# BROADCAST engineering®

AN INTERTEC PUBLICATION
February 1990/$4.50

## New directions for digital graphics


Using MIDI p. 46

# When you need extra hands mixing audio, Shure's AMS can help.

Until recently, you needed outstanding hand-ear-eye coordination to mix audio in multiple-microphone broadcast situations.

Now there's a system that gives you broadcast-quality audio when you can't cover all the faders at once. It's the Shure Automatic Microphone System (AMS), featuring patented direction-sensitive gating.

The Shure AMS continuously compares audio signal levels from two matched unidirectional condenser microphone cartridges located back-to-back in each AMS microphone. The rear-facing cartridge monitors ambient sound, while the front-facing cartridge handles sound from the desired source. When the front cartridge output exceeds the rear cartridge output by 9 dB, the AMS mic channel gates on automatically in .004 seconds.

Because of this unique gating concept, an AMS microphone channel will *only* gate on when addressed from within a 120-degree "window of acceptance" centered at the front of the microphone. AMS mics *not* addressed from within this angle remain off. So the number of open microphones is kept to a minimum automatically, with no need for manual control.

Since the Shure AMS automatically keeps track of the number of open microphones and adjusts the overall gain to compensate, your broadcast level stays constant as mics open and close, without troublesome gain-riding.

Direction-sensitive gating makes the Shure AMS the best system to use in multiple-mic situations, from panel talk shows to game shows to hearings on Capitol Hill. More and more broadcast engineers are discovering the advantages of having broadcast-quality multiple-microphone audio without the headaches of manual mixing or the time-consuming setup of so-called automatic mixers.


With AMS you not only get all the advantages of a truly automatic microphone system, you also get the broadcast-quality audio and reliability of Shure microphones.

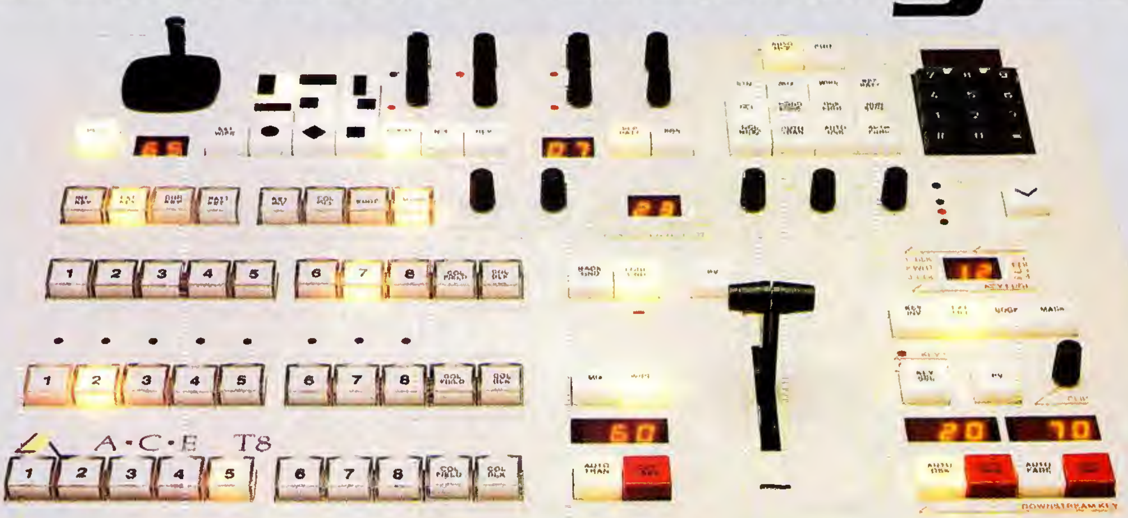
For a comprehensive AMS literature packet, call us at 1-800-257-4873. For AMS technical support, call Michael Pettersen at 1-708-866-2512.

**SHURE®**

The Sound of the Professionals®...Worldwide.

# Big FX.


# Small Package.




A·C·E

If fitting all this capability into such a remarkably compact switcher is a piece of cake, everyone should be offering you one.

They aren't.

Not with true linear keying via dual linear keyers... standard. To assure compatability with anti-aliased graphic systems. These switchers would also offer over 80 wipe patterns. Including rotary and clock wipes. As well as dual pattern generators for wipe within wipe effects, a non-volatile fx memory with 64 set-up capability, and too much more to list in *this* ad.

And if that kind of compact capability is as hard to achieve as it seems to be, the T8 should cost a bundle.

It doesn't.

Which should mean the T8 is going to sell like the proverbial hot cakes.

It already has.

Maybe you should give your Midwest representative a little call.

To get the big picture on the T8.

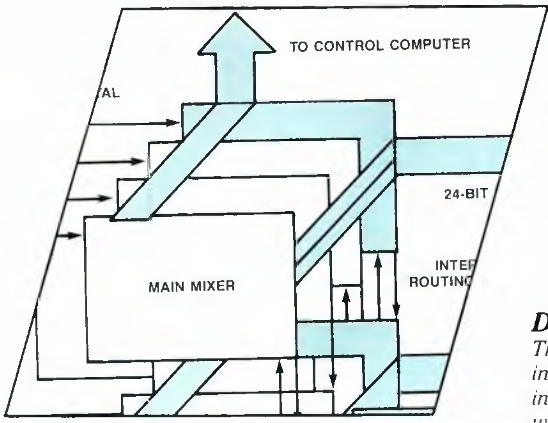
MIDWEST
Communications Corp.
One Sperti Drive
Edgewood, KY 41017
(606) 331-8990

Circle (3) on Reply Card

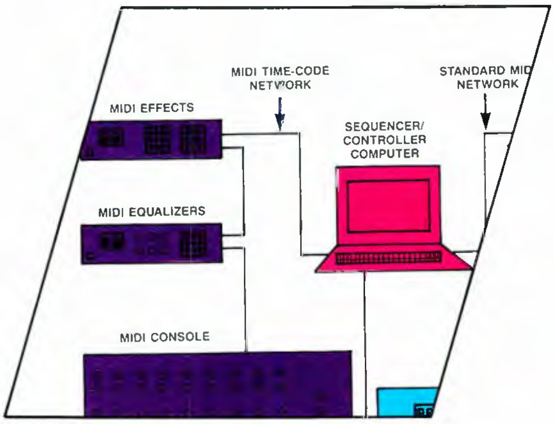
the SOURCE

# Contents

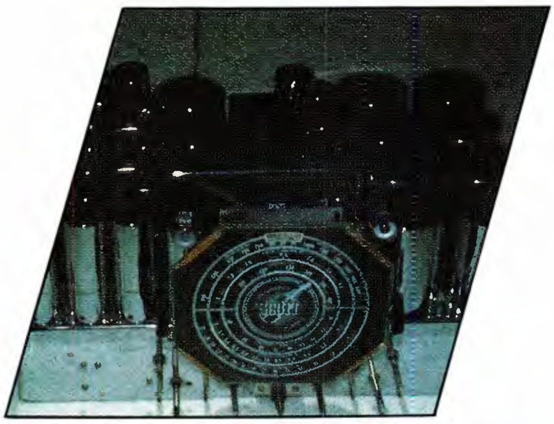
February 1990 • Volume 32 • Number 2



Page 26



Page 36


Page 46

BROADCAST engineering

***DIGITAL TECHNOLOGY FOR THE 1990s:***
*The products available to the professional audio-video industry today are influenced in large part by advancements in digital technology. Computer-based hardware has found its way into virtually every area of broadcast and post-production operations, from cameras and audio consoles to transmitters and test equipment. This month, we take a look at several key areas of exciting development in the application of digital hardware.*



## OTHER FEATURE:



## ON THE COVER

Computers have changed the way professional audio and video is recorded, edited and transmitted. Technology has given a new look to broadcasting. Our cover this month illustrates this digital revolution. (Cover credits: Monitor supplied by ASACA, graphic image courtesy of Pinnacle Systems, design by Dennis Mclaren, photography by Douglas Schwartz.)

## DEPARTMENTS

## PESA acquires assets of 3M TV products business

PESA Electronica, S.A., Madrid, Spain, has announced the acquisition of a portion of the 3M broadcast and related products business, effective Jan. 1, 1990.

The agreement includes the assets of the audio-video routing switcher and character generator product groups and associated advanced technology products presently in development.

The key 3M sales, engineering, manufacturing, service and administrative personnel are a major contribution to the new company and will continue to provide service and products to 3M and PESA customers.

PESA Industries is the new company located in the acquired 3M facilities in Huntsville, AL. It is the U.S. engineering and manufacturing center for PESA products.

The R&D and engineering departments in Huntsville will concentrate on advanced routing switcher technology. They and the Madrid engineering groups will jointly develop products for the TV and telecommunications global markets.

## Tektronix and Sony discuss business relationship changes

Tektronix, Beaverton, OR, has entered into discussions with Sony, Japan, about possible changes to their business relationship.

Tektronix and Sony jointly own Sony/Tektronix Corporation, which manufactures, sells and services Tektronix products in Japan. In addition, Sony distributes products of the Grass Valley Group, a wholly-owned subsidiary of Tektronix, in Japan and other parts of the world.

The discussions have included possible changes in the ownership of Sony/Tektronix and Grass Valley. No merger or combination of Sony and Tektronix is under consideration. No agreements have been reached with respect to the matters being discussed.

## Swanson to receive NAB Engineering Achievement Award

The National Association of Broadcasters' Engineering Conference Committee selected Hilmer I. Swanson, a senior staff scientist at Harris Broadcast Division, Quincy, IL, to receive its Engineering Achievement Award.

NAB recognized Swanson for giving AM broadcasts the potential to compete with other high-fidelity media. Other work by Swanson has dramatically lowered the power requirements for transmitters, saving AM radio stations an estimated $50 million in extra power costs over the years.

