or less, than conventional subcarrier systems and delivers network-quality performance. It is compatible with many different types of equipment and can easily be integrated into existing transmission systems.

Call for more information about VAMP, or other products from Graham-Patten Systems.

GPS GRAHAM-PATTEN SYSTEMS, INC. P.O. BOX 1960, GRASS VALLEY, CA 95945
(916) 273-8412 - FAX (916) 273-7458 - INSIDE CA: (800) 422-6662 - OUTSIDE CA: (800) 547-2489 - TWX 910-333-6065

Continued from page 86
local breaker panels or large distribution panels) should be kept clear of obstructions and be easily accessible.

• *Article 426—De-icing:*
Articles 426, 427 and 430 are likely to be of special interest to operators of earth stations. De-icing a large antenna can consume lots of power and require high currents in a nasty environment where the potential for electrical shock is great. Proper grounding and wiring techniques for heating elements and electric motors (used when steerable dishes are employed) should be understood by all earth-station engineers, as well as by broadcasters who employ large motors on transmitter fans or water pumps.

• *Article 445—Generators:*
Although the section on generators is quite small, it includes vital information about dealing with connections and overcurrent protection.

• *Article 450—Transformers and vaults:*
Most studio facilities have heavy electrical loads or transmitter facilities that require an extraordinary electrical service, and in some cases, their own mini-substation where high transmission voltages (12,500V) are converted to usable power at 480V/240V/120V at multiple phases. (See Figure 2.) The transformers that perform these conversions often require special mounting pads or underground vaults that warrant special attention of the broadcaster. Many large transformers are oil-cooled, requiring periodic inspection and refilling. The environment in which a large transformer is mounted is important, and obstruction clearance dimensions are covered in this article. All vaults and pads should be fenced in securely or locked.

• *Article 520—Theaters:*
This article, devoted exclusively to theater lighting, is a must-read for all broadcast engineers. It describes the care and feeding of lighting systems and the associated electrical controls, cables and switchgear. Because many TV lighting systems have been added to over the years, engineers should examine their systems to make certain they comply with the code. Systems installed by lighting, rather than electrical, contractors may need to be inspected by a licensed electrician to pass local or NEC requirements.

• *Article 530—Motion picture and TV studios:*
This outdated article has little relevance in 1988. It deals with lighting, arc projectors and nitrate film storage. This section needs updating.

• *Article 700—Emergency power systems:*
This serves as a fine tutorial for the broadcast engineer on emergency power installations. Many plants have an emergency generator and standby or emergency power routed to select studio gear, lights, the transmitter and selected outlets around the facility. All emergency power systems should be tested regularly, and system performance should be logged.

• *Article 810—Radio and television*
Like the studio article, this is rather out-of-date and quite limited. Most of the information found in this section and the following article, which covers community antenna systems, can be found in other sections of the code.

A lot of information can be gleaned from the NEC. Broadcast engineers should not rely on common sense alone when designing "from scratch" or modifying an existing facility.

INTRODUCING THE NEW MX-55

Before you take us to task for trying to improve the BII, a design that has become the "workhorse" standard for two-channel audio machines, consider what the new MX-55 offers:

An integral autolocator; a voice editing mode that allows 2X speed playback at normal pitch; a built-in cue speaker; GSPIPO (gapless, seamless, punch-in, punch-out),* and because you told us you wanted it, *all* adjustments are available through the front panel! These, and many more improvements will help make your job easier, and the results more creative.

And for those of you who still won't forgive us, we're keeping the BII in the line. So either way, you can get exactly what you need from Otari; Technology You Can Trust. Call Otari at (415) 341-5900 for information about the new MX-55.

OTARI®

Circle (121) on Reply Card

People

Conrad Coffield has been named marketing manager for professional videotape recorders at *Sony*, New York. Coffield will be responsible for developing and coordinating marketing programs for the U-matic and BVU lines of VTR equipment.

Thomas McDonough and **Mark Grasso** have joined the staff of *Schwem Technology*, Pleasant Hill, CA. McDonough will assume the duties of a sales representative for the Gyrozoom image stabilizing lens throughout the United States and Canada. Grasso has been named manager of government and industrial sales for the United States and Latin America.

Greg Stoner has been appointed Western regional sales manager for the Broadcast Equipment Division of *NEC America*, Wood Dale, IL. He is responsible for video product sales west of the Mississippi river.

Joseph E. Tibensky has been promoted to the position of national marketing manager for audio products at *Agfa-Gevaert*, Ridgefield Park, NJ. He is responsible for the marketing of the magnetic tape division's line of audio products in the United States.

Rick Sietsema has joined the staff of *Allied Broadcast Equipment*, Los Angeles. **Cal Vandegrift** has transferred to the Los Angeles office and **Scott Beeler** has transferred to the home office in Richmond, IN.

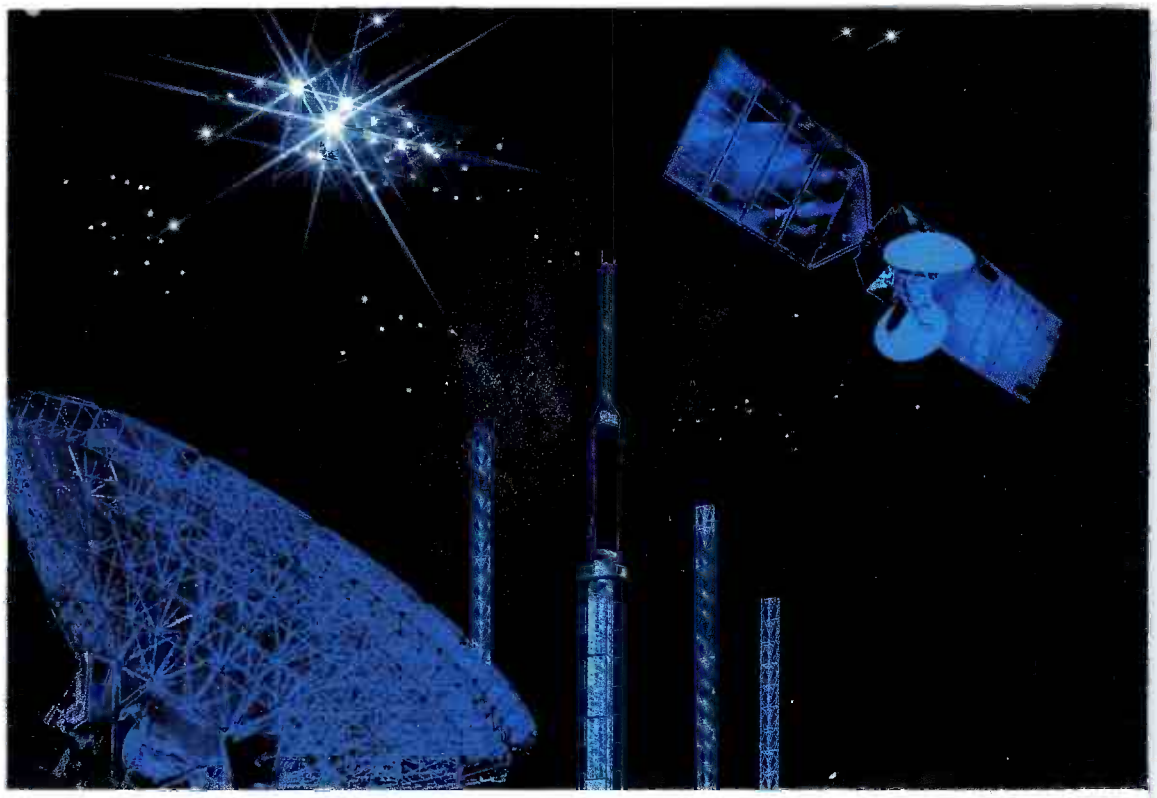
James S. Mays and **Steven Krampf** have been appointed to positions with *Waveframe*, Boulder, CO. Mays is president and chief executive officer. Krampf is senior vice president of sales and marketing.

Jim Pino has been appointed director of research and development for *Gentner Electronics*, Salt Lake City. He will manage all R&D operations. **Craig Boswell** has been named product development coordinator. **Jim Wright** has been appointed CAD services coordinator. **Dan McGuire** and **Tracy Bathurst** have joined the software and hardware engineering staff as engineers.

Leslie B. Tyler has been appointed vice president of technology for *Carillon Technology*, San Bruno, CA. He will head the newly formed department, CTI Research. The department will be responsible for technology development of the Carillon group of companies.

Denise Ewing, **Roger Hamel** and **William E. Stacy** have been appointed to positions with *H&E Micro-Trak*, Chicopee, MA. Ewing is chief operating officer. Hamel is president, but will not be involved in day-to-day activities. Stacy is vice president of sales and marketing.

THOMSON-CSF

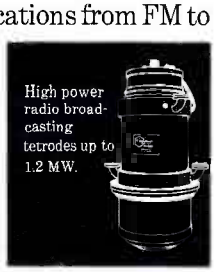


THE FURTHER WE GO, THE FURTHER YOU GO.

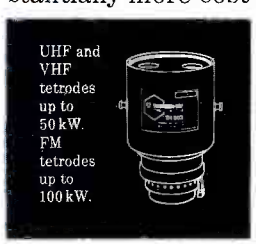
At Thomson-CSF we've been pioneers in developing the use of high-power tetrodes in transmitters for more than 70 years.

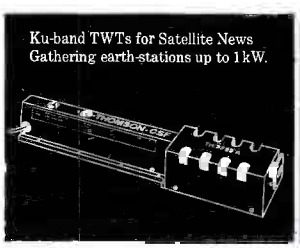
Over the years we've stayed ahead with such developments as Pyrobloc® grids and the Hypervapotron® cooling system.

We offer: A complete line of tubes for radio broadcasting applications from FM to the most powerful SW and LW transmitters – the quality of our 500-600 kW tubes has been amply demonstrated in 15 years of service in over forty transmitters worldwide.



A complete line of power grid tubes and their associated cavities for UHF/VHF TV transmitters. Thanks to their efficiency, reliability and tight tolerances, systems makers can offer their customers substantially more cost-effective products.





A complete line of klystrons and TWTs for ground stations and space TWTs for direct broadcasting satellites (DBS) designed to last for at least a decade.

And we also produce high-resolution image pick-up tubes and devices (CCDs), and high-luminosity CRTs for top range professional applications.

In radio and television, telecommunications, military and civil aviation, as well as in a wide range of scientific and medical applications, Thomson-CSF know-how gets your systems moving. Fast.

The world's most powerful tubes for radio and TV broadcasting.

THOMSON-CSF
ELECTRON TUBES

Circle (124) on Reply Card

THOMSON ELECTRON TUBES AND DEVICES CORPORATION
550 Mount Pleasant Avenue
P.O. Box 6500
DOVER, New Jersey 07801.
Tel.: (1-201) 328-1400. TWX: 7109877901.
Fax: (1-201) 328-1747.

Brasil: SAO-PAULO
Tel.: (55-11) 542 47 22
Tx: (11) 24226 TCSF BR

Canada: MONTREAL
Tel.: (1-514) 288 41 48
Tx: 5560248 TESAFI MTL

Deutschland: MUNCHEN
Tel.: (49-89) 78 79-0
Tx: 522916 CSF D

España: MADRID
Tel.: (34-1) 4051915
Tx: 46033 TCCE E

France: BOULOGNE BILLANCOURT
Tel.: (33-1) 49 09 28 28
Tx: THOMTUB 200772 F

Italia: ROMA
Tel.: (39-6) 639 02 48
Tx: 620683 THOMTE I

Japan: TOKYO
Tel.: (81-3) 264 63 46
Tx: 2324241 THCSFJ

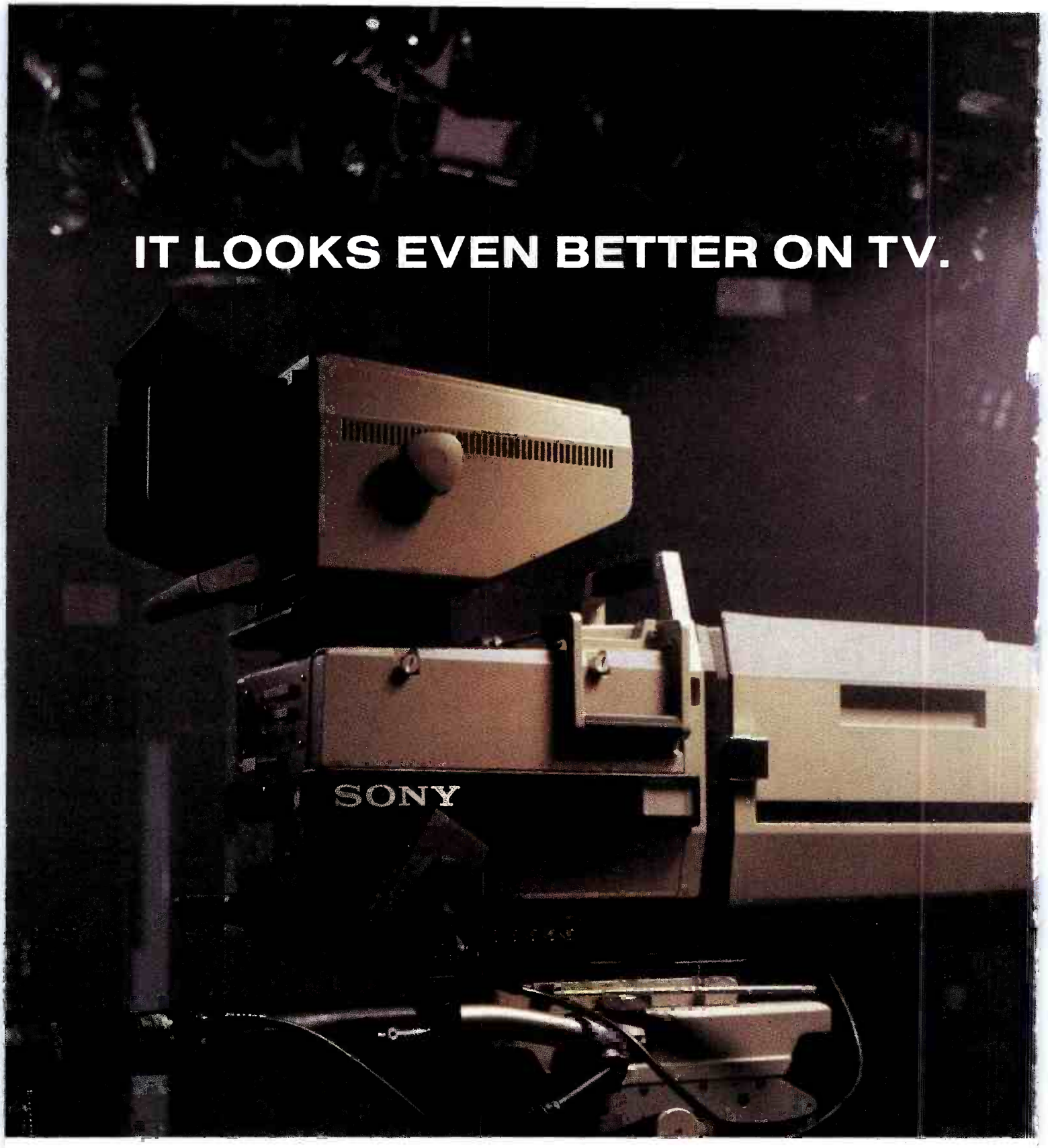
Sverige: TYRESÖ
Tel.: (46-8) 742 02 10

United-Kingdom: BASINGSTOKE
Tel.: (44-256) 84 33 23
Tx: 858121 TECI UK G

U.S.A.: DOVER N.J.
Tel.: (1-201) 328-1400
Twx: 7109877901

POLARIS EXPANSION 5576/88

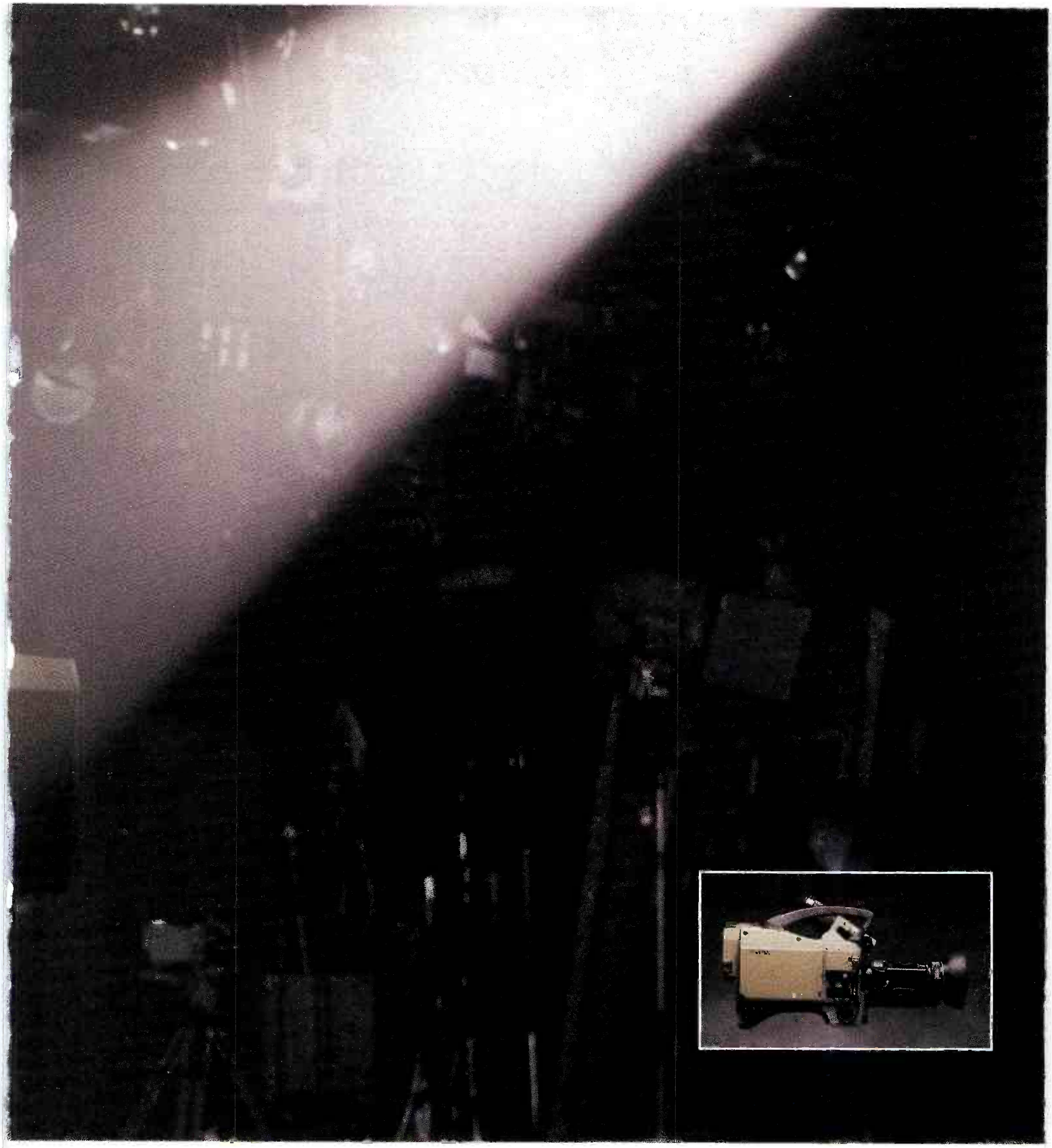
IT LOOKS EVEN BETTER ON TV.



And no wonder—it's the Sony BVP-360. The best-looking studio camera on TV. And the one with the best-looking picture.

The BVP-360 offers state-of-the-art mixed-field technology in 2/3" Plumbicon™ tubes—precise and ultra-stable geometry and registration, and more than 700 lines of resolution. The best signal-to-noise ratio. And the most accurate color reproduction. To the darkest shadows and highest-level whites. And the widest range of light levels in between.

By design, the BVP-360 is ideally suited for studio and outdoor production. And, since the portable companion



BVP-350 uses the same circuit boards and optics, its picture is exactly the same.

But most of all, the BVP-360 looks good because it's from Sony—the leader in broadcast camera sales. And it's backed by Sony service. Our national service organization is on call 24 hours.

Any day. Anywhere.

But see the BVP-360 for yourself. Contact your Sony Broadcast Sales Engineer. Or call Sony at (800) 635-SONY.

SONY®

BROADCAST PRODUCTS

Circle (125) on Reply Card

Alpha Wire on-line in Fremont

Alpha Wire, Elizabeth, NJ, has announced the completion of the Western regional sales and distribution center in Fremont, CA. The facility is equipped to handle shipping, receiving, spooling, modification and warehousing capabilities. With the computer-equipped order entry and job-tracking system, the customer-service representatives and wire specialists can place and track orders from the initial phone call through delivery.

Canare relocates West Coast facility

Canare Cable has moved the West Coast operations to an expanded facility. The new complex will house all sales, warehouse and shipping operations for the United States. The location of the office is 511 5th Street, Unit G, San Fernando, CA 91340; telephone 818-365-2446.

EECO/Convergence sponsors technical training

EECO/Convergence Video Products, Santa Ana, CA, has announced the implementation of a technical training course to be held monthly at the EECO corporate headquarters in Santa Ana, CA. The course will cover setup, installation, routine maintenance and troubleshooting of EECO video editing systems. Operator training covering post-production equipment also is conducted on a monthly basis. For information and registration contact Pam Heck, 714-835-6000.

Harris wins USAF contract

Harris, Melbourne, FL, has been awarded a $25 million contract by the U.S. Air Force Air Logistics Center in Sacramento, CA. The contract calls for Harris to provide AN/GRC-206(V) remote-controllable radio systems for installation in utility vehicles and armored personnel carriers. The systems will provide ground-to-air and point-to-point long-distance communications.

I.Den enters the U.S.

I.Den Videotronics, San Diego, has been established as a subsidiary sales office of I.Den Corporation of Japan. Pat O'Rourke, director of marketing and one of the founders of I.Den, will head the office as executive vice president.

IDB establishes new division

IDB Communications Group, Los Angeles, has formed IDB Systems to specialize in systems integration, systems operation and maintenance and systems services for the satellite communications industry. The company will design, install and integrate domestic and international satellite earth stations, customer-premise IBS earth stations and custom transportable earth stations. David McDonald, general manager, will direct operations and will be joined by Sheryl Vandeventer, technician, and Stan Speilbusch, manager of computer engineering. The location of the new division is 14480 Beltwood Parkway East, Dallas, TX 75244.

New company forms

H&E Micro-Trak has been formed. H&E will occupy 4,500 square feet of the Cabotville Industrial Center in Chicopee, MA. H&E has purchased certain assets of Micro-Trak, a broadcast audio, tone arm and studio furniture manufacturer. It will continue to supply products previously

The Abekas A72
Digital Character Generator.

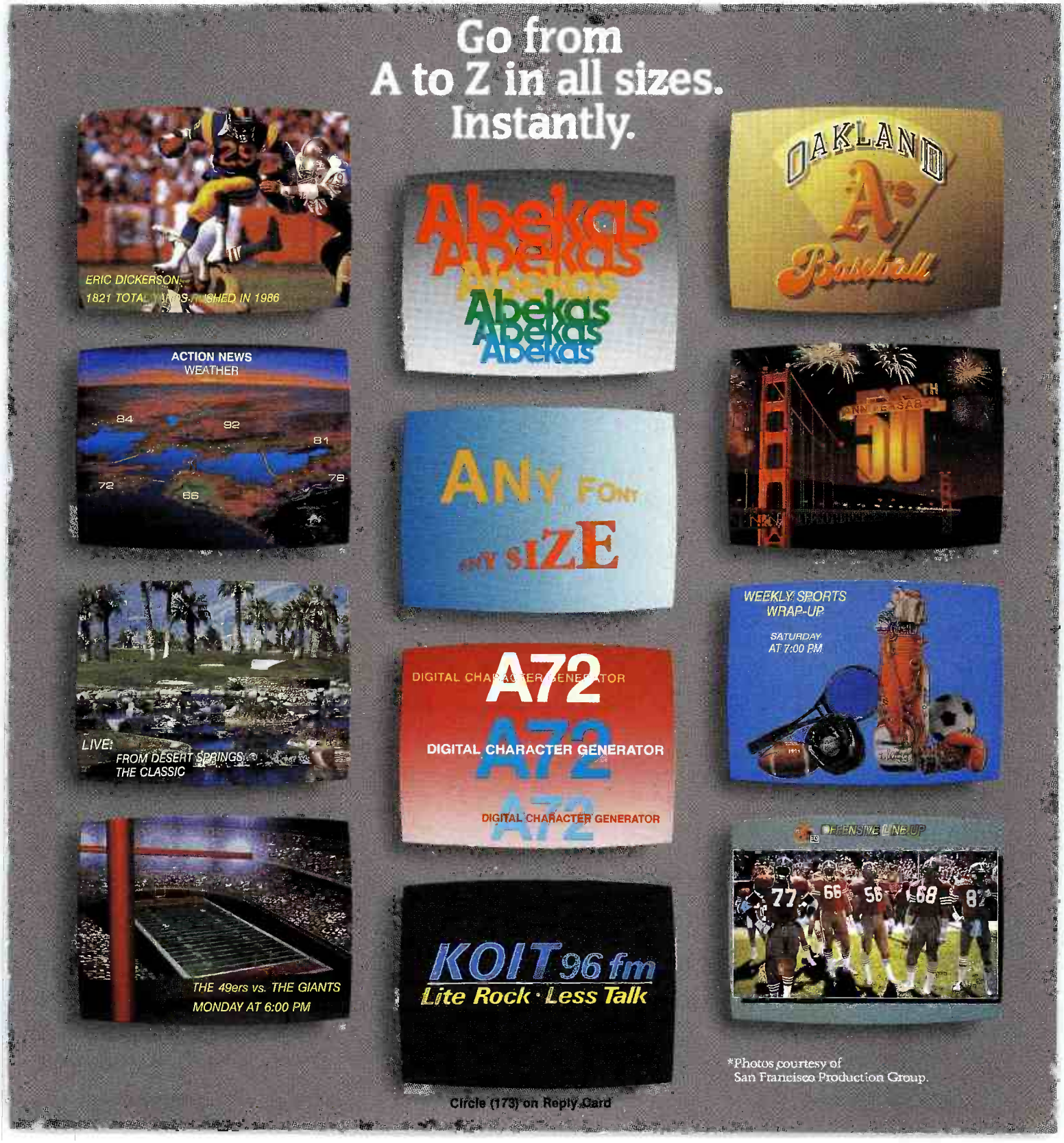
Introducing a colorful new character generator from Abekas, the leader in video post-production innovation. The Abekas A72. Size characters on-line from 8 to 256 scan lines high, *instantly.*

A72-reproduced characters are digitally derived from over 1500 well-known typographical faces. All fonts have "razorsharp" edges with 256 levels of antialiasing. Advanced RGB scan-in gives you a powerful new means for adding logos. Traditional style, solid-color filled logos and full-color RGB pictures can be freely sized, positioned and mixed with your text.

Other advanced A72 features include: unlimited on-line fonts and colors... a palette of over 16 million colors... instant drop shadows, outlines and italics... macro programming... character overlap... variable speed rolls and crawls... ultra smooth character motion... two full bandwidth channels ...programmable wipes and dissolves between channels... standard Winchester disk drive... component 4:4:4:4 architecture and CCIR 601 inputs and outputs.

Size up all your characters instantly with the A72. For details, contact Abekas Video Systems, Inc., 101 Galveston Drive, Redwood City, CA 94063. (415) 369-5111.

Abekas
Video Systems, Inc.
Now Anything is Possible.



*Photos courtesy of
San Francisco Production Group.

Circle (173) on Reply Card

manufactured by Micro-Trak. Warranty service of existing Micro-Trak products will be handled by H&E Micro-Trak's service department.

MCL releases adapter brochure

MCL, Northfield, IL has released a brochure titled "Satcom Communications Adapter, Ku-Band," that includes information and diagrams concerning specification of voice channel communications adapters. The publication contains system block diagrams of the MCL M/N 20075 Satcom 5W communications adapter, the M/N 20076 and the Ku-band uplink/downlink control system.

WTVI renovates facility

WTVI-Channel 42, Charlotte, NC, has selected OmniArchitecture to design and supervise the renovation and new construction of the public television station's facility. The $3.1 million project calls for the creation of a teleconferencing and on-site broadcasting facility as well as increasing the size of and upgrading the present studio. Robert Mann, of OmniArchitecture, has been named project manager for the WTVI renovation and expansion.

Harrison Systems expands

Harrison Systems, Nashville, TN, has acquired new executive offices to house its administrative, sales and engineering departments.

AKG's Digital Products Division relocates office

The Digital Products Division of *AKG Acoustics* has relocated its office. The new address is 125 Walnut Street, Watertown, MA 02172. Telephone, FAX and telex numbers have remained the same. The AKG U.S. headquarters' address remains 77 Selleck Street, Stamford, CT 06902.

BPForum Technical Data Library has been renamed

The Technical Data Library (DL4) of *BPForum*, on CompuServe, has been renamed the BE Technical Library. Broadcasters who belong to CompuServe will find that DL4 has a large collection of technical articles and background material ranging from NTSC to HDTV and cameras to transmitters, and includes virtually all areas of the broadcast facility. Graphics are now supported on the system as well. Significant additions to the contents of the BE Technical Library will be noted in this column. Submissions are invited from other resources as well.

To reach the BE Technical Library, you must first access CompuServe. At any prompt (!) enter GO BPFORUM. Answer the questions on the menu to join the forum (the cost is the connect time). Once in the forum, select Data Library 4. You may browse through entries in the library by title or keywords and may download any material.

Additional information regarding the BE Technical Library may be obtained on-line by leaving a message in the feedback area for the forum administrator or by contacting Carl Bentz, technical and special projects editor, at the **Broadcast Engineering** editorial offices; 913-888-4664.