Swanson will accept his award at NAB's engineering luncheon Tuesday, April 3,

*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) 541-6697.*



**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.

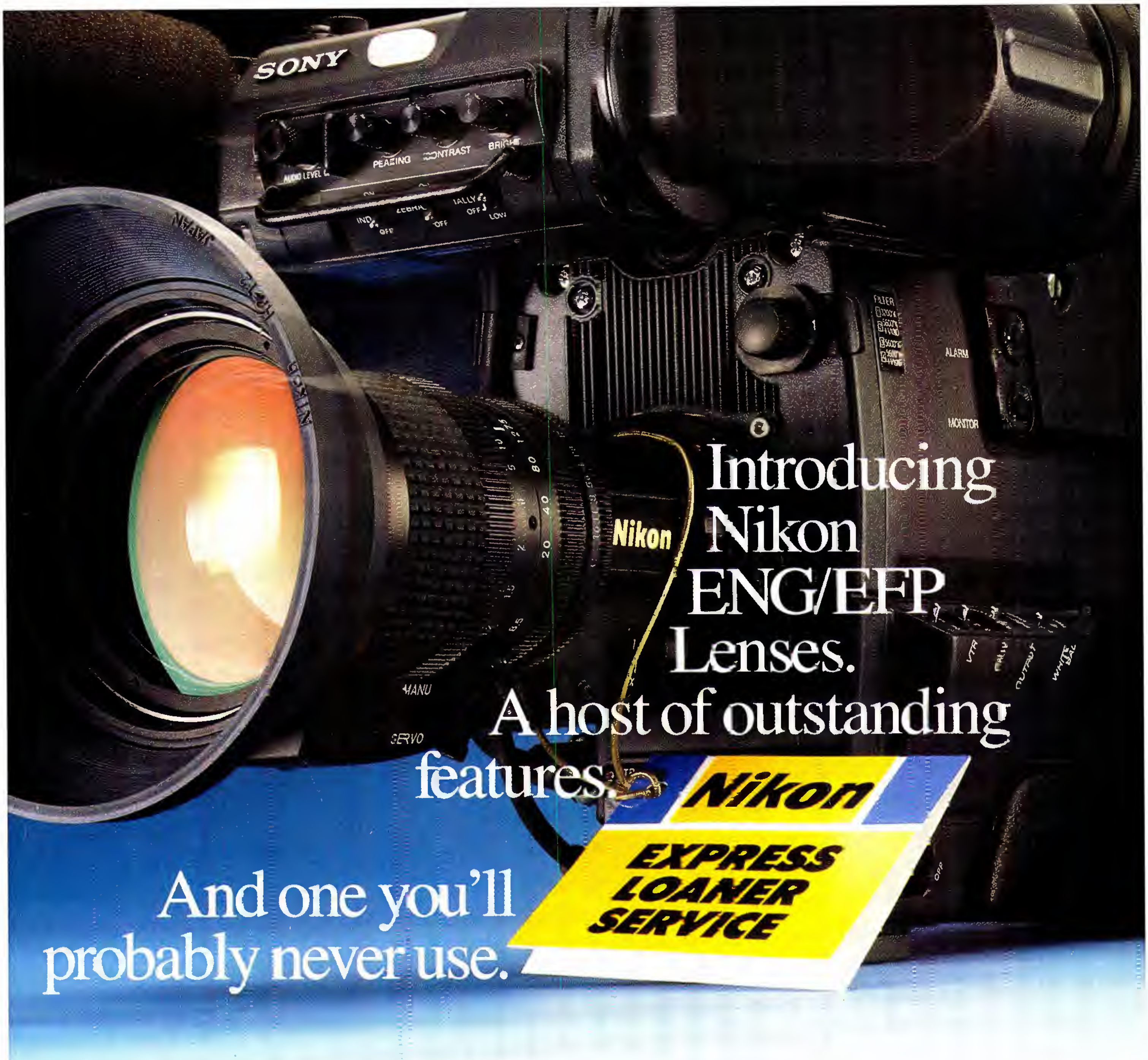
**BROADCAST ENGINEERING** (ISSN 0007-1794) is published monthly (except in the fall, when two issues are published) and mailed free to qualified persons within the United States and Canada in occupations described here by Intertec Publishing Corporation, 9221 Quivira Road, Overland Park, KS 66215. Second-class 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: Broadcast Engineering** is mailed free to qualified persons in occupations described above. Others may subscribe at the following rates: United States, one year, $50; all other countries (surface mail), one year $60. Rates include postage. Foreign air mail and Canadian first class options are available at the annual subscription rate of $115. Single copy price $4.50, except for the annual Buyers' Guide/Spec Book, which is $20. Back issues, when available, $5; Buyers' Guide/Spec Book back issues $23. Adjustments necessitated by subscription termination at single copy rate. Allow six to eight weeks delivery for change of address or new subscription.



**Advertising offices listed on page 135.**

INTERTEC
PUBLISHING CORPORATION




# Introducing Nikon ENG/EFP Lenses. A host of outstanding features.

## And one you'll probably never use.

Selecting an ENG/EFP lens for your ⅔″ CCD camera is a creative decision. It should be lightweight, responsive and zoom smooth as silk at any speed. Its design should utilize Extra-low Dispersion Glass to minimize chromatic aberration. It should include an anti-reflection coating for improved spectrum transmission ratio. And it should have an advanced design that improves corner resolution and produces a high, flat MTF curve. In short, it should be a Nikon.

But selecting an ENG/EFP lens is also a business decision. And on that score we provide something almost as compelling as Nikon quality – our unique Express Loaner Service. Simply register the Warranty, then in the unlikely event your lens needs service we'll get you a loaner lens overnight. All your investment in equipment and crews is more secure than ever before.

A service like this is remarkable in itself. But not quite as remarkable as our lenses.

As with all Nikon products, our new ENG/EFP lenses have all our renowned quality, tradition and technology built right in. Our growing line is also fully accessorized, including adapters that allow the use of your entire arsenal of Nikkor 35mm SLR camera lenses for special effects.

To find out more, call or write for our complete brochure: Nikon Electronic Imaging, Dept. D1, 101 Cleveland Avenue, Bayshore, NY 11706, (516) 222-0200 Ext. 324. Or call 1-800-NIKON-US (645-6687) for the dealer nearest you.

**Nikon**
**ELECTRONIC IMAGING**



Circle (4) on Reply Card

# We told you so

The first seeds of change at the FCC began germinating almost a decade ago. The Fowler Commission had this wonderful concept called *the marketplace*. They tried it out on everything from technical standards to programming. Rules disappeared from the books overnight. Trying to keep up with the changes was a full-time job. *Volume 7* became a pamphlet. Lawyers and speculators got rich.

In the wake of this tumultuous change, engineers were shocked. They saw the foundation upon which broadcasting was built being undermined. Station management, however, saw this marketplace mania as an answer to their prayers. No more silly technical logs. No more restrictions on how many ads they could cram into a quarter-hour period. No more need to keep equipment in top shape; just being on the air was good enough.


Do you remember the day the FCC killed off the First Phone? I do. I was C.E. at an AM-FM combo at the time when my program director came in and said, "Guess that means we don't need you anymore." I handed him my pager and replied, "Guess not." (He handed it back to me and walked away.)

The first-class license was certainly outdated and had become a poor method of evaluating technical competence. The memory schools, which proliferated during the late 1970s, made it a joke. But that act was a clear indication to all broadcasters that this commission was out to rewrite the books.

The second seed that was planted during the Fowler Commission was the AM stereo non-decision, the ultimate test of the marketplace. The results are painfully obvious to everybody now; the marketplace failed, miserably.

It is, then, with great surprise that I read testimony given by members of the NAB's AM improvement group. In a recent meeting, various officials of the NAB told the commission about the many problems faced by AM, "We petition you...to establish higher transmission technical standards with strict enforcement of such things as modulation, processing, power levels, directional patterns, frequency stability and harmonics."

Wait just a minute. Aren't these the same people who welcomed deregulation of technical standards just a few years ago? Aren't these the same folks who said that rules of all kinds should be relaxed as a way to encourage greater profitability and, thereby, better serve the listening public? Aren't these the same guys who wanted government to "get off our backs"? I concede that it is childish and non-productive to say that we — the engineering community — told you so, but, well, we told you so.

Although I applaud the NAB suggestion and hope desperately that the commission will forge the request into law, it is more than just a little ironic that the call for tighter technical rules should come from management types, not us techies in the back room with shirt pocket protectors.

The issue of reregulation already has been addressed by NAB and others insofar as AM is concerned. It also is, in fact, just as applicable to FM and television. The point has been raised with AM first because AM is in a weakened state. The technical repercussions of overenthusiastic deregulation also will come home to roost for the other services, eventually. Just wait.

The phrase "good engineering practice" isn't just something engineers dreamed up to ensure job security. It's good business.

Jerry Whitaker,
associate publisher

# THE STANDARD IN LEVEL CONTROL

Orban's Industry standard automatic level control units excel for one simple reason: They offer extraordinarily transparent control action on a wide variety of program material. Whether being used for multi-track recording or on stereo mixes, Orban compressor/limiters can be counted on to maintain transparency and dynamic integrity while efficiently controlling levels and peaks, with few audible artifacts.

**464A Co-Operator™ (Gated Leveler/Compressor/HF Limiter/Peak Clipper):** A four-stage, system approach to level control. Features quick set-up with straightforward front panel controls. Two channels in one rack space. Your "assistant operator" for a wide range of production chores. Astonishingly transparent and easy-to-use.

**422A/424A Gated Compressor/Limiter/De-Essers:** A full featured, "hands-on" production tool. Designed to allow maximum control of individual parameters such as compression ratio, and attack and release times. Contains an effective de-esser. Ideal for voice processing. Widely recognized for its smoothness. 422A mono/424A dual-channel/stereo.

**412A/414A Compressor/Limiters:** Orban's inexpensive compressor/limiters. Utilize the same basic circuitry as the 424A, but do not include the de-esser, nor the gating. A THRESHOLD control makes them ideal for sound reinforcement. Very effective for basic, cost-effective level control. 412A mono/414A dual-channel/stereo.

**787A Programmable Mic Processor:** Combines a compressor having adjustable release time with 3-band parametric EQ, de-esser, and noise and compressor gates in a fully programmable package. Designed for voice talent processing, the unit can be used to store 99 commonly-used instrumental and vocal settings for instantaneous recall. MIDI, RS-232, and remote control interface options.

**Optional Security Covers:** Attractive, acrylic security covers are available to fit standard 19" rack-mount products—from one to four rack spaces, in opaque white, clear, and transparent blue.

orban

LISTEN TO THE DIFFERENCE.

**Orban** a division of AKG Acoustics, Inc.
645 Bryant St., San Francisco, CA 94107 (415) 957-1067 Telex: 17-1480 FAX: (415) 957-1070

# FCC update

## Comments on cable issues sought

**By Harry C. Martin**

The commission initiated an inquiry proceeding last December into the cable TV industry's operation under the 1984 Cable Television Act. Based on the proceeding's results, the commission will submit a report to Congress later this year analyzing the effect on the video services marketplace of substituting market forces for cable rate regulation. The study is being made pursuant to a congressional directive in the 1984 Cable Act.

The commission is asking for comments on the following issues:

- The impact of the Cable Act on local cable regulation, which includes rates, city/cable regulations and quality of cable service.
- Other remedies to encourage competition, which include amending the Cable Act to require two or more competing cable systems in each community, and exploring the competitive potential of home satellite dishes, CBS and wireless cable.
- Remedies to encourage competition, which include leased access.
- The interplay between must-carry rules and the compulsory license.
- Regulatory remedies, which include rate regulation and trafficking restrictions.
- The effects of horizontal concentration and vertical integration on competition.