Midwest opens Northeast office

Midwest Communications, Edgewood, KY, has announced the opening of a New York City office to serve the Northeast U.S. video market. Jeff Steier will serve as the regional manager.

Time Base Correction: The Third Dimension

Time Base Correction has taken on a whole new dimension with the introduction of the FOR-A FA-740 Parallel Effects TBC. A/B roll *plus* Program Output all in a single package. Three simultaneous outputs!

It's a powerful full-frame dual-channel time base corrector with independent channel freeze plus an impressive array of special effects on the program output channel. The FA-740 gives you reliable time base corrected outputs on channels A and B while simultaneously generating your mixes, mosaics, paints, wipes, cuts, dissolves and more on the program output. With unparalleled reliability and performance.

Perfect for A/B roll editing in post production suites, the FA-740 handles both 3/4" and 1/2" VTRs with or without external sync output. And the proven FOR-A analog component processing gives you the very best picture possible. Also part of this powerful package—dropout compensation, program memory capability (10 events/10 pages), and RS-422 and GPI ports for remote editing and external control.

For less than $12,000, you'll have the power of *two independent TBCs plus effects* in a single compact unit. Put it to the most important test. Your own. Enter The Third Dimension with a call to your FOR-A Dealer now.

FA-740

PARALLEL EFFECTS . . .
UNPARALLELED PERFORMANCE
NOW . . . S-VHS COMPATIBLE

FOR-A®
INNOVATIONS IN VIDEO and AUDIO TECHNOLOGY

FOR-A CORPORATION OF AMERICA Nonantum Office Park, 320 Nevada Street, Newton, MA 02160
Boston (617) 244-3223 / Chicago (312) 250-8833 / Los Angeles (714) 894-3311

Circle (129) on Reply Card

Ikegami's HK-323P at NBC's automated studio

The NBC television network's automated studio features some of the most sophisticated robotics technology available, complemented by the most flexible, high performance video camera: Ikegami's HK-323P.

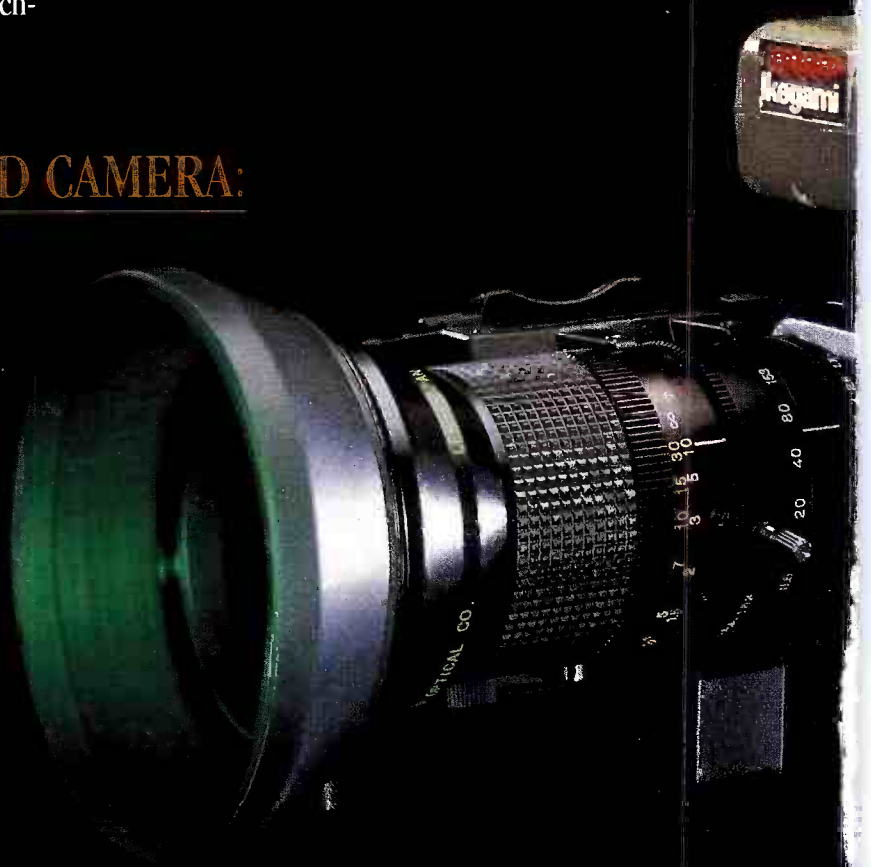
Home Shopping Network thought so much of the camera they purchased more than twenty for remote studio operations.

And to insure state-of-the-art broadcast quality, the pictures transmitted by the Goodyear Blimp, are sent via the HK-323P.

It's not surprising that a camera designed to be the hand-held version of our studio model HK-323, would become such a popular studio camera itself. The HK-323P, which operates off the same base station as the HK-323, is just that good.

THE HK-323P HAND-HELD CAMERA:

DISCOVER WHAT MAJOR NETWORKS AND CABLE SYSTEMS SEE IN IT.



Ikegami

Offering the most control functions of any hand-held ever, the HK-323P features a built-in microprocessor for various software based control functions and fully automatic setup, high performance prism optics, auto-knee circuitry to handle high contrast, scene files with extensive memory, the sharpest picture quality regardless of scene color content or special color lighting, selectable gamma values; 0.45, 0.4, 0.35, two motorized servo filter wheels each with four positions, a back-up memory system, and various adaptors for total system flexibility.

All this in a hand-held camera, critical buyers are looking into.

For more information contact your Regional Ikegami Office.

Ikegami Electronics (USA), Inc. 37 Brook Avenue, Maywood, NJ 07607
East Coast: (201) 368-9171 West Coast: (213) 534-0050 Southeast: (305) 735-2203
Southwest: (214) 869-2363 Midwest: (312) 834-9774 Hawaii: (808) 946-5955

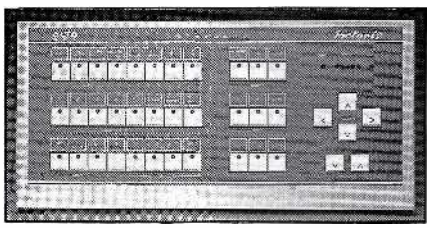
New products

Video compression system, format converter

Alta Group has introduced the following product updates:

• The ALTA Pictoris video compression system now includes mosaic, vertical and horizontal inversion, posterization, negative video and dissolve. The system can position compressed or cropped images anywhere within the live image area and store it with or without borders. The Pictoris also features auto zoom in and out, GPI remote control and freeze.

• The Celeris Y/C format converter now features advanced chroma delay correction circuitry that provides digital vertical and horizontal correction. The converter is designed to convert programming in U-matic and U-matic SP formats to S-VHS and to convert S-VHS material to U-matic dub mode. It also provides composite video output and can be used to interface ED-Beta to U-matic.

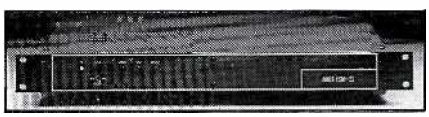


Video compression system

Circle (350) on Reply Card

Serial interface

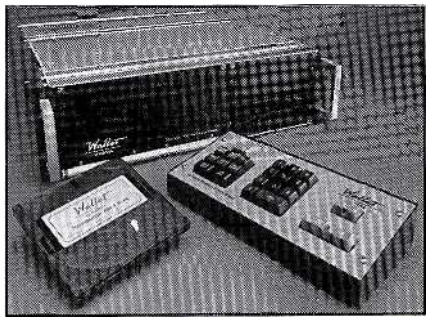
Amek has introduced the ESM32 serial interface that works in conjunction with the BCII audio mixing system. The interface allows control interfacing from all major edit control systems via the ESAM I and ESAM II protocols. With the addition of the ESM32, the BCII will follow serial commands from Ampex, Paltex, CMX and any other system using the ESAM protocol. The unit also can be programmed to work with For-A and Grass Valley systems.



Circle (351) on Reply Card

Still-store system

Aston Electronics has introduced The Wallet still-store system that stores key signals and features image access retrieval in less than 1.5 seconds. The system includes removable hard disks from which stored images can be transferred to the resident hard disk, editing output software that offers three operator-controlled automatic output sequences and can accept either RGB or YUV and act as a converter between the two systems. Video sampling conforms to the CCIR 601 and 4:2:2 specifications.



Circle (352) on Reply Card

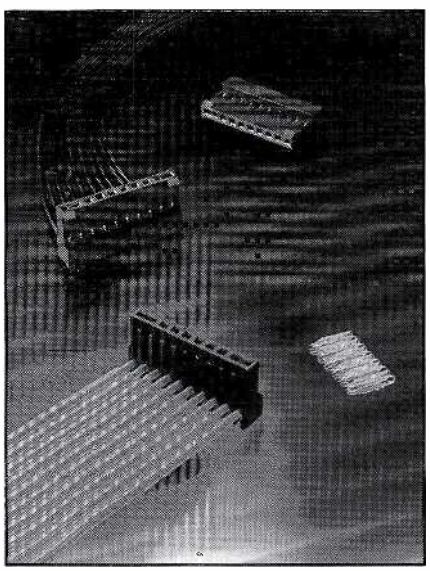
VTR control system

American Broadcast Systems has introduced the microcart VTR automation control system to provide control of up to 24 transports for automated spot and program playback. The system features stereo audio, 2-second preroll, event recue and fool-proof operation.

Circle (353) on Reply Card

Contact connectors

AMP has announced the availability of the MTA quad contact connectors. The 2-through 10-position connectors are capable of carrying 8A at 250VAC and can meet the 30° temperature-rise restriction of UL Standard 498. The connectors have pre-loaded, highly-conductive contacts, which incorporate quad-beam geometry, offering four independent points of contact. The wire-to-post connectors are molded with flame retardant thermoplastic and are end-to-end stackable.



Circle (354) on Reply Card

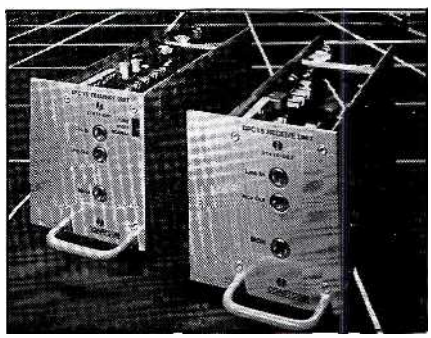
Portable oscilloscope

Createc Signal Computer has announced the availability of the Scout SC-02 portable oscilloscope. It has an analog-to-digital, digital-to-analog measurement system. Features include a transient recorder with 46 data memories, 10 complete setup memories, dual time-base viewing, a high-contrast supertwist LCD display, a 1MHz true rms multimeter, compensated dc measurement, automatic frequency measurement to 7MHz, computing functions on all input and stored waveforms and self-tested and self-calibrated measurement systems. The system can be used as an oscilloscope, a multimeter, a frequency counter and a signal computer.

Circle (355) on Reply Card

Program channel

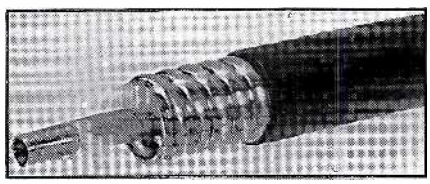
Coastcom has introduced the 14-bit digital program channel DPC 15 for sending low-distortion, 15kHz bandwidth audio over the nationwide digital telephone network. The system converts program-quality audio into digital form before transmission to prevent the distortion and line loss that can accompany telephone transmission of analog audio. The DPC 15 is plug-compatible with AT&T, Alcatel and Northern Telecom D4 channel banks.



Circle (356) on Reply Card

Coaxial cable

Cablewave Systems has introduced air-dielectric, 50 coaxial cable with a tubular center conductor. The HCC 7/8-inch Flexwell cable is a flexible transmission line exhibiting a high velocity of propagation and low attenuation that is designed for medium-power applications of up to 5GHz. The cable peak power-handling capability is 76.7kW. It is available in continuous lengths with a black polyethylene jacket.



Circle (357) on Reply Card

Finally.

Professional DAT is here. And it's called the Sony PCM-2500. Sony's considerable know-how in digital audio recording brings you a superb sounding DAT recorder with the special features that professionals need.

It has 32kHz, 44.1kHz, and 48.0kHz sampling rates plus 3 separate digital input/output interfaces (AES/EBU, SDIF-2 and S/P DIF). Features that make the PCM-2500 a natural for direct interface to CD mastering systems and a variety of digital studio equipment.

Consistently superior sound quality is ensured by newly developed Sony digital LSIs including independent A/D and D/A converters for both audio channels (left and right). And the D/A section employs 4x oversampling digital filters.

Other special features include a built-in error indicator, switchable emphasis and a wired remote control.

For an ear-opening demonstration of the new PCM-2500, see your Sony Professional Audio representative or call Sony at 800-635-SONY.

SONY

Professional Audio

Sony Communications Products Company, Professional Audio Division, 1600 Queen Anne Rd., Teaneck NJ 07666.

Circle (132) on Reply Card

Dual-trace oscilloscope, multimeters

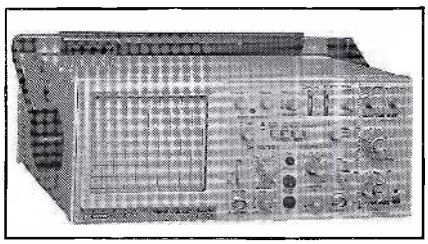
B&K Precision has introduced the following products:

• Model 2125 is a 20MHz dual-trace oscilloscope with delayed sweep from 0.1μs/div to 50ms/div in 18 steps, allowing 1mV/div sensitivity. The device has a built-in component tester for capacitors, inductors, diodes, transistors and zener diodes. The 2125 features a 10X sweep magnifier; ALT, CHOP or ADD modes of dual-trace operation; selectable auto/normal triggered-sweep operation; input coupling for ac, TVH and TVV and line operation; and a built-in calibration source. X–Y operation and a Z-axis input for phase comparison, special applications and interconnection to external component testers also are provided.

• Model 2832 is a 3.5-digit multimeter/capacitance meter with a basic dcV accuracy of 0.5%.

• Model 2833 is a 4.5-digit true rms meter with a basic dcV accuracy of 0.05%. It measures frequency up to 200kHz and dBm from −48dB to 62.21dB.

Both models are bench-style digital multimeters designed for bench or field applications (with battery or ac operation). The units feature an audible continuity checker and can measure voltage, resistance and current. Included are test leads, ac adapter, detailed instruction manual, schematic diagram and parts list.



Dual-trace oscilloscope

Circle (358) on Reply Card

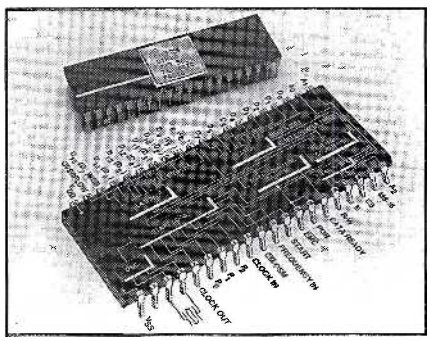
3-D graphics system

Cubicomp has introduced the Vertigo V2020 3-D graphics system based on the Silicon Graphic's 4-D/20 work station. The graphics system can be used as a stand-alone animation system, linked to high-speed compute servers for more rendering speed, or as part of a network of PictureMaker and/or other Vertigo systems.

Circle (359) on Reply Card

Counter/timer

Dymec has introduced the model 5024 counter/timer subsystem integrated circuit. The 5024 consists of a 24-bit resolution counter and a programmable time base. Counting intervals can be programmed from 100ns to 16s. Counter data can be interfaced to either 8- or 16-bit-wide microprocessor databuses. The unit supports frequency counting and period-averaging techniques and operates in continuous and single sampling modes.



Circle (360) on Reply Card

Console

The Q-series console, introduced by *DDA*, incorporates features from the S-series and the D-series consoles. The 8-bus console comes in 16-, 24-, 32- or 40-input frame configurations. The input modules each have eight bus assigns, eight aux buses and a direct output with level control. Each module includes 4-band equalization (a preset high, a parametric hi-mid, a parametric low-mid and a preset low). The console is available in standard PA or matrix. The matrix version has eight aux returns with 3-band equalization and 4-way matrix.

Circle (361) on Reply Card

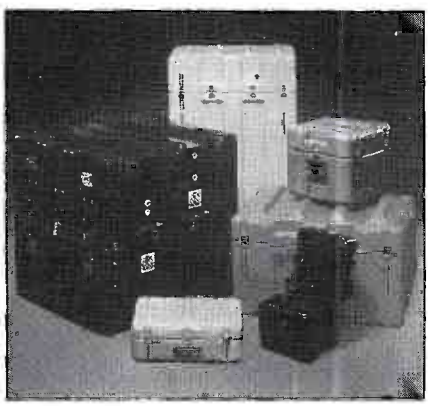
Off-line digital editing system

Editing Machines has introduced the Emc2 off-line digital editing system. It is a computer-based system for digital editing of audio and video. Emc2 does not control tape decks, but works with all video and sound digitally. Source material is transferred from tape to a master optical disk. Up to four hours of SMPTE/EBU time-coded video and audio is stored as low-resolution color images and digitized audio. The system is non-linear and any change to The EDL is immediately reflected in the edited master. An unlimited number of variations of the same show can be stored and recorded from disk.

Circle (362) on Reply Card

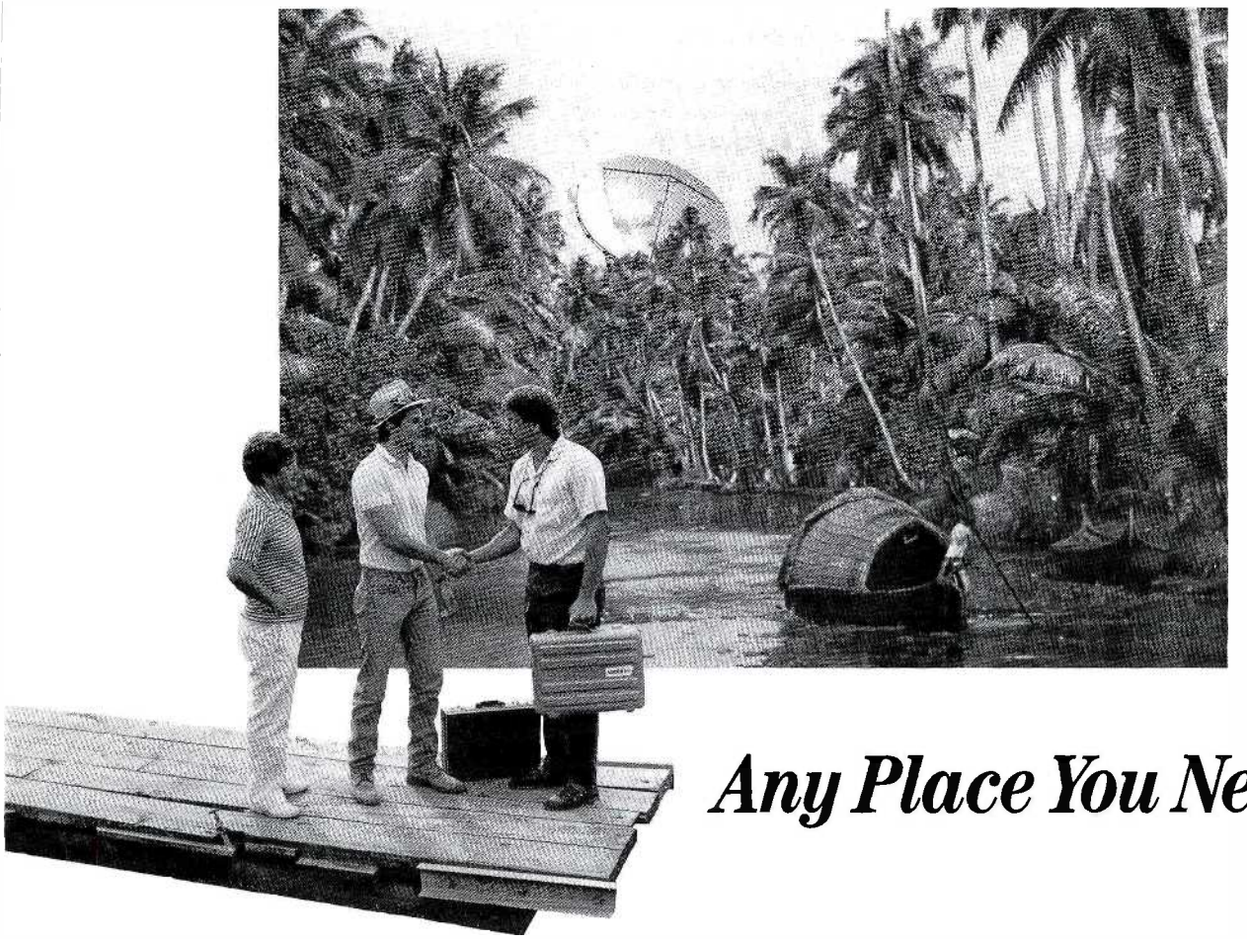
Shipping containers

Hardigg Industries has introduced a line of reusable shipping and storage containers designed for protection of sensitive equipment and materials. The containers are constructed of a specially formulated polyethylene and engineered for high-impact strength. They are resistant to fungus, water, solvents, abrasives, temperature and pressure. Included in the line are deck-mounted containers, rack-mounted double-entry containers and double-wall containers.



Circle (363) on Reply Card

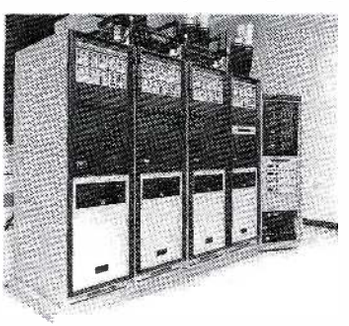
TOTAL SERVICE SUPPORT



Any Place You Need It.

VARIAN MICROWAVE EQUIPMENT DIVISION

GLOBAL SUPPORT. Can a company be big and still be *responsive to your needs?* The truth is one company can and is. Varian Microwave Equipment Division's service for satcom and instrumentation amplifiers literally covers the globe 24 hours a day. ***PERSONALIZED SERVICE.*** VMED makes it easy for you to do business with us. Call any one of Varian's centers from anywhere in the world for experienced field service and product specialists to assist you by telephone or on-site.



RAPID SHIPMENT. Varian's size means we have the resources to support you with an inventory of factory approved replacement parts at our strategically located depots around the world. And you'll get 24-hour turnaround time on emergency spares. ***RESPONSIVE.*** We're more than just a big company. We're totally responsive to meeting your service support needs *in a very personal way.* Get the world's best support by calling Varian MED.

Varian leads the way...again.

varian

24-hour-a-day Technical Assistance Center: In the USA and Canada call: 1-800-231-4818. Outside USA and Canada call: 1-415-330-8214. 24-hour-a-day parts and service: 1-800-338-VMED.

Headquarters 3200 Patrick Henry Drive, Santa Clara, CA 95054, TEL 408-496-6273. **Asia/Pacific** Varian Microwave Equipment Ltd., Singapore TEL 65-225-0011. **Europe/Mideast/Africa** Varian Benelux B.V., Amsterdam, TEL 31-20-10-47-05. **The People's Republic of China** Nanjing, TLX 342202CJVMS

Circle (133) on Reply Card

Graphics work station

Harris Video Systems has introduced the HarrisVws 1000 video/graphics work station that allows image management, processing, storage and retrieval of still images. The system includes a relational database with high-speed 32-bit processor, the multiviews program for rapid image cataloging, advanced windowing, pull-down menus, on-line help and user-defined function keys. The work station also offers paint, composition and titling.

Circle (364) on Reply Card

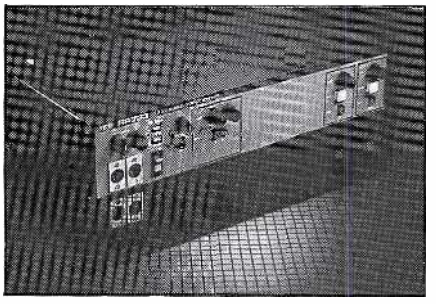
Broadcast console

Harrison Systems has introduced the AP-100 on-air broadcast console. The console features 12 input stereo on-air configurations.

Circle (365) on Reply Card

Power station

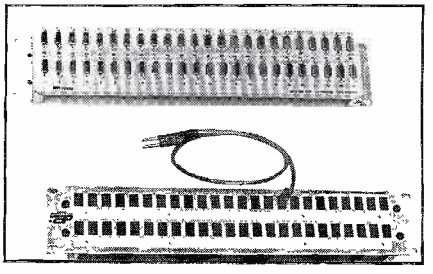
HM Electronics has added a rack-mountable power station to the 700 series cabled intercom products. The RP733 is compatible with the entire line as well as most other 3-wire intercom systems. It has two independent channels with two headset stations having communication access to one or both channels. The two auxiliary inputs allow microphone and line levels to be fed to one or both channels. The RP733 has the capability to power up to 32 belt packs with call lights or up to 100 belt packs without the lights.



Circle (366) on Reply Card

Data patch panel

Jem-Fab has introduced the D-PATCH self-normaling data patch panel for use in data signal path switching. Signal connections are made through 9-pin D connectors. The normal signal path does not require patching. When a patch cord is plugged in, the normal signal path is broken and rerouted to follow the patch panel.

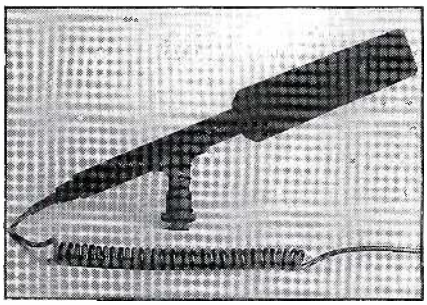


Circle (367) on Reply Card

Video camera boom microphone

Nady Systems has introduced the Nady VCM-100, a superdirectional microphone. The supercardioid electret condenser element combines wide frequency response with extremely low noise. A single AA battery powers the element. The microphone replaces the on-board mic supplied with video cameras. A switch in the mic housing offers the option of either normal or long-distance recording. In long-distance mode, extraneous noise is eliminated. The mic comes equipped with a 3-foot coil cord and shoe-mounting bracket for on-

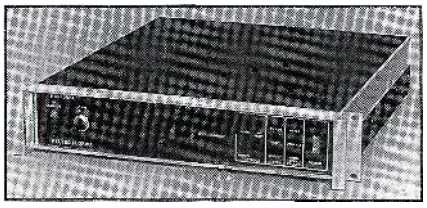
camera use, and a 20-foot straight cord for remote use. A full-length windscreen also is provided.



Circle (368) on Reply Card

Low-power amplifier

Keltec Florida has announced the R40 series low-power amplifier. It fits into a 3.5-inch rack. The series is available in power levels up to 80W in Ku-band, C-band and X-bands. The LPAs are pretested for extreme environments (−40°C to +50°C). The unit weighs approximately 40 pounds. Overall outside measurements are 19"×3.5"×22".



Circle (369) on Reply Card

Operator software

Management Solutions has released a software package for managing the business functions of a radio station. The radio station management software is designed to operate on the IBM Application System/400. The software allows complete traffic and billing, daily sales status, general ledger accounting, accounts payable and payroll.

Circle (370) on Reply Card

Event controller

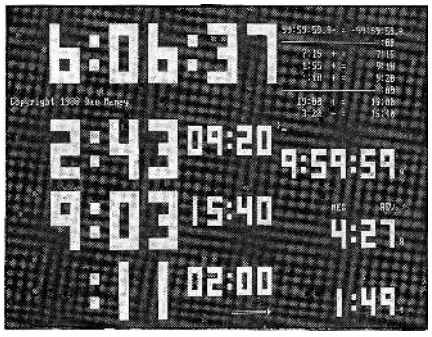
NTSC Productions has introduced Risetime, a controller designed to upgrade small production switchers. The device enables any manual switcher to function in an A/B-roll edit system triggered by a GPI pulse from any edit controller. It allows frame-accurate, editor-triggered cuts, wipes and dissolves. Repeatable-duration wipes and dissolves of any length (from one field to 1,000 frames) may be previewed and performed.

For camera applications, the controller permits simple push-button remote control over the host switcher. One camera operator can direct a basic 2-camera shoot

by using a hand-held take button to achieve smooth wipes and dissolves between cameras. Risetime also works as a stand-alone universal delay generator. It generates a field- or frame-accurate programmable delay from an incoming GPI pulse to trigger any device that can be triggered by an electronic pulse.

Circle (371) on Reply Card

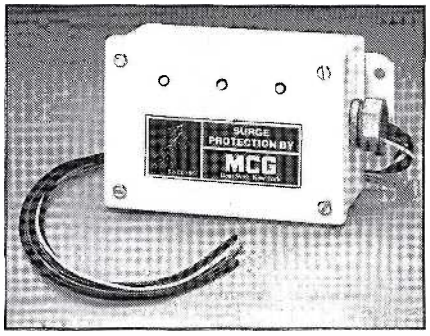
PC compatible tool



Maney Logic has introduced the News Timer Plus, a PC-compatible tool for news and production timing. It is a crystal-controlled clock system that is quickly synchronized to any reference. It provides NTSC monitoring of time of day, three time-outs, three time-remains and three stop-watch timers. There also is an on-screen hour/minutes/seconds, tenths/frames calculator scroll to show all calculations and totals. Unused features may be deleted from the display.

Circle (372) on Reply Card

Power-line protectors



MCG has introduced the SPA series of transient protectors, designed to protect equipment from transients, lightning and surges on ac power lines. Despite its compact size, the protector provides absorption capability of 1,680j/phase. Three front-panel LEDs indicate protection on each phase. Models are available for 120Vac, 208Vac, 240Vac, 277Vac or 480Vac systems in single-phase, wye and delta power configurations.

Circle (373) on Reply Card

Rack cabinet

Winsted has introduced 56-inch rack cabinets with removable side panels. The cabinets are available in both 16-inch and 26-inch depths, with 56 inches of vertical rack space. They come with a choice of either punched or tapped rails. Both models are manufactured to EIA standards. The cabinets are finished in shadow gray and natural putty-color baked enamel.