The commission will convene three field hearings as part of its proceeding. The first, held in Los Angeles on Feb. 12, focused on the impact of the Cable Act and subsequent cable TV developments on program supply and the program production community. A second hearing, to be held in Orlando on March 2, will address the state of competition to the cable industry and the future direction of cable technology. The final hearing, to be held in St. Louis later in March, will address the Cable Act's impact on local cable regulation, particularly in the areas of cable/city relations and service quality.

### Broadcast fees to increase

As part of the Omnibus Budget Reconciliation Act of 1989, the Communications Act has been revised to increase and expand the schedule of charges imposed by the commission for selected regulatory services. The fees for broadcasting services will be increased as early as June 1.

| | From | To |
|---|---|---|
| **1. Commercial TV stations** | | |
| a. New and major change construction permit application fee | $2,250 | $2,535 |
| b. Minor changes fee | $500 | $565 |
| c. Hearing charge | $6,000 | $6,760 |
| d. License fee | $150 | $170 |
| e. Renewals | $30 | $100 |
| **2. Commercial radio stations** | | |
| a. New and major change construction permits | | |
| (1) AM station application fee | $2,000 | $2,255 |
| (2) FM station application fee | $1,800 | $2,030 |
| b. Minor changes application fee (AM & FM) | $500 | $565 |
| c. Hearing charge | $6,000 | $6,760 |
| d. License fee | | |
| (1) AM | $325 | $370 |
| (2) FM | $100 | $115 |
| e. Directional antenna license fee | | |
| (1) AM | $375 | $425 |
| (2) FM | -0- | $355 |
| f. Renewals | $30 | $100 |
| **3. FM/TV translators and LPTV stations** (New and major change construction permits) | | |
| a. Application fee | $375 | $425 |
| b. License fee | $75 | $85 |
| c. Renewals | $30 | $35 |
| **4. Station assignment and transfer fees** | | |
| a. AM, FM and TV commercial stations | | |
| (1) Application fee (Forms 314/315) | $500 | $565 |
| (2) Application fee (Form 316) | $70 | $80 |
| b. FM/TV translators & LPTV stations | $75 | $80 |
| **5. Auxiliary services** | | |
| a. Application fee | $75 | $85 |
| b. Renewals | $30 | $35 |

**The following are new fees not included previously in the FCC fee schedule:**

| | |
|---|---|
| 1. Remote control/AM | $35 |
| 2. Call sign modification (AM/FM/TV) | $55 |
| 3. STA (other than to remain dark/silent) (All services) | $100 |
| 4. Extension of time to construct or replace CP (AM/FM/TV) | $200 |
| 5. Petition for RM for new community of license (TV/FM) or higher-class channel (FM) | $1,565 |
| 6. Ownership report (AM/FM/TV) | $35 |

***Table 1.** A summary of the new filing fees for commercial broadcast stations.*

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

# The cost of quality digital effects...


# ...just took a tumble!

GVG's exciting new DPM-100 Digital Picture Manipulator puts a full array of exciting digital effects at your fingertips — for an incredibly low price.

The newest member of GVG's popular Model 100 Production System family, the DPM-100 gives you standard effects only available as expensive options on other systems. Including spin and orbit around variable axes, skew, mosaic, posterization, solarization, false color and cropping.

And there's a lot more. The DPM-100 gives you an optional *full function, full bandwidth second channel.* Including a standard *priority dissolve combiner* for spectacular shadow and dissolve effects.

For even more power, the DPM-100 gives you a *recursive memory* option for star, decay and strobe trails. Not to mention other standard high-end features like a luminance and linear keyer, STREAMLINE™ Effects Controller with disk drive, and GVG's E-MEM® Effects Memory System — all in a three rack unit frame.

Once you take the DPM-100 for a spin, you'll flip! Get all the details today from the GVG office nearest you.

cost cost cost cost cost

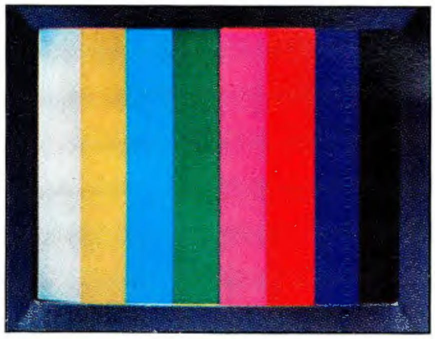
**Grass Valley Group®**

A TEKTRONIX COMPANY

THE GRASS VALLEY GROUP INC.
P.O. Box 1114, Grass Valley, CA 95945 USA
Telephone (916) 478-3000 TRT: 160432
FAX (916) 478-3187

OFFICES: New York (201) 845-7988; District of Columbia (301) 622-6313; Atlanta (404) 493-1255; Miami (305) 477-5583; Chicago (219) 264-0931; Minneapolis (612) 483-2594; Dallas/Fort Worth (817) 483-7447; Los Angeles (818) 999-2303; GVG International Ltd. (U.K.) + 256-817817; Grass Valley Group Asia (HK) + 852-3-7874118; Grass Valley Group Sud America (USA) (305) 477-5488.

**Circle (6) on Reply Card**



# Review your local EBS tests

**By Tim McCartney**

If the FCC inspects your station, it is certain to scrutinize your EBS testing procedures. From a business standpoint, it is clearly a better decision to conform to the rules than to pay a fine for a violation. FCC field operations bureaus are not allowed to be discretionary about issuing fines for inoperative EBS equipment. A fine, usually $1,000, is mandatory.

### Who must run tests

Every TV station must have operational EBS equipment and participate in the weekly EBS testing, even if the station is categorized as "non-participating EBS." Although originating LPTV stations are not required to send such tests, the monitoring and logging rules still apply.

The commission released a list last year of problems that frequently surface during station inspections. It includes these EBS-related violations:

- missing or non-functional EBS monitors.
- failure to receive or transmit weekly EBS tests.
- failure to log EBS tests.
- lack of a current EBS check list or authenticator word list.

### Weekly tests

Local tests must be transmitted on a random basis once each week, between the hours of 8:30 a.m. and local sunset. The formal FCC terminology for these tests is the weekly Emergency Action Notification (EAN) transmissions. Because the primary EBS station that your station monitors also follows this schedule, you should receive a test from this station.

### Log and investigate

Each test must be logged so it can be shown to an FCC inspector. Most stations use the existing transmitter/operating log to note the date and time of the tests, as well as the name of the operator making the entry. If the tone generator is not functional for a given week's test, the script is still to be aired without the tones, and this action must be logged.

The station's chief operator is required to review the EBS notations once a week.

McCartney, an SBE-certified senior engineer, works as a contract engineer in Bemidji, MN.

The most prudent approach is to verify at the end of each week that the test has been transmitted; this allows rescheduling if necessary. If a test was not run, the chief operator must find out why. Was the test scheduled? Did the operator run the test but forget to make the log entry? The findings must be logged.

The investigation on the receive side is a little more difficult. A call to your primary EBS station should reveal when the test was sent. From there, a check with the operator on duty may reveal the nature of the problem. Again, log the reasons.

### FCC inspections

One FCC visit last year revealed a typical procedure for checking EBS compliance. The inspector reviewed a few weeks of logs, checking for the appropriate EBS entries and noting when tests were received. This allowed him to later compare entries with other stations inspected in the same market. A comparison would uncover any fabrications. The inspector asked the on-air operator to transmit a local test. The purpose of this was to verify the operator's EBS competence and check the operational status of the 2-tone generator. While the tones were being broadcast, the inspector observed the audio modulation monitor to verify that the required 40% level was obtained. He also wanted to see the EBS check list and current authenticator word list (sealed in the red envelope).

The inspector offered a few details on how he handles fines for EBS violations. He would not issue a fine for the absence of one week's EBS log entries; he would, however, if several weekly tests were missing. If a station's EBS equipment is not functional at the time of the inspection and this status is not so logged, a fine is sure to be levied. Likewise, a fine would be a certainty if the equipment had not been working properly for six months.

### EBS test script

In 1987, the commission amended its rules to permit the weekly test script to include the types of emergencies likely to occur in a particular region. This followed a request from California broadcasters who wished to identify earthquakes as among the emergencies in which EBS will be used. In 1989, the National Association of Broadcasters called upon the commission to permit inclusion of references pertaining to the availability of air raid shelters, Red Cross centers or hospitals.

The commission makes optional the use of call letters in place of the term "this station" in the second sentence of the required copy. The EBS check list (revised in 1987) contains the updated script, including the two optional sections.

### Equipment requirements

The 2-tone generator must provide tones of 853Hz and 960Hz, with each frequency off by no more than ±0.5Hz, with distortion less than 5% at the output. Upon activation, the tones must appear simultaneously for 20 to 25 seconds. Once broadcast, the two tones must modulate the transmitter at least 40% and be within 1dB of each other. Because 40% may be a problem for some audio-processing setups, some EBS generators allow program lines to "loop through," so that processing may be bypassed. On the video side, a TV station must display the appropriate EBS slide.

The EBS receiver must activate from eight to 16 seconds after sensing the two transmitted tones, enabling reception of tones for a period of four to 17 seconds. The receiver must not respond to tones that vary more than ±5Hz from each of the two frequencies. However, if continuous monitoring by the station staff is the method of EBS reception, this automatic sensing circuit is not necessary.

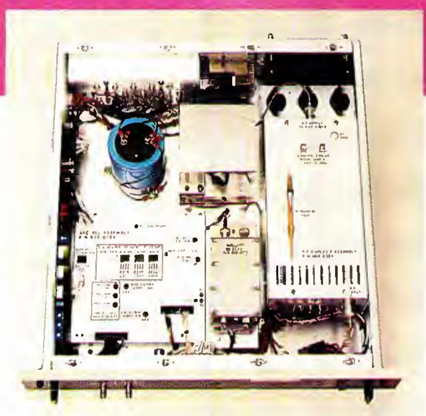
And, of course, the EBS equipment must be FCC-certified.

### Learn from others' mistakes

Review these practices now in order to avoid fines. Start with your chief operator to ensure that the requirements are being met. Buck-passing won't work with the commission. The licensee is ultimately responsible for meeting regulations.

# New FX 50 Exciter

## Audio Performance That Rivals CD's

**THD and IMD 0.003%, 93 dB S/N, 50 Watts**

Broadcast Electronics introduces the ultimate FM Exciter - the new FX 50 - with performance even superior to the world standard FX 30.