- The model V8530 16-inch-deep cabinet has an open bottom for cabling and cooling.
- The model V8532 26-inch-deep cabinet is designed for deeper electronics.

Circle (374) on Reply Card

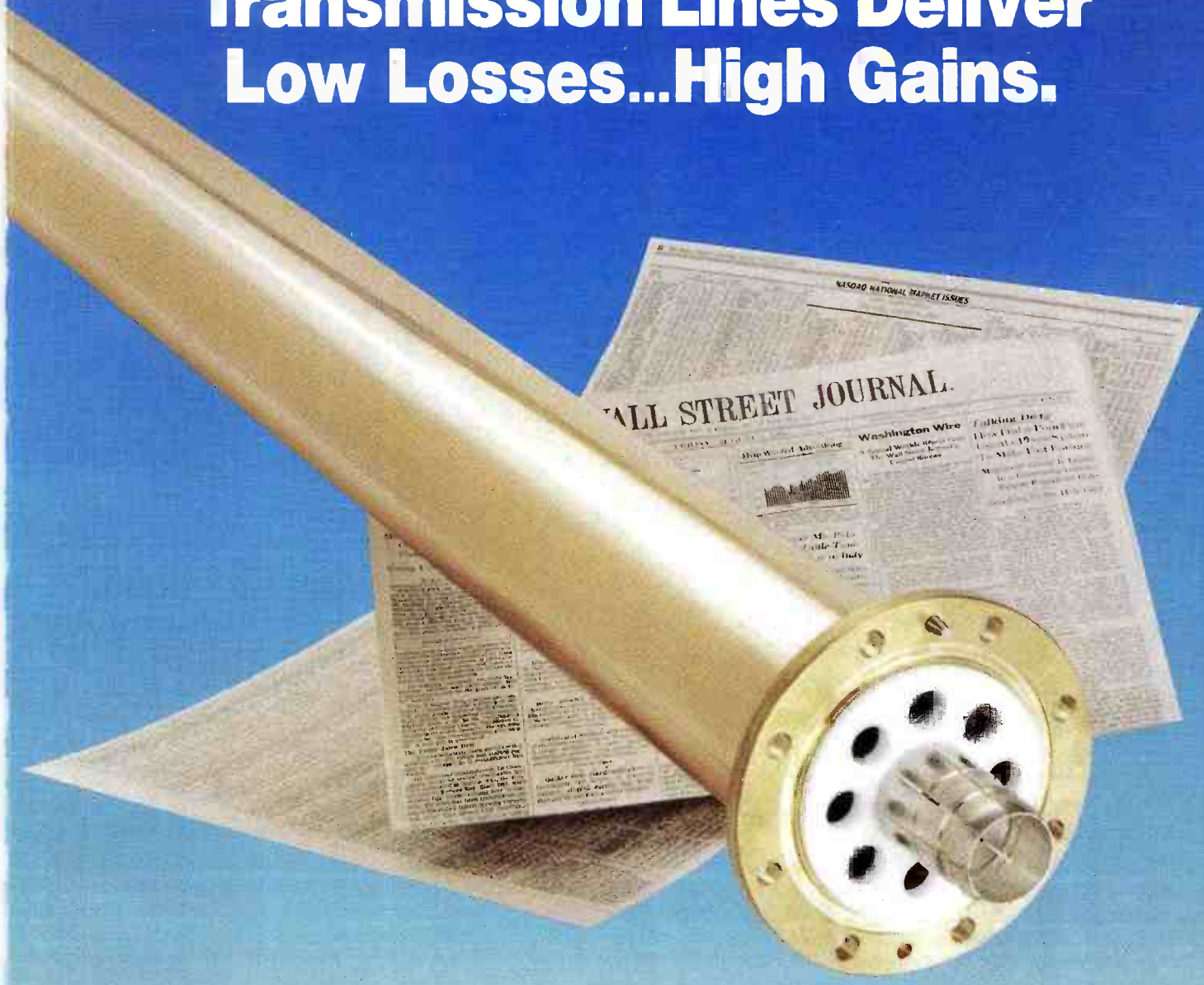
Vision mixer, linear keyer and digital routing system

Grass Valley Group has introduced the following products:

- Model 200-1 is a single-mix effects level version of the model 200 vision mixer. Features in the base system include extensive key and wipe facilities, with a comprehensive range of options. Three key levels are standard, each capable of linear and luminance keying. Twenty analog wipe patterns also are standard in the base system.
- The DSK-101 linear keyer features high-quality keys that include linear keying for anti-aliased character generators and digital video effects units; and additional keying for production vision mixers. One key feature is the ability of the operator to program functions to suit individual requirements. It includes PAL or NTSC selection, GPI input programming and E-MEM register stores. Additional features of the keyer include frame-accurate auto transition with pause mode, internal matte generator and mask generator, four key source and fill inputs, and look-ahead preview monitoring.
- The DHX-532 parallel digital routing system is designed to operate as a level of the Horizon routing system or to "extend" a level of the Horizon control panel, and other options work equally well with the routing system. The system comes in blocks of eight input/output increments; from 8×8 to 32×32. The routing system is a 10-bit system, fully compliant with international parallel digital standards. Each input is terminating: two outputs are provided for each destination, regardless of frame configuration.

Circle (375) on Reply Card

Rigid Coaxial Transmission Lines Deliver Low Losses...High Gains.



Cablewave Systems delivers everything you need and expect from Rigid Coaxial Transmission Line performance...superior quality, plus optimum mechanical and electrical specifications.

To achieve this, Cablewave Systems fabricates high conductivity, hard-drawn copper tubing with precision machined, pin-type Teflon dielectric insulators. Standard 50 ohm transmission line is offered in sizes from 7/8" thru 9 3/16"; 75 ohm in 6 1/8" and 9 3/16". All utilize EIA bolt type flanges and inner connectors compatible with EIA standards, MIL specs and international IEC recommendations. Aluminum outer conductor 50 and 75 ohm transmission lines are available on special order.

To complement our full line of Rigid Coaxial Transmission Lines and accessories, Cablewave Systems also manufactures a complete line of semi-flexible air and foam dielectric coaxial cables and connectors.

For a copy of our 48 page Rigid Coaxial Transmission Line catalog and information on other broadcast and RF communication products, contact Cablewave Systems.

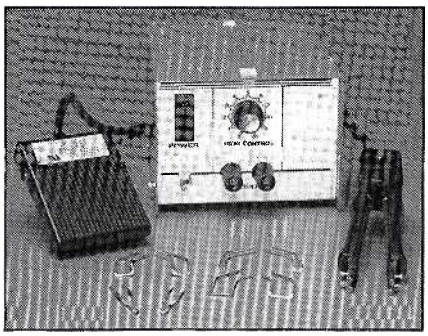
Cablewave Systems

DIVISION OF RADIO FREQUENCY SYSTEMS, INC.
60 Dodge Ave., North Haven, CT 06473 • (203) 239-3311

RFS Member of the Radio Frequency Systems Group

Circle (160) on Reply Card

PC board repair kit, surface-mount station, desoldering tips



Pace has announced the availability of the following products:

• Cir-kits are printed circuit board repair kits that allow repair or replacement of lifted, damaged or missing lands, plated through-holes, conductors and edge connectors. Included in each kit are more than 30 sizes of eyelets, tracks in sheets of various pad diameters and track widths, abrasive stick, setting tool for cold setting eyelets and an instruction manual. The repair systems are available in basic, advanced and master models.

• The PR-10 station is designed for the removal of small surface-mount components. The station includes a conductive-heating tweezer and a wide selection of tip styles. The operator can dial in the desired temperature and use the foot pedal to activate instantaneous pulse-heating from the tweezer tips. The tweezer is slim for handling comfort and features handles that are made of static-dissipative materials, which prevent damage to sensitive components on the bench.

• Specially angled desoldering tips permit operators to see surface-mount pads and conductors during removal of old solder. Clogging does not occur in the tips because the angle allows the tip to be close to the heater assembly, which keeps it above solder-melt temperature. The tips are available in a variety of inside and outside diameters.

Circle (376) on Reply Card

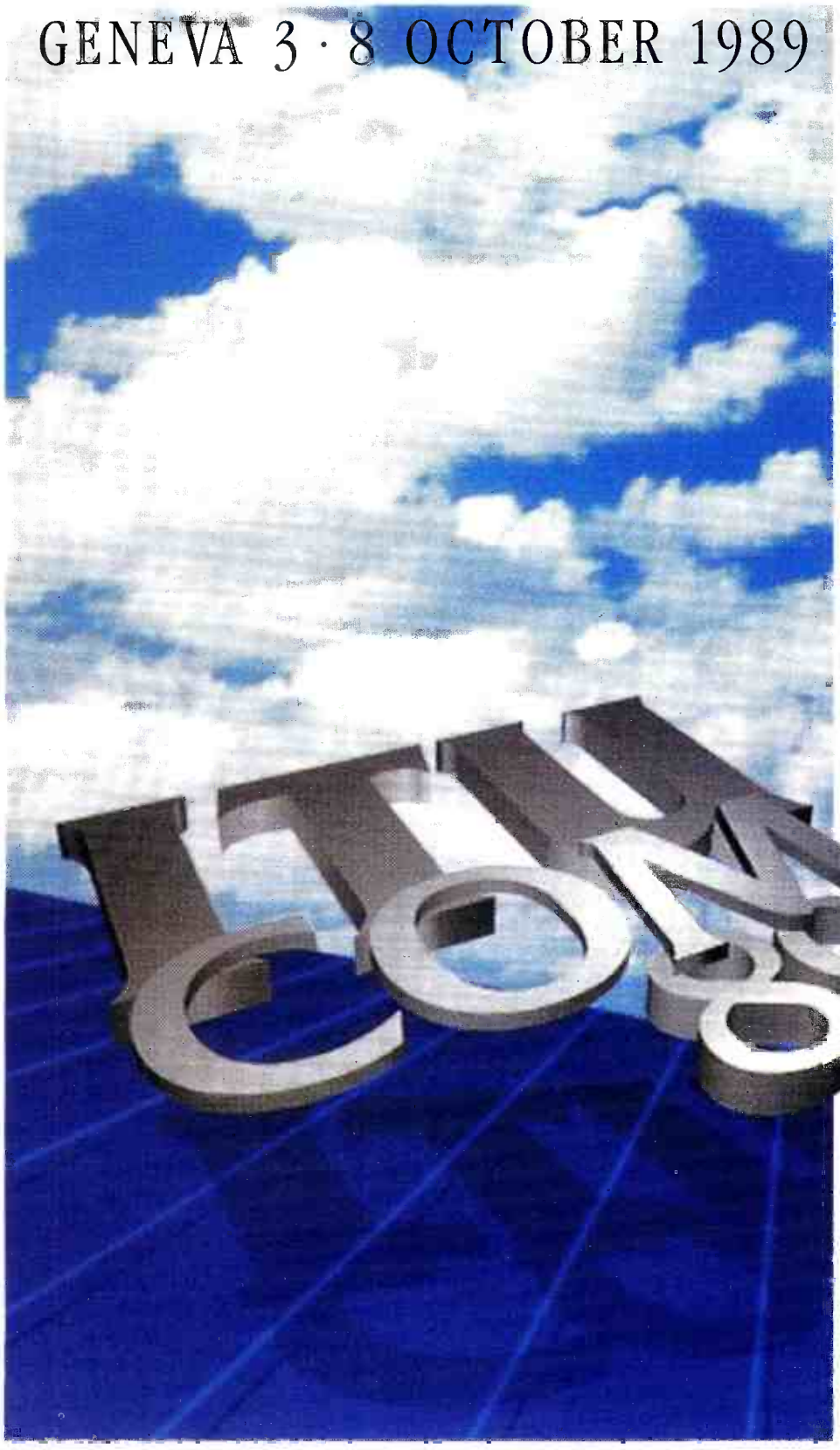
Tripod cases

Nalpak Video Sales has introduced Tuffpak, a new line of tripod cases designed to protect tripods and photographic light stands during on-location shoots. The cases are available in eight sizes, with inside diameters from 9 to 11 inches and inside heights ranging from 23 to 52 inches. These heavy-duty, shock-resistant cases have twin handles for easy balancing and are octagon-shaped for strength and to prevent rolling during transport.

Circle (377) on Reply Card

NEW HORIZONS IN ELECTRONIC MEDIA

GENEVA 3 · 8 OCTOBER 1989



ITU-COM 89, the first World Electronic Media Symposium and Exhibition, will be held in Geneva from 3-8 October 1989, under the general theme "Towards Global Information: The electronic media explosion."

Are you a manufacturer, equipment or specialized systems supplier, service provider or user? Are you a policy-maker, industry-leader, investor, researcher, engineer, scientist?

Are you engaged in electronic media activities, broadcasting, journalism or publishing? Or are you working in the field of computer terminals, software and databases for the mass media?

Whatever your specialization, the current explosive growth of mass media communications technology is undoubtedly affecting your life in some way, either at work or in the home. Maybe you are already fully conversant with the immense scope of the new technologies and the tremendous economic and social changes that will be brought about by the rapid transfer of information. In that case, you are looking for the ideal showplace for your latest products and ideas. Or perhaps you are seeking the appropriate forum for a dialogue with tomorrow? ITU-COM 89 will provide you with the appropriate answer.

All aspects of modern life are becoming increasingly interdependent. There are no longer clear demarcation lines. The International Telecommunication Union (ITU), being the U.N. specialized institution in that sector, has always played a leading and guiding role in telecommunications of all kinds. Mass media communication applications are no exception.

ITU-organized events are unparalleled in reputation and ITU-COM 89 provides that vital first step in focusing world attention on the dynamic growth area of electronic media — a step that is possibly a quantum leap into the Information Age.

Circle (161) on Reply Card

Please send more detailed information on:

☐ ITU-COM 89
☐ Policy Symposium, 2-4 October 1989
☐ Technical Symposium, 4-7 October 1989
☐ Legal Symposium, 4-6 October 1989

Name/Company/Organization _____

Address _____

Tel. _____

Date _____ Signature _____

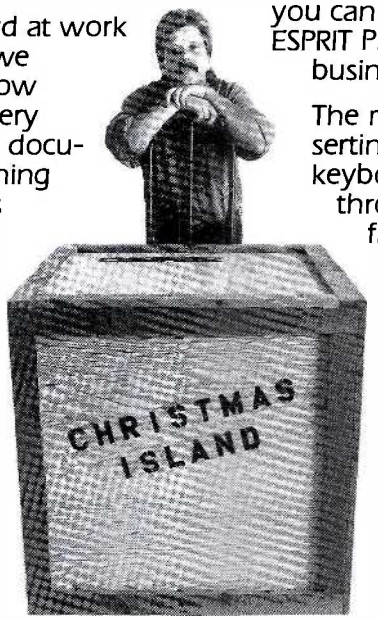
send to: International Telecommunication Union · ITU-COM 89 Secretariat · Place des Nations · CH-1211 Geneva 20 · SWITZERLAND

Paltex Editing Systems, Hard At Work Everywhere.

Almost.

If anyone on Christmas Island is listening, we would like to ask you a couple blunt questions:

With E-Series editing systems hard at work all over the world, why haven't we received your order? Did you know that E-Series systems are used every day producing feature programs, documentaries, "soaps," corporate training and sales programs, music videos and much more?



In fact Paltex editing systems have consistently increased their share of the market, while other editing systems have lost market share.

It's hard to believe that you haven't heard about the world's hottest editing systems. But ok, let's go over it one more time:

First, rather than relying on someone else's mainframe, designed to do little more than compute, we built our mainframe from scratch. Every element of its design was aimed at doing one thing, video editing. And doing it very well.

Second, we chose to create a keyboard dedicated to the task of editing instead of one more appropriate for word processing. The keyboard is logically laid out, the way you would do it, not a computer programmer. After all, you're processing ideas and images, not words.

As your business grows and your needs increase, there's an E-Series Editor to meet those needs. System upgrades are as easy as swapping software and keyboards. For roughly the incremental cost between models, you can move to the next level. You can start with the 3 machine ELITE, 4 machine ELAN or 6 machine ES/D. Each has 20 controllable ports. And, you can end up with the 8 machine 25 port ESPRIT PLUS. Your system expands as your business prospers.

The mainframe upgrades by simply inserting another circuit board or two. The keyboards and displays are compatible throughout the line, so you won't find yourself going "back to school" when you graduate to the next level.

If you're like the rest of the editing world, you want a full featured video editing system that will interface to any serial VTR without changing software, that has a sensible keyboard design, user-friendly displays and superior logic. With an E-Series editing system you'll get all these things and more.

But first you have to send us an order. That's the easy part because our dealers are hard at work everywhere: From California to Copenhagen, from New Zealand to New Delhi, Paltex dealers are there. Do you know a good one on Christmas Island?

PALTEX
Editing Systems

NTSC ◇ 2752 Walnut Avenue ◇ Tustin, CA 92680 ◇ TEL (714) 838-8833 ◇ TWX 910-333-8535 ◇ FAX (714) 838-9619

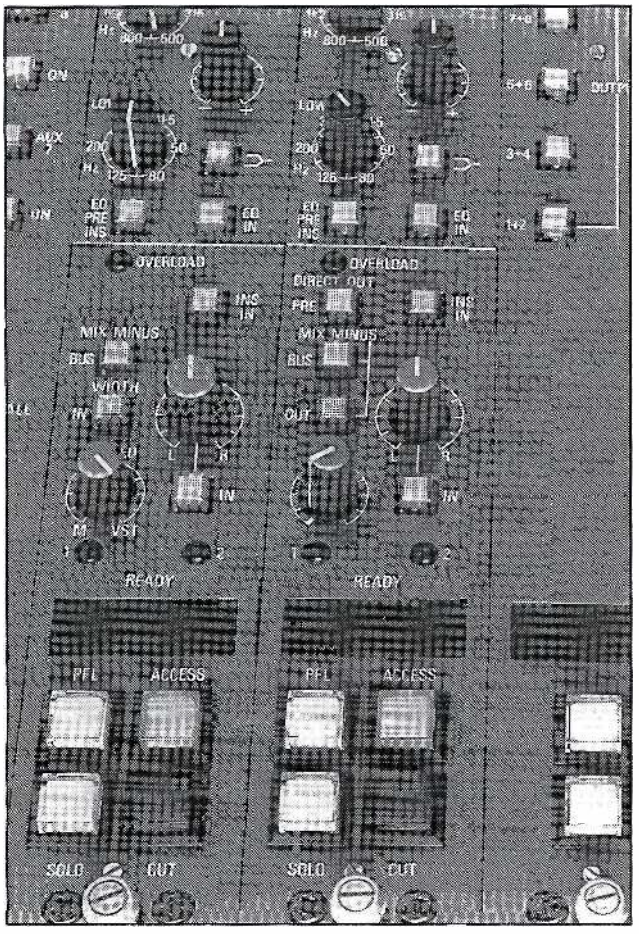
PAL/SECAM ◇ 948 Great West Road ◇ Brentford, Middlesex TW8 9ES ◇ England
TEL 01-847-5011 ◇ TLX 94011067 ◇ FAX 01-847-0215

Circle (162) on Reply Card

Analog console

Neve/Siemens has introduced the 66 series digitally controlled analog consoles designed to meet German IRT specifications. The consoles have an integral computer-controlled reset system for switch status and input gain. The main processor controls the reset and master console status functions and the group and multitrack routing. The input modules are miniature switching matrixes controlled by an internal microprocessor that is controlled by the main processor. Each module, however, operates independently and the failure of the main processor will not cause the console to lock up.

The 66 series consoles are available with four stereo groups, eight stereo groups or multitrack (24- or 32-track routing and monitoring with eight stereo groups). Modules of the series include mono input, stereo input, aux master, monitor, central control and talkback/oscillator.



Circle (378) on Reply Card

Half-rack series

Symetrix has introduced a line of half-rack-sized products designed for audio professionals. A 2-unit full-rack-mounting pan is available with the series to allow two different functions to be mounted within a single rack space. The SX200 series products include:

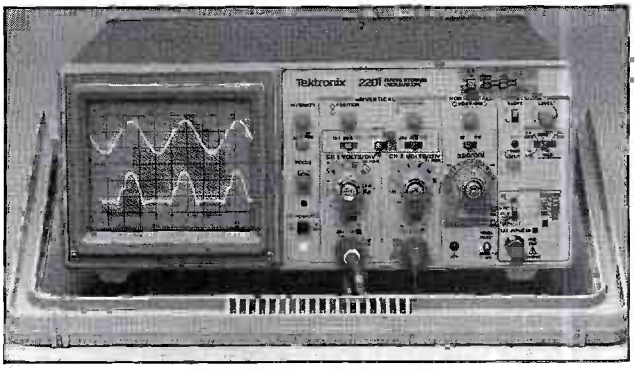
- SX201 parametric EQ/pre-amp features +15dB boost and −30dB notch filter capability. It has unbalanced pre-amp input, balanced/unbalanced line level input and balanced line driver output.
- The SX202 dual microphone pre-amplifier has two ultraclean microphone pre-amplifiers with variable gain, 15dB pad, +48V

phantom powering and left, right and left + right outputs.
• SX204 headphone amplifier is a 1-in 4-out amplifier that uses proprietary high-voltage converter technology to drive high-impedance headphones.

Circle (379) on Reply Card

Portable oscilloscope

Tektronix has introduced the 2201 portable digital storage oscilloscope. The 2201 features a 10 MS/s sampling rate, pretrigger capabilities, 8-bit resolution, 1MHz useful storage bandwidth and 2K record length. The scope provides analog elements including 20MHz bandwidth, dual channels and sensitivity from 5mV to 5V per division.



Circle (380) on Reply Card

Equalizer

MicroAudio has announced the EQ POD2, a patented dual-channel, 28-band, one-third octave, single-rack-space equalizer programmable by the IBM PC or a MicroAudio programmer. The equalizer is designed for fixed-installation applications, has no front-panel controls and features a 50-year, non-volatile memory with no internal batteries. The equalizer combines filters to give a smooth response and a noise floor better than 90dBm.

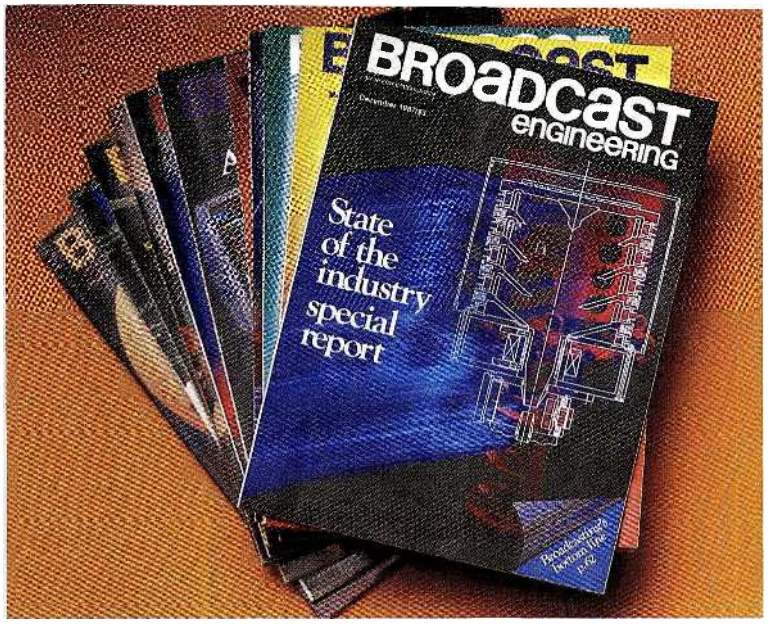
Circle (381) on Reply Card

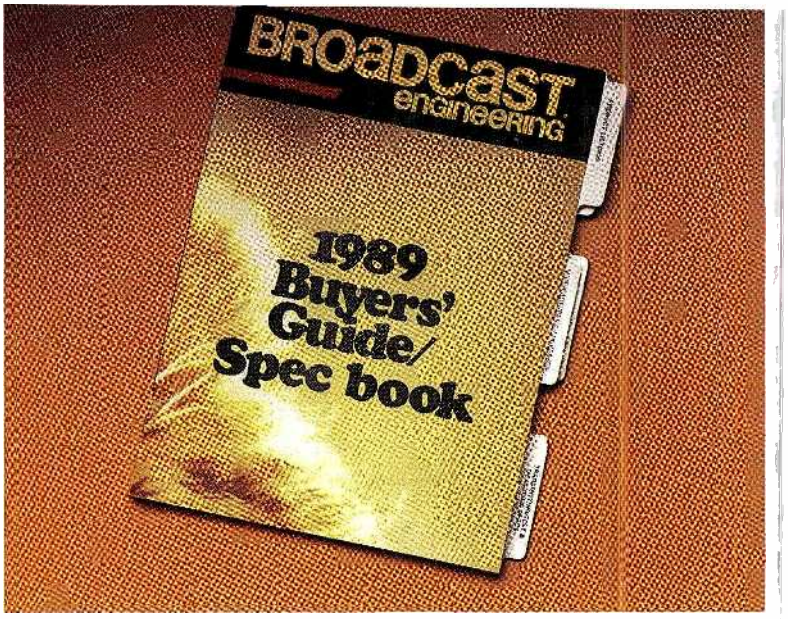
Computer software, component library

Video Design Pro has introduced the following products:

- Autocad Release 10 computer-aided design software features a user-selectable 3-D plane that can be drawn on in 2-D. A generalized 3-D mesh can be used to model surfaces. The screen can be split into as many as four interactive viewing ports allowing the front, side, back and floor plan views to be viewed simultaneously.
- The VidCAD 3-D library allows 3-D viewing of all components and facility animated walk-through drawings using AutoFLIX. The software will allow the user to enter and maintain data on serial number, model number, system name and location.

Circle (382) on Reply Card





The monthly seminar

The year-long reference manual

BROADCAST ENGINEERING gives you the information you need to plan your station's future. In fact, every issue is like attending a technical seminar in print.

But *BE's* seminars don't stop with our regular 12 issues. *Buyers' Guide/Spec Book* is the perfect complement to your "monthly seminar," dramatically simplifying your equipment purchases.

Past *BE* seminars have given you the technical information you needed to keep your station up and running, and to make informed purchasing decisions. Now you need the equipment to make it happen.

And that's where *Buyers' Guide/Spec Book* — your year-long reference manual — comes in.

Over 350 types of equipment and services in the Product Listings. Over 1,000 entries in the Manufacturers' Addresses section. More than 40 categories of equipment with major specifications in a side-by-side presentation.

So many products . . . so many manufacturers . . . so many choices.

You are bombarded with so many advertising impressions and sales calls every day, it's easy to become overwhelmed. *Buyers' Guide/Spec Book* helps simplify your overwhelming purchasing task by giving you everything you need in one neat, easy-to-use reference manual.

Equipment specs, technical data, manufacturers' addresses and phone numbers . . . and much more. Packed into the only comprehensive broadcast equipment directory of its kind.

With *Buyers' Guide/Spec Book*, you have at your fingertips everything you need to make equipment purchases your company can live with for a long time.

Make *Buyers' Guide/Spec Book* a permanent part of your reference library today. Read it. Use it. And save it.

***Buyers' Guide/Spec Book* — the year-long reference manual to *BE's* "monthly seminars in print."**

BROADCAST ENGINEERING

P.O. Box 12901, Overland Park, KS 66212 (913) 888-4664

Professional services

Classified

Advertising rates in Classified Section are $1.50 per word, each insertion, and must be accompanied by payment to insure publication.

Each initial or abbreviation counts a full word. Minimum classified charge, $35.00.

For ads on which replies are sent to us for forwarding (blind ads), there is an additional charge of $40.00 per insertion, to cover department number, processing of replies, and mailing costs.

Classified columns are not open to advertising of any products regularly produced by manufacturers unless used and no longer owned by the manufacturer or distributor.