***CD Sound***
The new FX 50 Exciter has the lowest distortion of any exciter available with THD and IMD of 0.003%.*

**Move Up To CD Standards**
Every new "B" Series FM Transmitter incorporates the FX 50 for true CD transparency. And, the FX 50 is the ideal retrofit for your present exciter.

***CD Dynamic Range***
With a signal to noise ratio (S/N) of 93 dB* the FX 50 can handle all of the nuances and power of compact discs.

***Set It And Forget It — 50 Watts***
Sophisticated automatic control systems assure stable reliable 50 watt MOSFET power output even under mismatch conditions.

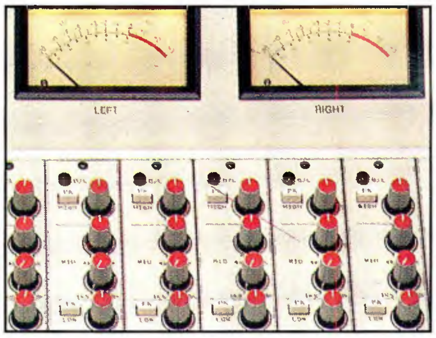
*Typical

For information on the FX 50 Exciter and on Broadcast Electronics' new "B" Series FM Transmitters which incorporate the new FX 50 Exciter, call Bill Harland or Russ Erickson at 217-224-9600.

**BROADCAST ELECTRONICS INC.**

4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305, (217) 224-9600, TELEX: 250142, FAX: (217) 224-9607

Circle (7) on Reply Card




## Check the array of your DA

**By John Battison, P.E.**

Sometimes a directional antenna system will not directionalize properly. It could be a new DA that must be tuned for the first time or it may be an existing DA that has begun to show its age. Whatever the reason, when it comes time for retuning a DA system, you need to consider carefully what is involved.

### Changes over time

Many engineers have attended to the average array, and over the years it can wander out of adjustment. This change is not always apparent; the monitor points (MPs) may not be high, but a little on the low side. In this case, there is no need to make unnecessary corrections because they are within the FCC's limits. Unless the PD complains that coverage is down, not much action is taken. The MPs that are examined critically often are those with low values, in minor lobes or low-signal radials.

In the case of a normally low monitor point, the emphasis is on keeping the MP within limits. Even if the signal is low, often it is considered "so much the better" because there is less chance for a potential violation.

Whatever the cause, the day will come when the DA must be retuned. If the array has been in use for more than 10 years, a full DA proof will reveal much more than a partial. The disadvantage of a full proof is that it requires a non-directional proof to be run. Unless the station is a DA-N operation with normal non-DA daytime operation, management will resist running at 25% of normal daytime DA power while you complete the non-DA proof.

### What's the resistance?

How many DA operators know the exact value of their station's common point resistance? Although the common point current might have been maintained at the licensed value, the resistance could have gone up or down. Some station engineers may not even realize that a change occurred. Several years ago, there was talk that the FCC eventually would require that all new DAs have an in-line bridge located at the input of every phaser. A portable O-I-B is far more useful. A fixed CP bridge is limited to one point.

As the common point value changes over time, CP current is adjusted as necessary to keep the parameters legal. Today, base currents seldom are read. The ratio shown on the antenna monitor often is taken as gospel. Even if the base currents are read, it is the current ratio that is frequently used as proof of legality.

### Make the measurements

If you decide to run a full proof, performing the non-DA runs is easy; the most difficult task usually is eliminating the effect of the unused DA towers. This requires that you determine the operating impedance of the non-DA tower and then match it, removing its effect from the pattern.

***Several professional computer programs can help you recalculate design parameters before starting a proof.***

The *nuances* of detuning unused towers are many and generally are well-known. The process requires floating ¼-wave and grounding ½-wave towers. If, after making a non-DA proof, the pattern is non-circular for no apparent reason (such as adjacent towers or other potentially disturbing tall objects), you must address the question of unused tower interference.

A field-strength meter can detect the problem easily. Couple the sampling line from the tower to the RF input on the front panel of the field-strength meter. Record the RF induced in each tower. If the readings from any tower are excessive, a simple resonant or anti-resonant circuit can be connected to the unused towers and tuned for minimum tower effect.

### Locate the station's roots

If you are lucky, the station's original consulting engineer would have calculated all the phaser and ATU element values for setting up the original array. Now you are ready, or are you?

If no changes were made since the original array was designed and built, you *may* be ready. Ask yourself if anything has changed in the ATUs, transmission lines, sampling lines or tower lighting system. Have any RPU, STL or mobile radio antennas been added to any tower? If so, you are *not* ready.

Even if nothing has changed since your station was tuned, the consulting engineer's original individual element impedance values probably are not close to what you need today. Even when new, the calculated values seldom are an exact match with the final tuned values. In the past, it was not uncommon for the array design parameters to be less than 100% efficient.

DAs were designed using mechanical comptometers, which helped expedite long and tedious calculations. They did not always produce the best array design, however. An engineer, tired after days of working his mechanical computer, might think of a workable array and use that rather than continue on the computer and, perhaps, find a better set of operating design parameters.

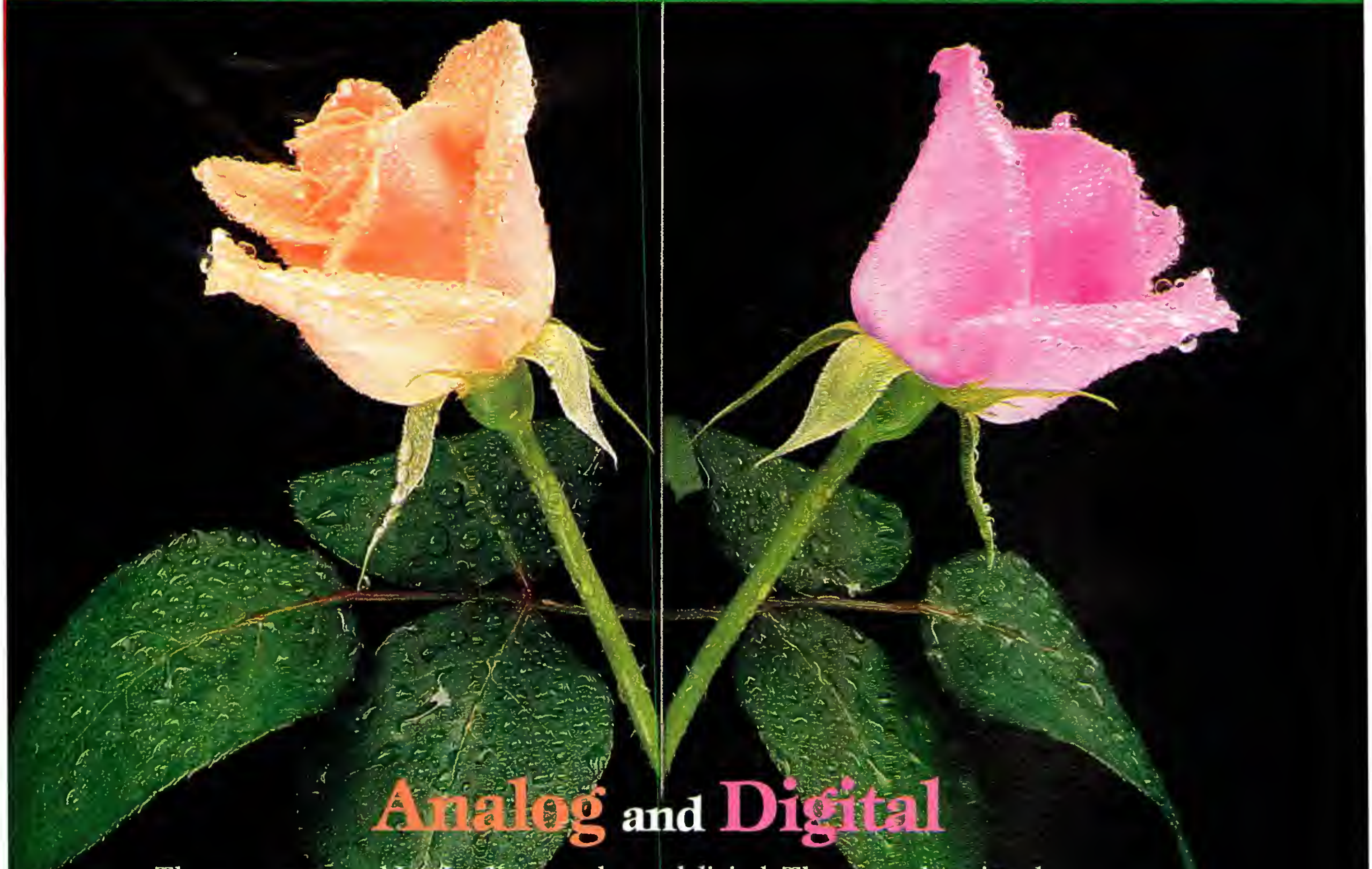
It might be worthwhile to spend a little money and hire a consulting engineer or one of several services that will compute the array parameters required to produce your desired patterns, possibly improving upon your original design. This is not a scheme to modify your license, but rather a check of what the system is supposed to do and how well it is doing it.

Several professional computer programs can help you recalculate design parameters before starting a proof. If your station will not pay for a complete set of calculations, try for a calculation of reactances in the phaser and the ATUs, which will provide much useful information before you begin the adjustment process.

Next month, we will continue to bring your array back into tolerance. You will need an accurate schematic with all the component values marked, any original documentation, an OIB and a generator.

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

# Dual Domain Audio Testing



## Analog and Digital

There are two worlds of audio . . . analog and digital. These two domains share many basic attributes but when it comes to audio testing, they're distinctly different. Until now custom hardware was needed to test digital audio devices in their own domain. Now the **System One Dual Domain** combines both analog and digital testing capability in one unit.

**ANALOG** audio testing with **System One Dual Domain** is even more comprehensive than before. Data acquired can be further analyzed using the Digital Signal Processor, which adds harmonic analysis, waveform display and FFT spectrum analysis to the already extensive list of System One's capabilities. New version system software supports color VGA graphics and on-screen cursor function with numeric readouts.

**DIGITAL** audio testing directly in the digital domain is available for the first time. **System One Dual Domain** provides signal generation, analysis and Input/Output capability and also mirrors familiar analog measurement techniques, now implemented digitally. The multiple-DSP architecture supports both AES/EBU serial and two-channel parallel inputs and outputs at a variety of sampling rates.

**Integrated analog and digital domain audio testing . . . only from Audio Precision.**

System One

Audio precision

P.O. Box 2209, Beaverton, OR 97075
503/627-0832 1-800/231-7350
FAX: 503/641-8906, TELEX: 283957 AUDIO UR

Circle (8) on Reply Card

ERNATIONAL DISTRIBUTORS **Austria, Eastern Europe:** ELSINCO elektron GmbH 222871751 **Benelux:** Trans European Music NV, Brussels (02) 4665010 **Canada:** Glentronix Ltd. 4758494 **China, Mainland:** Harvest Scientific and Technology Company Ltd. Hong Kong 5-742983 **Denmark:** npn Elektronik ApS 86-57 15 11 **Finland:** Into OY 0 755 7711 **France:** Mesureur (1) 45 83 66 41 **Germany, West:** FTW GmbH 2270913C **Hong Kong:** TRP Consumer Electronics, Ltd 5-887 2008 **Italy:** Medea S.r.l 24-53828 **Japan:** TOYO Corporation 32790771 ...a: Myoung Corporation 784 9942 **Mexico:** VARI S.A. 250 7394 **New Zealand:** Audio & Video Wholesalers, Ltd. 7173414 **Norway:** Lydconsult 09 19 03 81 **Portugal:** Acutron ELA 251 40 87 ...apore & Malaysia: TME Systems PTE Ltd 236 4608 **Spain:** Telco Electronics S.A. 231 7840 ...

# Uncommon engineers

## K. Blair Benson

**By Elmer Smalling III**

He is an engineer whose career has spanned almost every phase of TV broadcast engineering. Appropriately, his birth coincided with what is now considered the beginning of the electronics age. K. Blair Benson was born in New York City during the height of the careers of Nikolai Tesla and Thomas Edison. He attended school in New York and, in 1941, was graduated from Worcester Polytechnic Institute, Worcester, MA, as an electrical engineer.

Upon joining General Electric Company, he worked in the radar and short-wave radio design departments. It wasn't long until Benson became project manager in the projection TV receiver section of GE. Those who remember early TV receivers will recall that some used small, 4- or 6-inch picture tubes that faced outward from the set. GE models, however, had a small picture mounted internally and used mirrors and lenses to project a picture on a large screen.

Benson's next career stop was United States Television, where he held the position of assistant chief engineer. In 1948, he began a 25-year career with CBS Television. As senior project engineer, he was in at the beginning when CBS began full-scale commercial television. Grand Central Station housed the network's first studios, and the transmitter and antenna were atop a skyscraper on Manhattan's East Side.

Up to this point, all TV programming (except for theatrical movies) was live. There was no such thing as broadcast-quality videotape recording, although many groups had working models that resembled large reel-to-reel audio recorders. On April 14, 1956, CBS and Ampex unveiled the first videotape machine, using rotating heads, which was suitable for broadcast service. The inaugural broadcast using videotape was on Nov. 30, 1956, at CBS Television City, Hollywood. Benson, for CBS, and Charles Ginsburg, for Ampex, jointly won the Emmy for Best Engineering that year.

Benson worked on solving many of the problems inherent in early videotape recording. This was important work because, although the accepted practice was "live" television, which many stars were hesitant to change, there was an overwhelming need for high-quality recordings. The recorded programming was needed to fill the delay that occurred during refeeds of the network's Central and West Coast time zones.

*Profile*

- *Broadcast consultant*
- *Instrumental in the inception of full-scale commercial television*
- *Instrumental in the development of videotape for broadcast*
- *Helped design the CBS Broadcast Center in New York*
- *Served on JCIC/SMPTE ad hoc committee for color TV standards*
- *Helped develop VIR signal*
- *Created 600-hour course on broadcast equipment engineering and maintenance for the New York School of Television Arts*
- *Edited "Television Engineering Handbook" and "Audio Engineering Handbook"*
- *Married, with four children and four grandchildren*
- *Hobbies: amateur radio, sailing, swimming*
- *Awards:*
  *Emmy for Best Engineering, 1956*
  *Fellow, Society of Motion Picture and Television Engineers*

In 1961, as manager of audio and video systems for CBS, Benson helped design the New York CBS Broadcast Center on West 57th Street, which is still active today. The building, which began as an old milk-processing and delivery facility, was totally redesigned. It was converted into the most modern and technically advanced TV studio of the time by Benson and his engineers.

As a Fellow of the Society of Motion Picture and Television Engineers (SMPTE), Benson served on the JCIC/SMPTE ad hoc color TV standards committee. This important committee worked toward the improvement of the fidelity of color TV transmission. One of the most important developments of Benson's committee was the VIR signal, which provides each TV set with a color phase reference of the broadcast TV signal during the vertical interval. Before VIR, viewers had to adjust the hue control each time they changed channels and, in some cases, when a station went from local to network programming or from live to tape.

In 1972, Benson joined Goldmark Communications, a consulting group in Stamford, CT, as director of audio and video engineering. In 1974, he was appointed vice president for engineering. That same year, Benson urged the TV industry to investigate wide-screen, high-definition television to be transmitted to the home via cable or microwave. In the late 1970s and early '80s, many pay-TV services did use microwave for transmission of premium movies to the home using the standard TV format, especially in markets where cable had not established a foothold.

Benson later held the posts of vice president of engineering and director of operations for Video Corporation of America, a videotape production house in New York. In 1980, he founded his own consulting firm, based in Norwalk, CT. One of his major activities as a consultant is preparing educational course material. Benson has created a 600-hour course on broadcast equipment engineering and maintenance for the New York School of Television Arts, as well as handbooks and manuals for other major communications corporations.

Working with McGraw-Hill Publishing, he edited the 1,500-page "Television Engineering Handbook" in 1986 (the first edition was edited by Don Fink in 1957), followed in 1988 by the 1,000-page "Audio Engineering Handbook." He is working on a book, "HDTV: Advanced Television for the 1990s," to be published later this year.

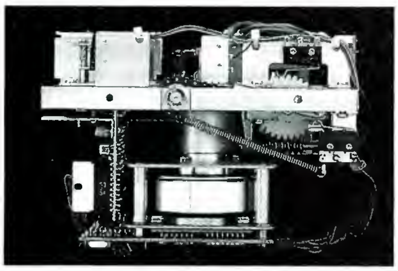
Benson's interests, besides his four grandchildren, include amateur radio (W1IGR), sailing and swimming. This uncommon engineer continues his excellent record of improvement to our industry through his educational efforts and his eagerness to share with others his invaluable experience.

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

**Next month:** Ogden Prestholdt, consulting engineer, inventor.

# The cart machine with bells and whistles your audience will never hear.

Finally, a cart that delivers the creature comforts that other Otari audio machines have offered for years! And not only does Otari's CTM-10 make your job easier, it also delivers outstanding audio performance, so your output sounds more like a CD player than a cart.



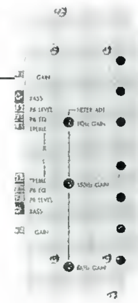
*Heavy duty, direct drive capstan provides accuracy and reliability.*

You get extensive metering, including dedicated metering for the cue-track. (Now you can verify the cue-tone *before* you go on-air!) And for adjustments to program length, there's a *true* vari-speed control.

You'll also find a record azimuth adjustment system *with phase display* for when you want to make the best recording possible.

But the CTM-10 is not all just bells and whistles. It's the only cart you can buy with HX-Pro.* That means that you can get a really hot signal off the tape, and still keep those high frequencies where they need to be for that crisp, clear sound.

And some things we keep real cool, like we don't use solenoids for our pinchroller because they can generate excess heat. You'll also appreciate the CTM-10's fast start time—it lets you cue up tighter without worrying about wow.

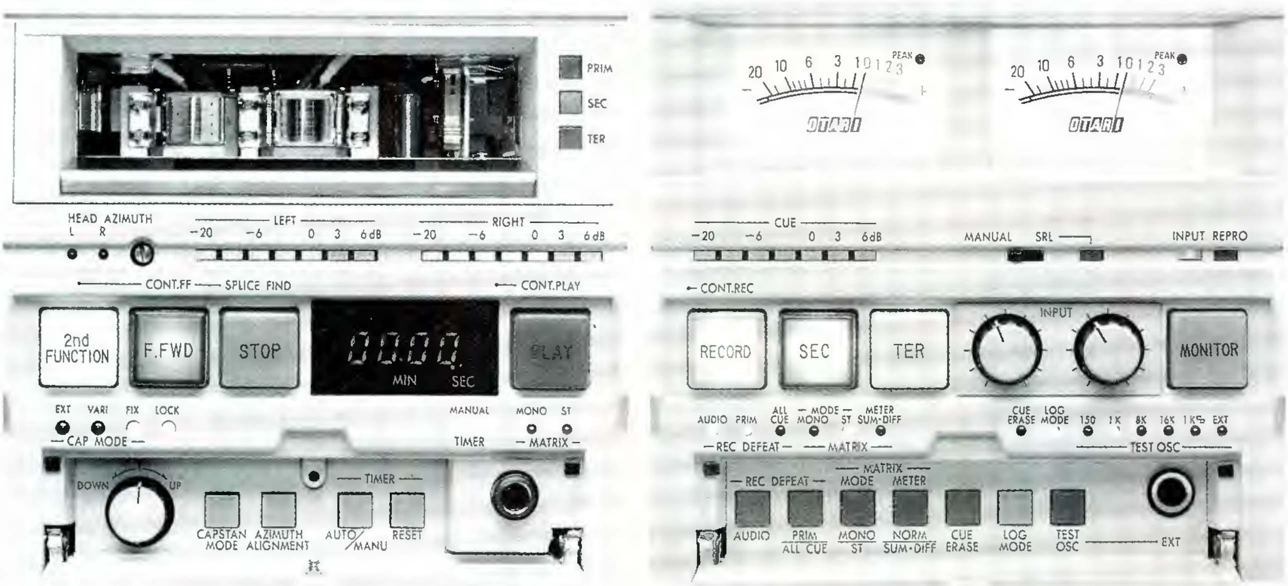


*Equalization adjustments are easy to reach and clearly marked, making maintenance and service fast and easy.*

And, of course, we give you choice. There are stereo *and* mono record/play decks, *and* a mono/stereo play-only deck.

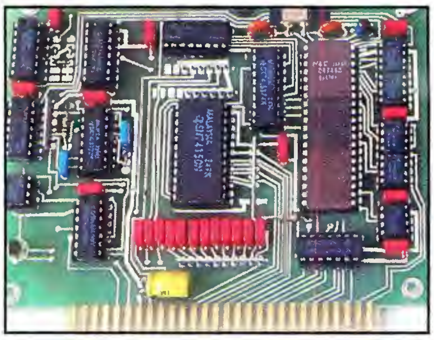
Call us at (415) 341-5900 for more information about the CTM-10. The cart machine we built for perfectionists.

OTARI®




*HX-Pro is a trademark of Dolby Laboratories Licensing Corporation

# Circuits



## More about Smith charts

**By Gerry Kaufhold II**

In typical use, Smith charts are drawn with the resistance component line horizontal. This facilitates the construction steps and makes it possible to use several important peripheral graphical tools.