TRAINING

FCC GENERAL RADIOTELEPHONE operators license through cassette recorded lessons at home plus one week seminar in Boston, Washington, Detroit or Philadelphia. Our twentieth year teaching FCC license courses. Bob Johnson Radio License Preparation, 1201 Ninth, Manhattan Beach, Calif. 90266. Telephone (213) 379-4461. 8-81-tfn

NAPA VALLEY COLLEGE offers a two-year maintenance telecommunications program. Emphasis in 1 inch C format, time base correctors, component and digital systems. Call or write Gary Vann, Napa Valley College, Napa, CA 94558, Ph: (707) 253-3258. 8-88-2t

SERVICES

AUDIO AUTOMATION: Computer controlled, 8-CD changers, music and commercial program software, hard disc for commercials. Complete: $6900. BGM INTERNATIONAL, (904) 438-8054. 7-71-tfn

TRANSMITTER TUBE REBUILDING SINCE 1941: 3CX2500, 4CX5000, 4CX15000 and many others. Write for details. FREELAND PRODUCTS INC., Rt. 7, Box 628, Covington, LA 70433. (504) 893-1243 or (800) 624-7626. 6-79-tfn

FOR SALE

67 KHZ SCA AVAILABLE on Austin, TX Class C FM. Contact Kevin Stone, (512) 345-9300. 10-88-1t

C-BAND TRANSPORTABLE UPLINK, Compact 42, fully redundant, 50KW generator, tractor, 2 degree compliant antenna, excellent condition. Contact Ben Miller, Trinity Broadcasting, 714-665-2145. 10-88-2t

RCA TP-66 "NEW" 12K, TP-66 used completely refurbished, 4500. Parts, Access., Assembly Exchanges. Simber Broadcast Services, Inc., (609) 435-1091. 11-88-1t

GIANT USED EQUIPMENT SALE!!! Sigma VPA-100 prod amp, full control of video, 200. Newsmatte-2 Digital Memory, perfect chroma keying, 5000. CEL Efx-IIi 2-channel digital efx w/TBC's, Maurice, 15,000. JVC ¾" CR-8200, CP-5500, RM-88U, 4000. Singer Graflex 10mm telecine projector, 800. Sony VO-4800 ¾" portable w/pwr supply, 1200. Sony VO-2610 ¾" arecorder, great condition, 600. Buhl Multiplexer, 600. Elmo K-110SM reg8/super 8 telecine projector, 500. Panasonic WV-777 3 tube camers, 2000. Sony DXC-M3 3 tube cameras (2), 3000. Microtime 2525 TBC/Framestore, 4000. JVC HR-2650U VHS stereo portable w/tuner, 400. Panasonic NV-8410 VHS prof poartable w/pwr, 400. JVC CP-5000 ¾" players (3) need minor maint., 100. Sony Betamax SL-7200 2 speed I & II, 100. Sony Betamax industrial player BI, 100. Fortel CCD/HP, like new TBC, 1500. Crosspoint Latch 6107 switcher, 1000. For further information contact: CORPORATE TELEVISION PRODUCTIONS COMPANY, 900 WALT WHITMAN ROAD, SUITE LL8, MELVILLE, NEW YORK 11747, (516) 673-0777. 11-88-1t

SELLING: Ikegami HL-79EAL w/16Xlens—$28,000; NEC E-Flex/Optiflex/Bubble Memory/2-channel—$33,000; Bosch TAS-2000 20X10 V/A2 Router—$17,600; Sony BVH-2500/BVT-2000 1" VTR/TBC—$55,000. Chyron RGU-2 Character Generator 2 channel, $15,950; 38' Mobile Production Trailer—$75,000. All items used and subject to prior sale. Looking for: 1" VTRs; Betacam; DVEs; Controllers; Iketami/Sony Cameras; Mobile Trucks; Complete Systems. Micor Video Equipment Sales, 343 S. Dearborn, STE 516, Chicago, 60604 • (312) 663-0025, FAX (312) 663-0710. 11-88-1t

PLOT DISTANCE AND AZIMUTH, dish elevation and azimuth, X & Y distances, latitude & longitude from USGS maps. IBM PC compatible software requires CGA. $24.95. James Kuhns, 815 E. Front St., Statesville, NC 28677. 11-88-1t

TOSHIBA TS-100 subscriber processing units for 2-way/addressable CATV w/IR remote. 1600+ available. US/postpaid sample $25. G. Chase, 2411 Holly Dr., Pekin, IL 61554. 309-347-3950 evenings. 11-88-1t

WANTED TO BUY

HIGHEST PRICES for 112 Phase Monitors, vacuum capacitors and clean, one kw or greater powered AM and FM Transmitters. All duty and transportation paid. Surplus Equipment Sales, 2 Throncliffe Park Dr., Unit 28, Toronto, Canada M4H 1H2, 416-421-5631. 3-86-tfn

WE PLACE ENGINEERS

ALL CATEGORIES FOR TV, PRODUCTION, VIDEO, CATV (EXCLUDING OPERATORS)

America's Leading Source for a Decade

ITV STATIONS, PRODUCTION FACILITIES, CORP TV, MFG., CATVI

For information phone or write Mark Kornish

key SYSTEMS

479 Northampton Street

Kingston, PA 18704

Employer Paid Fees

(717) 283-1041

HELP WANTED

CHIEF ENGINEER Small market UHF TV station needs hands-on maintenance engineer ready for management; UHF experience, ability to trainpeople, equipment repair experience. Good Benefits. Salary commensurate with experience. Send resume, three references to General Manager, WCOM-TV68, P.O. Box 268, Mansfield, Ohio 44901. 11-88-2t

TRANSMITTER/STUDIO ENGINEER needed for Worcester, Massachusetts UHF television station. Strong background in UHF transmitters. Also, studio maintenance background helpful. Contact Fran Vaccari, Chief Engineer, WHLL-TV, 617-799-2727. 7-88-tfn

TECHNICAL COORDINATOR/CHIEF ENGINEER: Responsible for the operation, maintenance and repair of television system and audio/video computer graphics equipment. Minimum qualifications include associates degree in electronics engineering technology or a closely related field; previous operations/maintenance engineering experience; background in personal computer technology and ability to climb 20 feet high satellite dish. Starting salary range $21,600—$27,000. Send resume and cover letter for application materials. Completed applications must be received by November 30, 1988. Personnel Department, BURLINGTON COUNTY COLLEGE, Pemberton, NJ 08068. (609) 894-9311, Ext. 390. Equal Opportunity/Affirmative Action Employer (M/W). 11-88-1t

AUSTIN, TEXAS—A High-Tech Town with a High Quality of Life. The University of Texas at Austin is seeking an Assistant Director for Technical Services at the Center for Telecommunication Services. To provide direction as chief engineer and technical maintenance supervisor. Required qualifications: Bachelor's degree in electrical, telecommunication, or electronics engineering; five years' experience in electronic broadcasting equipment design, installation, maintenance, and operation; knowledgeable in respect to FCC technical rules and regulations. On call nights and weekends (beeper will be provided). Annual salary is $31,188 with excellent benefits. Department is willing to pay more depending on qualifications. Responsible for 100kw FM transmission facilities, including SCA; audio production facilities (master control, air control, three additional control rooms and associated studios); satellite audio uplink/downlink and video downlink; video cable system; master/8-slave highspeed, open-reel audiotape duplication system; STL and leased full-duplex microwave systems. Send resume with cover letter and three professional references to Mr. William Giorda, Communications Building B, University of Texas at Austin, Austin, Texas 78712. Applications will be accepted through December 1, 1988. Equal Opportunity/Affirmative Action Employer. 10-88-2t

FIELD OPERATIONS ENGINEER AND SYSTEMS ENGINEER. Manufacturer of High Power TV Transmitter systems has openings for experienced engineers in Field Operations and System Engineering departments. 50% travel required in Field Operations. Send resumes and salary requirements to: P.O. Box 229, Southwick, MA 01077. Attn: V.P. Engineering. 11-88-1t

VIDEOTAPE EDITOR: Full service post-production company seeks full time post editor. CMX 3600, ADO, A-62, VPR-3. Computer graphics experience helpful. Resume to: Scene Three, 1813 Eighth Avenue South, Nashville, TN 37203, ATTN: Mike Arnold, (615) 385-2820. 11-88-1t

CMX-3600 ON-LINE EDITOR. Estab. Full-Service So. CA Co. needs effects/program editor. Fast, creative and excellent people skills a must. Sony 3100's. 2-ch. ADO, SP Betacam's, ARt Star 3D animation/paint, and Scribe. Minimum 3-yrs on-line experience. Send resume & reel to: VPC, 1701 E. Edinger, Ste. B-10, Santa Ana, CA 92705, Att: Perri Lounsbury. 11-88-1t

ENGINEER TECHNICIAN—3 years television experience in maintenance of studio equipment and television translators. Sound knowledge of analog and digital electronics. Contact: Fern Bibeau, KOB-TV, 4 Broadcast Plaza SW, Albuquerque, NM 87103 EEO/MF. 11-88-1t

IMMEDIATE OPENING for an experienced maintenance engineer with operator skills. Send resume to Chief Engineer, KXTX TV, 3900 Harry Hines Blvd., Dallas, Texas 75219. An equal opportunity employer. 11-88-1t

VIDEO MAINT. ENGINEER. New Post studio, full time, to repair and maintain Sony 1", ¾" and ½" equip. Exp. a must, hrs. negot. Call Ed, Audio Post, 10 AM-2 PM, (212) 475-3522. 11-88-1t

TV ENGINEER: Responsible for maintenance and operation of broadcast quality equipment in new Telecommunications Center. Minimum qualifications: 2-year degree in electronics and 2 years experience in maintenance and operation of broadcast quality TV equipment. Equivalent combinations of education and experience may substitute for the state qualifications. For full consideration resume must be received by December 15, 1988. Send resume to: Marshall E. Allen, Director Educational Television Services, Telecommunications Center, Stillwater, OK 74078-0585. OSU IS AN AFFIRMATIVE ACTION/EQUAL OPPORTUNITY EMPLOYER. Successful applicant must comply with IRCA. 11-88-1t

TECHNICAL TRAINER: Broadcast radio network seeks technical trainer who primarily will be responsible for the planning, development, coordination and delivery of NPR production and engineering technical training programs for public radio system personnel and independent producers. Requirements include six years experience in broadcast engineering/production to include two years as a technical trainer. Demonstrated ability and experience to train effectively. Send cover letter and resume with salary requirements to: National Public Radio, Personnel Department, 2025 M Street, NW, Washington, DC 20036. EOE/AA. 11-88-1t

TV/AV PRODUCER, NJ. BS Communication with 3 years experience supervisor—MUST KNOW: EFP, multi-cam, computer edit, lighting, AVL, Video projection. Good pay—Gov't experience plus - EEO. Send resume to Grant Associates, 300 Lanidex Plaza, Parsippany, NJ 07054. 11-88-1t

TV/AV ENGINEERING, NJ. BSEE with 2 years experience: facility design, hardware knowledge, engineering cable systems, gov't facility consulting. Good pay—EEO. Send resume to Grant Associates, 300 Lanidex Plaza, Parsippany, NJ 07054. 11-88-1t

TV/AV PRODUCTION, NJ. 2 years experience with AA/BA & Communications skills important. WRITER (Corp/Ind), CAMERA OPERATOR (Video), AV & VIDEO TECH(S), LIGHTING DIR/TECH, & SET DESIGNER. Good pay—Gov't experience plus—EEO. 11-88-1t

WANTED "VIDEO": Directors, camera operators, engineers. Must be willing to travel 6-12 months per year. 'Energetic Beginners' with technical school or minimal experience O.K. Send resumes and salary expectations to: Video Productions, 17924 S. Avalon Blvd., P.O. Box 166, Carson, CA 90746. 11-88-1t

SOUTH CAROLINA EDUCATIONAL TV NETWORK is looking for experienced and qualified technical personnel to provide technical support for the production of Educational TV Programs for statewide and national distribution. Employees will have a rare opportunity to participate in the move to a new $18,000,000 production center next year. Many benefits including health, life, LTD and dental insurance; three weeks annual leave plus 12 State Holidays, and on premises Day Care Center. Positions available include: **TECHNICAL PROJECT MANAGER** to assist in the planning, design, and implementation of TV and Radio engineering projects. Extensive experience in and knowledge of: transmitters, microwaves, antennas, and satellite systems; studios, recording, editing, video and pulse distribution systems; and accepted technical standards. Degree in engineering and four years related experience or 8 years of design experience. Salary range $25,364 to $38,046. Two positions available. **TECHNICIAN IN CHARGE** to plan, design, and manage technical support for assigned TV productions. Responsible for assuring highest technical quality standards are maintained through all steps of projects, from initial stages to final completion, and assures efficient use of technical staff and facilities. Thorough knowledge of NTSC, EIA, SMPTE, FCC, and PBS TV standards. Extensive knowledge of and experience in TV studio, remote, and post production techniques including multi-track and stereo audio. Associate degree in electronics and 4 years related experience two of which must be in a supervisory position or an equivalent combination. Salary range $19,274 to $28,911. Two positions available. **ASSISTANT MAINTENANCE SUPERVISOR** to assist in the management of the TV maintenance department. Leads a team of maintenance technicians, assigning and supervising work in assigned areas. Thorough knowledge of the operation and maintenance of complex TV and stereo audio equipment including Quad, type C, Betacam SP, U-matic, Beta and VHS video recorders. Studio and portable camera systems, production and routing switching equipment, digital effects systems, and monitoring and test equipment. BS in EE and four years related experience two of which must be in a supervisory position or an equivalent combination. Salary range $23,449 to $35,173. Two positions available. EEO. Address all inquiries to: South Carolina Educational TV Commission, Personnel Department, Post Office Drawer L, Columbia, S.C. 29250. Telephone (803) 737-3457. 11-88-1t

TV BROADCAST MAINTENANCE ENGINEER: must have FCC General Class license and at least three years experience in TV studio equipment maintenance. Should be familiar with cameras, 1 inch videotape, and ¾ inch ENG equipment. Some transmitter and microwave experience a plus. Submit resume and salary requirements to: James Brodsky, KSBY-TV, 467 Hill Street, San Luis Obispo, CA 93401. EOE. 11-88-1t

BROADCAST MAINTENANCE TECHNICIAN to maintain and repair radio and television studio equipment and audio visual equipment. An associate degree in electronics technology and one year of experience in the maintenance and repair of electronic equipment used in the areas of radio and/or television broadcasting and production. Salary commensurate with qualifications and an excellent fringe benefits package. Request application form from: Personnel Department, Winthrop College, Rock Hill, SC 29733, (803) 323-2273. An Equal Opportunity/Affirmative Action Employer. 11-88-1t

TV MAINTENANCE ENGINEER, 4-5 years experience with strong digital background and edit suite maintenance. Contact George Murray, Trinity Broadcasting, 714-665-2147. 10-88-2t

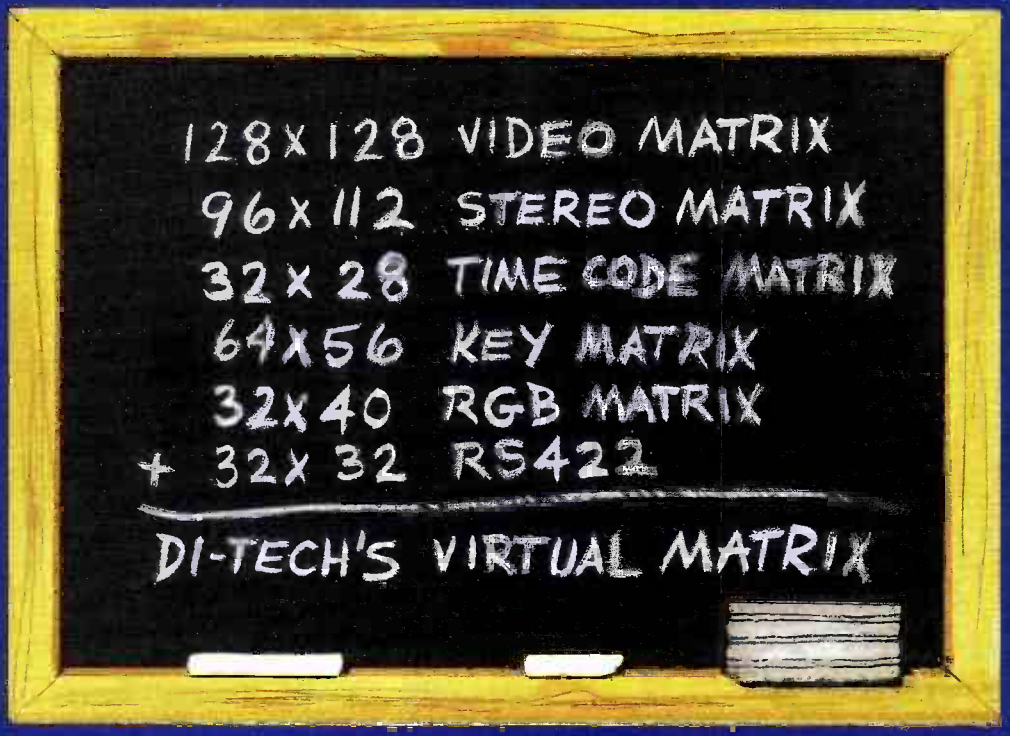
PROFESSIONAL TECHNICIAN I/ENGINEER-WFCR-FM Radio Station, University of Massachusetts, Amherst. Responsible for assisting the Chief Engineer in design and maintenance of electronic and electrical support systems for WFCR-FM, public radio for Western New England. Requirements: minimum Associate Degree in electronic technology or equivalent, FCC Restricted Radio Telephone license, two years experience with studio or transmitter maintenance (both preferred), and good administrative and communications skills. Experience with broadcast system design and fabrication is preferred. Normal starting salary range: $19,750-$26,300, plus benefits package. Apply to: Laura Howard, Continuing Edication and Public Service, Sixth Floor, Goodell Building, University of Massachusetts, Amherst, MA 01003. Deadline for receipt of letter and resume is November 28, 1988. An Affirmative Action/Equal Opportunity Employer. 11-88-1t