### Standing wave circles and scales

Last month's "Circuits" column showed circles of constant VSWR (voltage standing wave ratio), labeled 1.5:1 VSWR and 2.2:1 VSWR. Where did these values come from? In Figure 1, find the scale labeled SWR. This is the scale at the upper left in the area labeled "radially scaled parameters." This scale begins directly under prime zero of the Smith chart and continues left, laid out in geometric scale. It begins at 1.0:1 SWR, which is the definition of SWR for perfectly matched impedances.

Kaufhold is a market development engineer for SGS-Thomson Microelectronics, Phoenix.

Using a straightedge, mark a vertical line from the 2.2 mark of the SWR scale. This line intersects the resistance component line at about 0.475 (step A of Figure 1). Align your compass between this point and prime zero, then draw the constant VSWR circle for 2.2:1 VSWR. Any plot of a normalized load impedance that lies on this curve will exhibit a VSWR of 2.2:1.

### Decibel scales

To take into account attenuation caused by line losses, move the straightedge to the right-hand tangent of the 2.2:1 constant VSWR circle, and drop a line down to the line labeled "toward load/toward generator" (step B). This is the upper side of the upper right scale in the area labeled "radially scaled parameters." The upper side of this scale is labeled "attenuation," 1dB per major division (0.2dB per each small division). Move the straightedge left along the attenuation scale exactly six small divisions (for 1.2dB attenuation) caused by line loss. Mark this point, align the compass between this point and prime zero, and draw another constant VSWR circle (step C).

### Finding the SWR of a constant VSWR circle

Move the straightedge to the left-hand tangent of the newly drawn constant VSWR circle. Align the straightedge to ensure a right angle, and drop a line down to the SWR line. Mark this point. Note that you have intersected at 1.5:1 SWR.

These steps have illustrated a practical problem: showing how a Smith chart can be used to calculate differences in VSWR, caused by line losses of 1.2dB, at opposite ends of a transmission line.

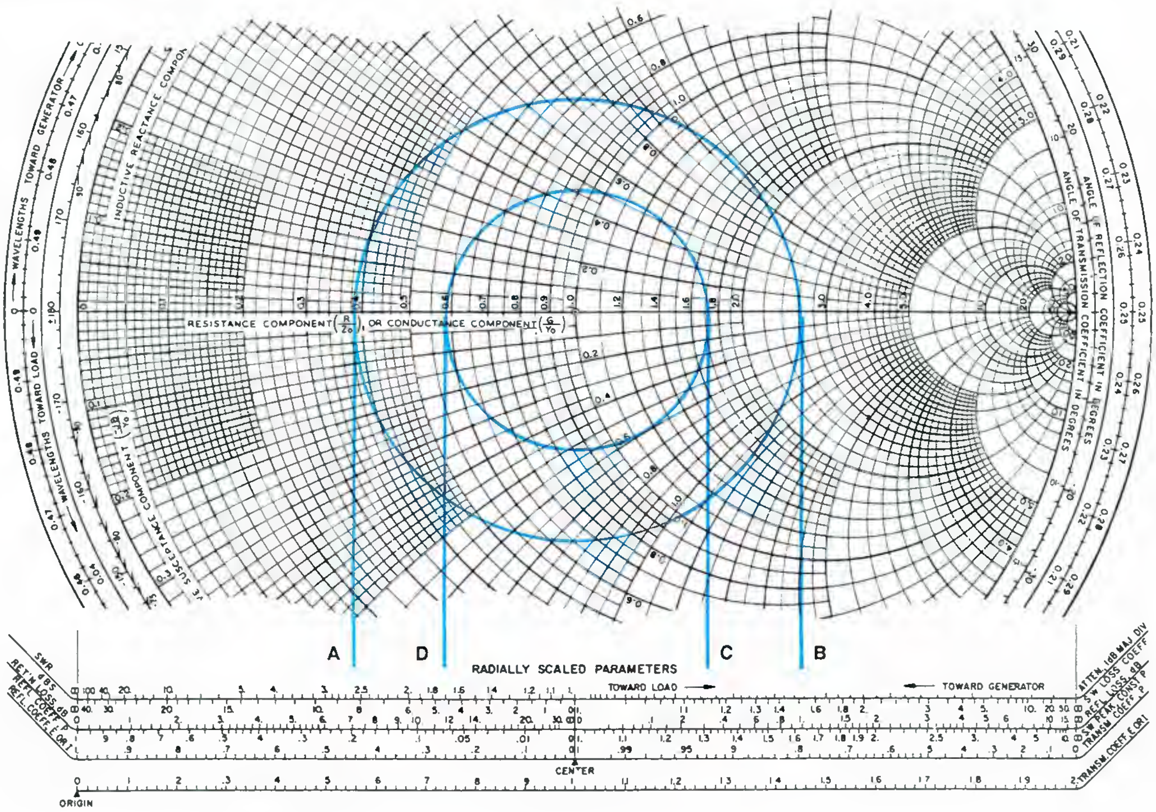



*Figure 1. SWR circles plotted on a Smith chart. (Chart top and bottom cropped for space.)*


# The Audio Processor Classic. And the one that endures.

In the arduous two-year development project that produced the 8100A OPTIMOD-FM®, there was always one overriding principle:

> While providing competitive loudness where needed, the processor must have an utterly natural, musical sound that not only attracts an audience, but holds it.

Processing artifacts that cause listener fatigue and tune-outs were simply unacceptable. Loudness at the expense of good sound is never worth the price. (A listener can compensate for loudness by simply adjusting the volume control. But there is *nothing* the listener can do to make a dirty signal sound clean again, except change to another station!)

The development project resulted in a *classic*. The most popular FM processor *ever*. The processor that helped build audience and ratings for thousands of stations. The processor that was the unchanging, indispensable core of countless customized processing setups. The processor with impeccable quality and rock-solid reliability. And the processor backed up with uniquely responsive Customer Service.

Today, OPTIMOD-FM has evolved into a complete system capable of serving any processing goal, and of fitting into any STL environment, thanks to OPTIMOD-FM's accessories. While other processors have come and gone, OPTIMOD-FM's audio quality has yet to be equaled any anyone, regardless of their bells, whistles, or flashing lights. It's the right choice for any station — because it's the one processor that you won't throw away.

OPTIMOD-FM 8100A/1. The Audio Processor Classic. The one that endures.

Call your Orban Broadcast Dealer for our *new* OPTIMOD-FM brochure, or call us direct.

orban

a division of AKG Acoustics, Inc.

645 Bryant Street, San Francisco, CA 94107 USA

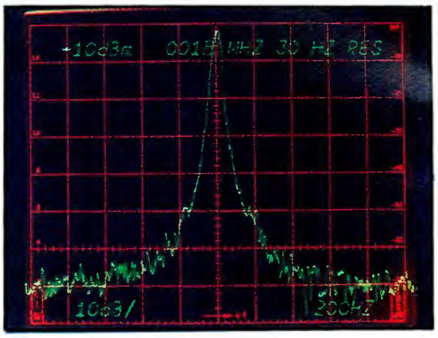
Telex 17-1480 FAX (415) 957-1070

**Telephone (415) 957-1067 or (800) 227-4498**

**Circle (10) on Reply Card**

Part 9

# Troubleshooting



## CD troubleshooting

By Brad Dick, radio technical editor

Exactly what will happen when your CD player encounters a large scratch is impossible to predict. What we do know is that some players seem to be better than others at handling inconsistencies in data and tracking errors.

Because parameters such as these are not discussed in the operator or maintenance manuals, it is difficult to gauge the sophistication of a player's error-correction system. In general, it's not safe to conclude that the more expensive professional models offer better correction schemes than the inexpensive consumer units. The pro models, however, may be more tolerant of CDs that contain a high number of defects.

The entire process of using a tracking test disc, unfortunately, is a subjective one. There is no objective way to test a player's capability to track or correct for disc errors. The test disc can only simulate commonly encountered errors. Manufacturing variances and user-caused damage cannot be replicated precisely with this measuring system.

No single test criterion should be used to evaluate player performance. For example, two players may differ only in their ability to track the wedge segment. A player that can track the 900$\mu$m wedge is not necessarily better than a unit that cannot; other factors should be considered.

### EIA measurement standards

The Electronic Industries Association (EIA) recently adopted standards for measuring the audio performance of CD players. These standards, described in Standard 560, are designed to help consumers make comparisons among different CD players. They apply to domestic reproducing equipment and outline the measurement methods and form of disclosure of a player's performance characteristics.

The EIA standards list these 15 primary test results to be used in rating CD players:

- Frequency response.
- Signal-to-noise (S/N) ratio.
- Dynamic range.
- Total harmonic distortion plus noise (THD + N).
- Channel separation.
- De-emphasis error.
- Wow and flutter.
- Intermodulation distortion.
- Phase difference between channels.
- Level difference between channels.
- Output voltage.
- Pitch error.
- Access time.
- Level linearity.
- Linearity with dither.

The standards are designed to eliminate misunderstandings between manufacturers and consumers, facilitate interchangeability, improve products and assist selection of the proper product.

The EIA test signals are contained on a disc, CD-1, available from CBS. If you can't obtain that disc, you may be able to find one of several others that contain the same type of test signals. See Table 1 for a summary of these discs.

Alternative discs are noted as follows. A single letter indicates the manufacturer, and a number indicates the track for the particular measurement.

| MANUFACTURER | PART NO. |
|---|---|
| D= Denon | 33C39-7441 |
| J= Japan Audio Society | YDDS-1 |
| P= Philips | 410-056-2 |
| $S_2$= Sony | YEDS-2 |
| $S_7$= Sony | YEDS-7 |
| T= Technics | SH-CD001 |

| SPECIFICATION | TRACK | TRACK NUMBERS FOR ALTERNATIVE DISCS |
|---|---|---|
| Frequency response | 1,6-10 or 11 | J8-38, P2, $S_2$2-11, $S_7$2-11, T4-16 |
| Signal-to-noise ratio | 4 | D6, P18, $S_2$21, $S_7$23, T19 |
| Dynamic range | 5 | P7, 11, $S_2$18, $S_7$20, T30 |
| THD | 6-10 | P4, 8, $S_2$2-11, $S_7$2-13, T4-16 |
| Channel separation | 2-3 | P4, 8, $S_2$26-29, 30-33, $S_7$29-36, T24-41 |
| De-emphasis error | 12 | $S_2$36-38, $S_7$37-41, T48-50 |
| Wow and flutter | 15 | J30, P19 |
| IM distortion | 13 | J46, 47, P16, $S_2$22, 24, $S_7$25, 27, T42, 44 |
| Phase difference | 10 | $S_2$11, $S_7$13, T16 |
| Level difference | 1 | J25, P4, 8, $S_2$1, $S_7$1, T1 |
| Output voltage | 1 | J25, P2, $S_7$1, T1 |
| Pitch error | 10 | J38, P4, $S_2$11, $S_7$13, T16 |
| Access time | 1,2,15,16 | Any disc with multiple tracks |

***Table 1.*** *The EIAJ CD test disc contains all the test signals needed to measure compliance with the matching performance tests. If you can't obtain that disc, several alternative discs provide the same test signals.*

### Perform your own tests

Making the tests on your CD player is not as simple as it may seem. Compared with analog sources, CD players call for a greater degree of precision to accurately document performance. In some cases the performance factors are several magnitudes greater than what you may have measured with analog equipment. Even so, it's worth looking at some of these parameters.

An important key to making valid tests is an accurate signal source. Several test discs are available that meet either EIA or EIAJ specifications, which are practically identical. Table 1 includes summaries of the tests and where the test signals can be found on the discs. Keep in mind that these test discs measure the performance of the CD player. Unlike other discs, they are not designed primarily to act as a substitute for an audio generator.

# "We've always known JVC makes great cameras...

*...so we were especially interested to hear about their new KY-25U three chip camera. We've been looking for a camera that offers at least 700 lines of resolution, can dock with our component VTR's, and won't eat up our limited budget."*

JVC's engineers specifically designed the KY-25U to be a versatile camera, with multiple signal outputs for docking to any component VTR, satisfying all the rigorous demands of field acquisition. Plus, it's well balanced, comfortable and feels great to use.

It's an outstanding camera that will give you over 700 lines of resolution to take advantage of today's superior recording formats like S-VHS, MII and Betacam. Three 2/3" high density CCDs, each with 360,000 effective pixels and a signal-to-noise ratio of 60dB, ensure exceptional picture quality.

Compare the KY-25U's compact size and advanced features including high speed shutter, stereo audio, advanced circuitry and much more. You'll agree...for price and performance there is just no better camera available today.

For further information call 1-800-JVC-5825 or write JVC PROFESSIONAL PRODUCTS COMPANY, 41 Slater Drive, Elmwood Park, NJ 07407.

**JVC®**
**PROFESSIONAL**


Circle (11) on Reply Card

# Think first, judge later

**By Brad Dick, radio technical editor**

It was a cold December morning in Kansas as I arrived at work. I noticed that the snowplow had created piles of fresh snow around the corners of the parking lot. Although the lot was cleared, the path to the office door was blocked by a car. To enter the building, I had to walk around the car and trudge through a foot of snow. "How thoughtless can people be?" I thought.

I continued my trek into the office, thinking about that car blocking the door. I stood inside the doorway stomping my feet to shake the snow off my trousers.

Cheryl, the receptionist, approached on crutches, with both legs in braces. She said hello as I held open the door so she could return to her car, which was parked across the pathway. As she ever-so-slowly inched her way to her car, I replayed in my mind what had happened. I was now feeling sorry for Cheryl, and also feeling guilty about my earlier thoughts of anger and frustration.

Nothing had changed. The car was still blocking the pathway, and my trousers and shoes still had snow on them. Yet, I was no longer angry and irritated. Why?

### Be responsible for your thoughts

The situation had not changed, but my *attitude* had. When I understood the reasons for the car being parked in front of the door, the inconvenience I experienced seemed insignificant.

How many times do we let situations control our emotions? We judge others every day. If they do not act as we think they should, we get upset and label them and their behavior. If we do not say anything to the other person, hidden feelings can create mistrust and tension.

When I was a teenager, I sat at a corner in my brand new, bright-red Ford, waiting for the stoplight to turn green. It was a 1-lane road, with a median on one side and a curb on the other. As I grooved to the radio, a car sped up behind me and the driver honked the horn.

Being the typical "youth in the know," I made a rude gesture to the errant driver. Undaunted, he continued to honk and wave his arm out the window, motioning me to move on. Of course I would not move; the light was still red.

Finally, the light turned green and we both continued across the intersection. As the other car sped past me, I again made a rude gesture to the other driver. "Just who does he think he is?" I thought. "He has no right to drive like that."

Four blocks down the road, I spotted the same car parked at the emergency-room entrance to the hospital. The man was helping a pregnant woman out of the car. I was embarrassed at my thoughts and actions; I had judged another's behavior based on insufficient information.

### Who is in control?

These true stories exemplify how we let circumstances direct our emotions. How often are you guilty of letting the behavior of others dictate how you feel or respond?

A group of 1,000 people were asked to list three of their greatest pet peeves. In all but two cases, the biggest gripes listed were caused by other people. This means that 998 people thought others were the main cause for their feelings of irritation, aggravation or frustration.

It is unfortunate that we often let others control us. Can you imagine saying to another person, "I've decided to let you determine how I feel"? We all like to believe we're in control of our feelings (most of the time.)

### You don't understand

The common thread tying these two stories together is that I did not see the whole picture. Later, when I knew all the facts, my anger immediately dissipated.

How many times have you been guilty of reaching judgment too quickly, discovering only later that you were wrong? We all have experienced such situations. It takes almost superhuman effort to postpone judgment until we know all the facts.

### Take control

If you respond spontaneously to every stimuli, your life will be a steady grind of emotional battles. The key lies in being able to, as Archie Bunker used to say, "stifle it," however briefly. You can never control other drivers on the freeway. Some always drive too slow or too fast or cut you off. Your teenager is guaranteed to test your limits (and patience) on occasion. Life will always offer you a full plate of emotional jabs, all guaranteed to upset you — if you let them.

### Step back

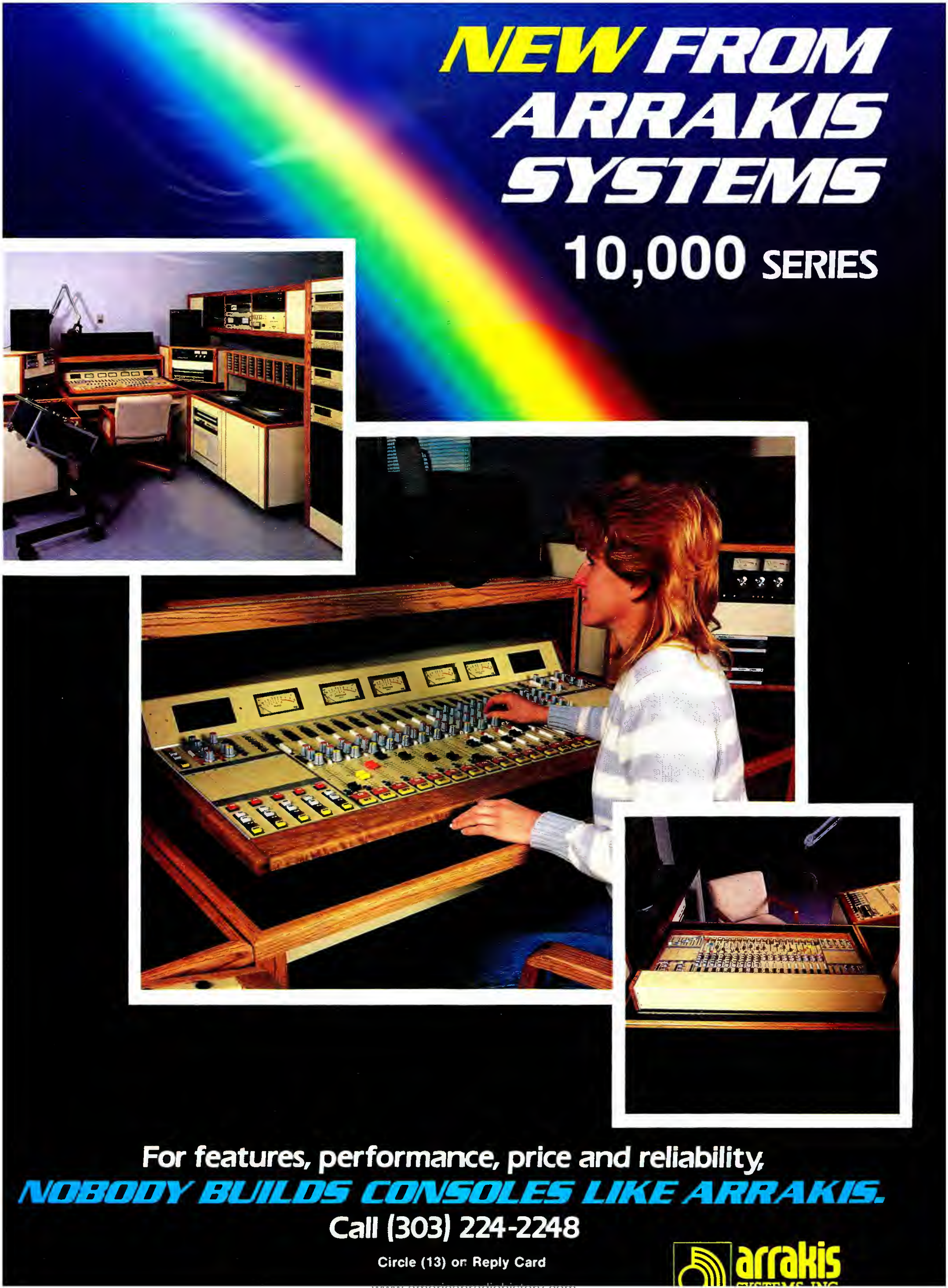
Even if you don't understand the situation, you can buy some time to think. Suppose your news director storms into your office saying, "Doug's camera failed again last night on the live shot. I asked you twice to have the darn thing fixed. Doesn't your maintenance staff know what they're doing?"

If this happened to me, my first inclination would be to respond angrily. That type of response, however, is unlikely to resolve the problem. In this situation, there are actually two problems. The first problem is the broken camera, which would be the easiest one to fix. The second problem is the news director's feelings, which is much tougher.