ABEKAS VIDEO SYSTEMS—RESEARCH AND DEVELOPMENT ENGINEERS: Hardware and software Engineers required for advanced digital video products. Ability and enthusiasm a must. Hardware positions require track record in digital video hardware or advanced microprocessor control systems. Software positions require experience in control or user interface code written in "C" or video DSP algorithms written in "C" or microcode. **TECHNICAL SUPPORT ENGINEER**—Based in Redwood City, CA. Responsible for providing technical support and troubleshooting assistance for our customers over the telephone. Applicants must have prior electronics work experience and knowledge of digital video products. **PRODUCT ENGINEER** (Manufacturing)—Responsible for taking prototype from engineering into manufacturing. Provide technical interface between engineering, marketing, technical support and manufacturing. Must have prior electronics work experience and knowledge of digital video products. Applicants: Send resume with cover letter explaining position desired to: ABEKAS VIDEO SYSTEMS/Mail Stop 60/P.O. Box 3659/Redwood City, CA 94064. 11-88-1t

Ad index

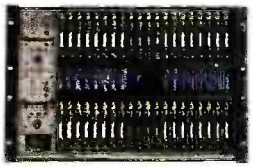
Advertiser	Page Number	Reader Service Number	Hotline
Abekas Video Systems	37	21	415/571-1711
Abekas Video Systems	125	173	415/571-1711
Accu-Weather, Inc	110	111	814/237-0309
ADC Telecommunications, Inc	59	65	612/893-3010
Adrienne Electronics Corp	94	174	800/782-2321
ADX Systems USA	76	79	800/444-4ADX
Alexander Mfg. Co	92	170,171	800/247-1821
Allen Avionics	120	139	516/248-8080
Alpha Audio	138	151	804/358-3852
Alta Group, Inc	80	82	408/297-2582
Alta Group, Inc	111	112	408/297-2582
Amperex Electronic Corp	77	80	401/762-3800
Ampex Corp (AVSD)	29	17	415/367-2911
Ampex Corp (AVSD)	31	18	415/367-2911
Ampex Corp. (MTD)	39	22	415/367-2911
Anvil Cases, Inc	48	28	818/575-8614
Arrakis Systems, Inc	21	13	303/224-2248
Arrakis Systems, Inc	27	13	303/224-2248
Audio Precision	43	24	800/231-7350
Audio Technologies, Inc	68	73	215/443-0330
Belar Electronics Laboratory, Inc	100	103	215/687-5550
Benchmark Media Systems	86	88	315/452-0400
BJM Electronics Ltd	146	156	718/442-0223
Boonton Electronics Corp	101	104	201/584-1077
Broadcast Video Systems Ltd	142	152	416/764-1584
BTS Broadcast Television Systems	75	78	801/972-8000
Cablewave Systems	141	160	203/239-3311
Camera Mart, Inc	132	126	212/757-6977
Canon USA Inc., Broadcast Lens	103	105	516/488-6700
Centro Corp	108-109	109,110	619/560-1578
Clear-Com Intercom Systems	86	87	415/861-6666
Computer Friends, Inc	137	135	503/626-2291
Conex Electro Systems	137	136	206/734-4323
Connect Systems, Inc	146	163	213/373-6803
Contact East, Inc	64	69	508/682-2000
Delta Electronics	105	107	703/354-3350
Di-Tech, Inc	IBC	2	516/667-6300
DKW Systems, Inc	140	154	403/426-1551
Dolby Labs, Inc	63	68	415/558-0200
E E V, Inc	47	27	914/592-6050
Eastman Kodak Co	88-89	90	212/930-7500
Electro-Voice	104	106	616/695-6831
ESE	145	150	914/592-6050
For-A Corp of America	127	129	213/402-5391
Full Compass Systems	147	157	800/356-5844
Gentner Electronics Corp	92	92	801/268-1117
Gentner Electronics Corp	93	94	801/268-1117
Graham-Patten Systems, Inc	117	119	800/547-2489
Grass Valley Group, Inc	9	8	916/273-8421
Grass Valley Group, Inc	107	108	916/273-8421
Grass Valley Group, Inc	118	120	916/273-8421
Harris Corp	65	71	800/4HARRIS
Harris Video Systems	35	20	800/4HARRIS
Hitachi Denshi America Ltd	3	4	800/645-7510
HM Electronics, Inc	91	91	619/535-6060
Ikegami Electronics, Inc	128-129	89	201/368-9171
International Telecommunications Union	143	161	
Intraplex, Inc	140	165	617/486-4072
Jampro Antennas, Inc	70	75	916/383-1177
Jensen Transformers, Inc	142	164	213/876-0059
JVC Professional Products Co	40-41	23	800/582-5825
JVC Professional Products Co	72-73	77	800/582-5825
Lake The Systems Company	134	149	617/244-6881
Leader Instruments Corp			800/645-5104
Leitch Video of America, Inc	79	81	804/424-7290
3M Broadcast & Related Products	69	74	800/328-1684
3M Broadcast & Related Products	99	101	800/328-1684
3M Magnetic Media Div	61	67	800/328-1684
Magni Systems, Inc	98	100	503/626-8400
Marconi Communication Systems, Ltd	139	159	
Markertek Video Supply	142	166	800/522-2025
McCurdy Radio Industries	71	76	416/751-6262
Microdyne Corp	55	62	904/687-4633
Midwest Communications Corp	1	3	800/543-1584
Mohawk Wire & Cable	94	95	800/422-9961
Moseley Associates, Inc	13	10	805/968-9621
Multidyne Electronics, Inc	120	142	800/535-3050
NEC America, Inc	97	99	312/860-7600
Neutrik USA, Inc	124	137	609/327-3113
North Hills Elecvtronics, Inc	136	134	516/671-5700
Omega International	100	102	714/553-0564
Opamp Labs, Inc	118	117	213/934-3566
Orban Associates, Inc	7	7	800/227-4498
Orban Associates, Inc	17	12	800/227-4498
Otari Corp	15	11	415/592-8311
Otari Corp	119	121	415/592-8311
Paltex, Inc	144	162	714/838-8833
Panasonic Industrial Div	82-83	84	201/348-7671
Panasonic Pro Industrial Video	50-51	60	800/553-7222
Panasonic Pro Industrial Video	53	61	800/553-7222
Periphex, Inc	142	140	800/634-8132
Pesa Electronica S.A	147	158	800/872-7372
Potomac Instruments	58	64	301/589-2662
QEI	115	114	800/334-9154
Ram Broadcast Systems, Inc	126	128	516/832-8080
RF Technology	118	116	203/866-4283
ROH	140	122	800/262-4671
RTS Systems, Inc	96	98	818/843-7022
Rules Service Co	137	155	301/424-9402
Sachtler Corp. of America	49	29	516/867-4900
Sescom, Inc	142	175	800/634-3457
Shure Brothers, Inc	IBC	1	312/866-2553
Sony Communications Prod/Pro Audio Div	131	132	800/635-SONY
Sony Corp/Broadcast Products Prod/Pro Audio Div	66-67	72	800/635-SONY
Sony Communications Prod/Pro Audio Div	44	25	800/635-SONY
Sony Communications Products Broadcast Div	24-25	15	800/635-SONY
Sony Communication Products/ Broadcast Div	122-123	125	800/635-SONY
Stainless, Inc	84	85	717/569-2681
Standard Tape Laboratory, Inc	118	118	415/786-3546
Studer Revox America, Inc	11	9	615/254-5651
Switchcraft, Inc	81	83	312/792-2700
Tascam Div. Tech Corp of America	45	26	213/726-0303
Techni-Tool, Inc	138	153	215/825-4990
Tektronix, Inc	56-57	63	800/452-1877
Television Equipment Associates, Inc	64	70	914/763-8893
Television Technology Corp	87	172	303/665-8000
Telex Communications, Inc	60	66	612-887-5550
Tex Ar	95	97	801/975-7200
Thomson-CSF/DTE	121	124	203/324-1320
Thomson-CSF/LGT	133	131	203/324-1320
Total Spectrum Manufacturing, Inc	19	14	914/268-0100
Townsend Broadcast Systems	118	115	413/568-9581
Valcom Ltd	113	113	519/824-3220
Varian	33	19	415/592-1221
Varian Med	135	133	800/231-4818
VideoTek, Inc	85	86	602-997-7523
Ward-Beck Systems Ltd	BC		416/438-6550
Winsted Corp	134	148	800/447-2257

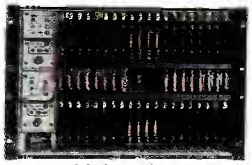
It all adds up.



The Solution to Real World Routing Problems

Today's teleproduction techniques impose new demands on routing switcher systems. Component/RGB and key video signals are more widely used than ever. Flexible interformat editing suites may require RS422 switching systems to allocate tape machines and their time code data. Planning for growth *now* means thinking in terms of many *differently* sized routers.


Model 5861
64 × 32 Video Switcher


Model 5862
64 × 32 Audio Switcher

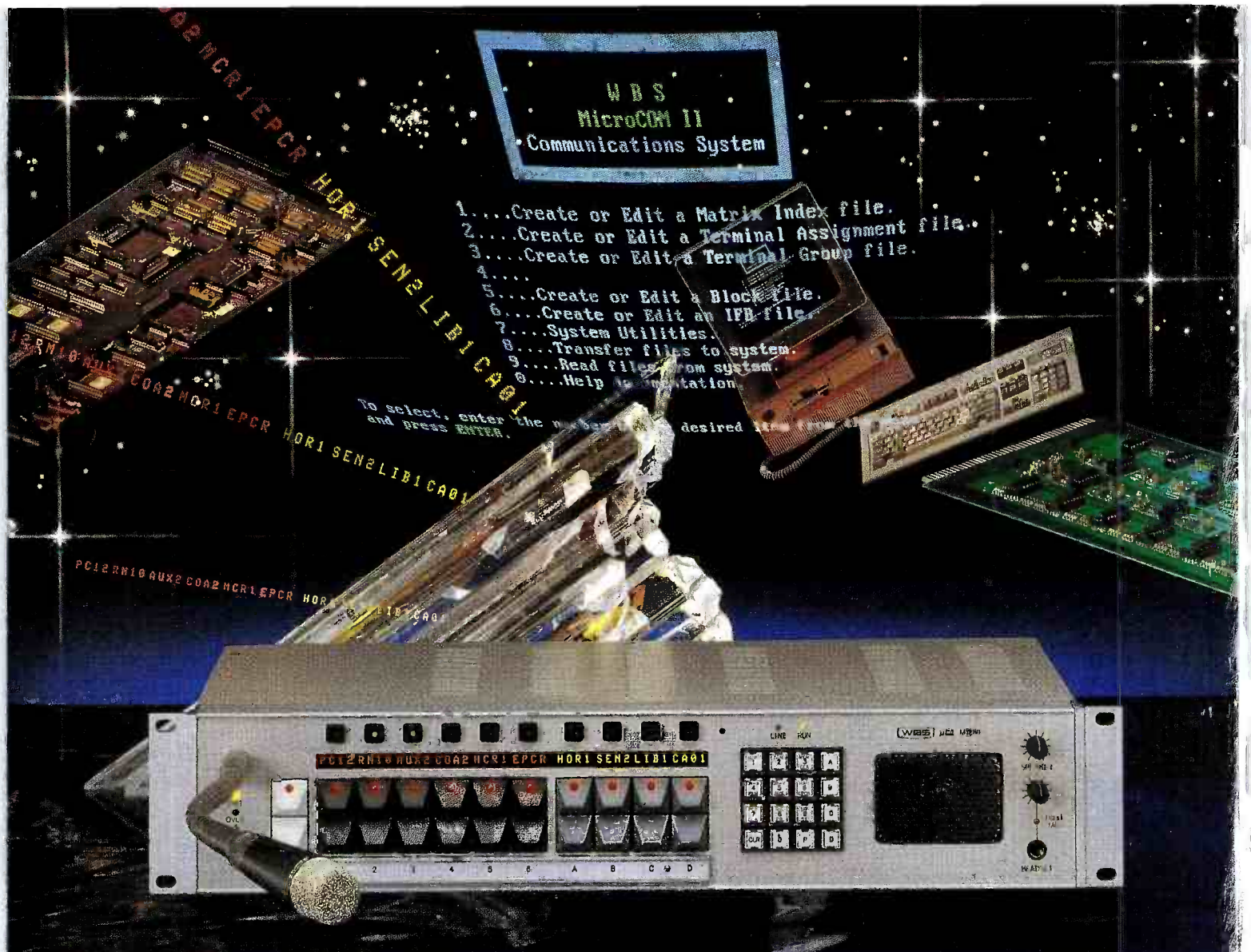
Di-Tech's *virtual matrix* control system, Model 9002, allows you to name over 500 input and output devices and *automatically* select the crosspoints on up to 8 *separate* routing frames as easily as on one big system. Since our high performance routing switchers are *field expandable*, you never need to overbuy to allow for growth.

Prepare for tomorrow with the company that can do it all today... Di-Tech.

di-tech inc.

Circle (2) on Reply Card

48 Jefryn Boulevard, Deer Park, New York 11729
(516) 667-6300, Telex No. 971806, FAX (516) 595-1012



MicroCOM II ... Clearly the industry's most advanced Communications System ...

With its superior design and advanced PC based software, MicroCOM II moves communications technology a whole generation forward, outperforming all the rest by a significant margin.

While some of its qualities are readily apparent, the full scope of its capabilities are best appreciated in actual operation . . .

* Dot matrix alpha-numeric multi-colored readouts identify functions
* All keys are programmable from both the PC and the terminals
* Unique tactile switches enhance simple rapid operation
* Reconfigurating does not interrupt system communications
* Menu-driven program is simple to operate
* On-line system operation is totally independent of the computer
* Ultra high speed microcontrollers provide faster response
* Matrix is expandable to 960 x 960 and beyond
* Self-initializing system operates without power backups.

But this is just the tip of the iceberg . . . talk to us . . . we'll be glad to reveal the additional power of features still beneath the surface!

WBS

WARD-BECK SYSTEMS

Ward-Beck Systems Ltd., 841 Progress Avenue, Scarborough, Ontario, Canada M1H 2X4.
Tel: (416) 438-6550. Fax: (416) 438-3865. Tlx: 065-25399.