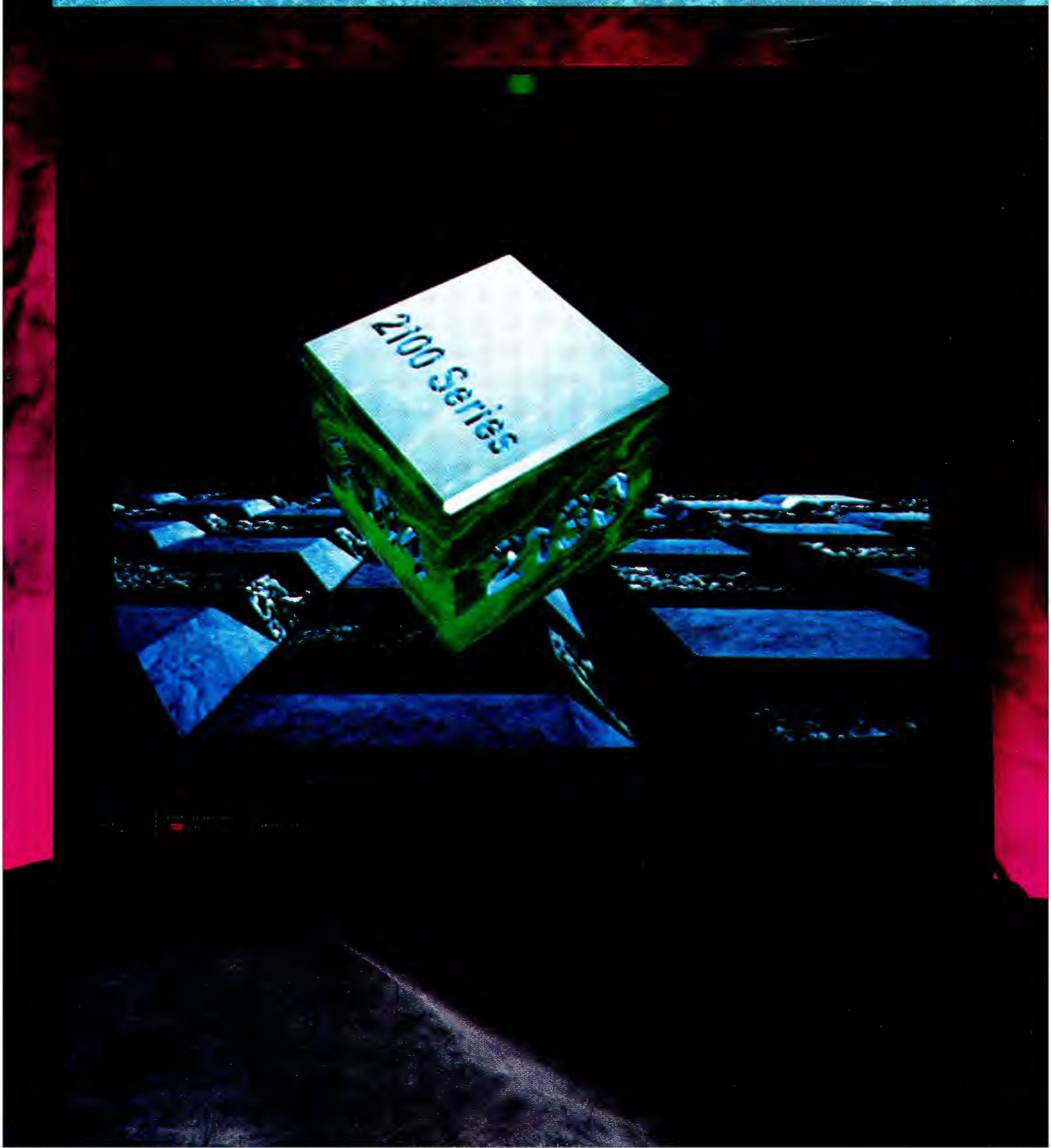
Recall from our previous discussions on problem behavior that repeating the other's concern is an effective technique. In this case, express your concern over the apparent camera failure. Try to show that you *understand* his viewpoint and that he has a friend taking his side on the issue. Then you can progress to the issue of the broken equipment. You also are trying to get him to develop some understanding with you.

No sure-fire formulas are available for dealing with your emotions in these situations. Even so, you must do whatever you can to allow yourself enough time to grasp what is really happening. If necessary, stuff your fist in your mouth before you say something that you will regret later.

Remember, to the degree you give other people what they want, you'll get what you want. This applies even in emotional situations. The key is holding your own emotions in check long enough to develop the correct response.


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

# Digital technology



# for the 1990s

**Computers are no longer just business toys. They are the building blocks for today's broadcast production systems.**

Broadcasting is an electronic business. As computers, which were once the toys of scientists and accountants, take charge of everything from space probes to automotive ignition systems, it is only natural that they become the building blocks for our production systems as well. Witness the encoders that matrix analog RGB video into NTSC using PROMS, or the emerging FM stereo generators that create the composite signal — main, L-R, and pilot — and do so completely digitally.

Just as word processors and CAD programs have replaced the typewriter and the drawing board, new tools are appearing for program production and distribution. It is only natural that such changes will fundamentally alter our approach to equipment usage, interface and maintenance.

As the components and procedures used to process signals shrink, it is only natural that production tools decrease in size. Take, for instance, the evolution of today's palm-sized camera and video recorder combinations, each of which was a body-worn device that required operators to have strong backs and legs.

This issue of **BE** focuses on the important changes that advancing technology is bringing to our industry. Articles this month include:

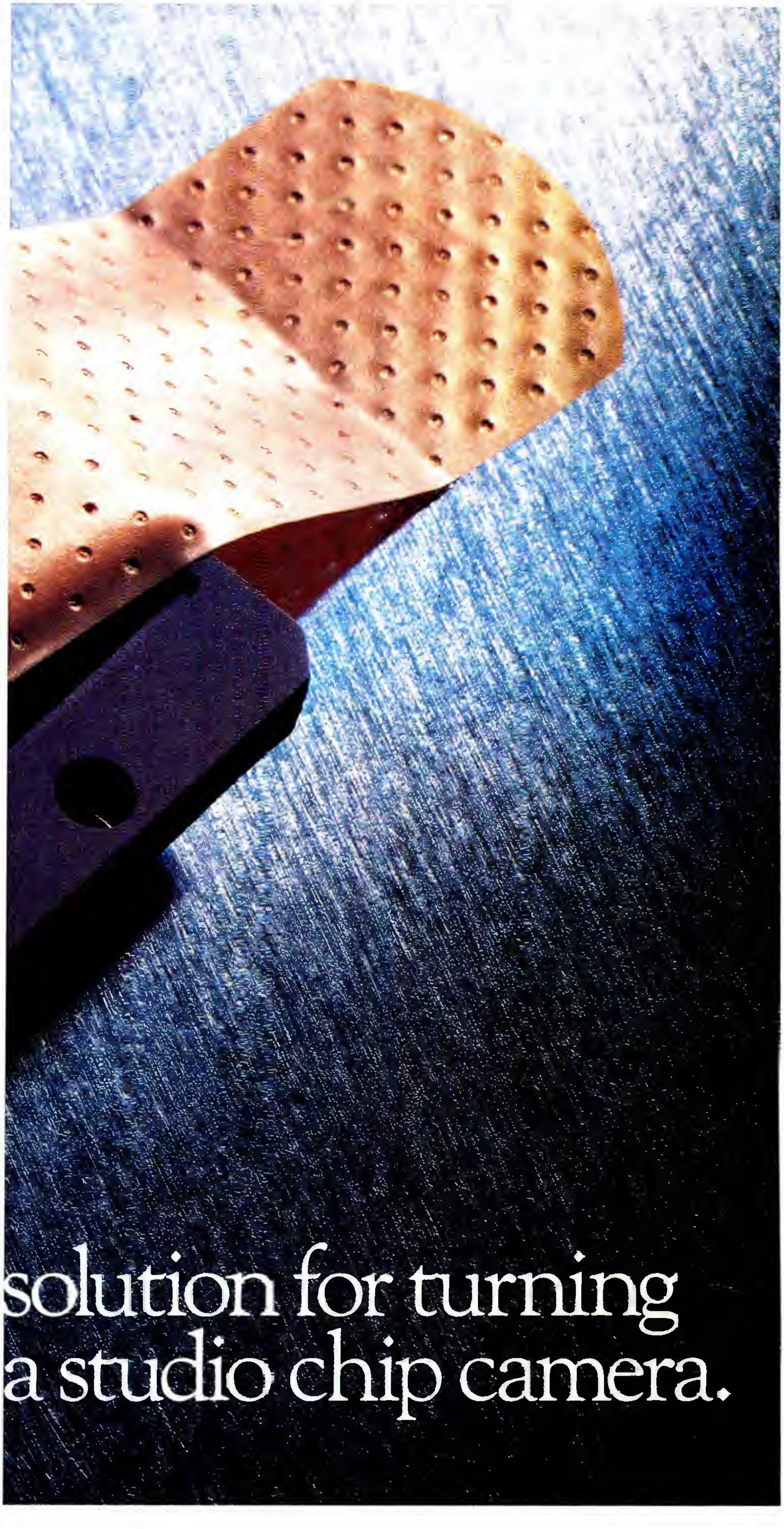


Few areas of the professional audio-video industry are untouched by the advancements in computers and digital technology. At times like this, it is more vital than ever that we keep abreast.

Rick Lehtinen

**Rick Lehtinen,**
**issue editor**


This is no
a studio tube camera into




In their haste to get to market, some camera manufacturers have employed what we think are band-aid solutions to product design.

Simply fitting chips into a camera originally configured for tubes seems quite acceptable to some.

But not to Sony.

Introducing the Sony BVP-370 studio CCD camera. It's been specifically designed to complement Sony's most advanced chip, the 768 FIT CCD, for superior performance.

This chip virtually eliminates vertical smear. And Sony's exclusive HAD sensor gives clean, quiet images, and excellent color reproduction.

Because we took time in the design process, you save time. The automatic set-up feature doesn't require an internal lens diascope or external charts. This reduces set-up time to a few seconds, instead of two and a half minutes.

And the BVP-370 employs the latest component triax system, specially suited for optimal performance of CCD cameras.

These features reflect Sony's belief that the only way to design a studio chip camera is from the inside out. And that a bandaid solution is no solution.

To learn more about the BVP-370 studio CCD camera, call (800) 635-SONY.

Sony Communications Products Company, 1600 Queen Anne Rd., Teaneck, NJ 07666


**SONY®**

**BROADCAST PRODUCTS**

# The great video/computer merger

By Rick Lehtinen, TV technical editor

**LANS? SCSI ports? This is video, isn't it?**

Pictures are pictures, right?

Once, not too long ago, video was video. That is, it conformed to RS-170A or it didn't. If it did, it was video. If it did not, it was bad video, and we either fixed it or rejected it.

### That was then

Today, we are experiencing the computer revolution. Microprocessors are sprouting up in equipment like desert flowers after a spring rain. As more equipment is built around microprocessors, a commonality of hardware will emerge. Manufacturers will build their systems into standard computers, tailoring-in their unique functions through the use of custom add-in cards, or through the use of standard add-in cards and customized software.

The great video/computer merger is under way.

### Interconnections

In reality, we haven't been able to say video is video for a long time. Since the appearance of the U-matic dub cable, it has been more convenient to send pictures around our facilities in various formats. Today, we can find one of several dub formats — analog component, Y/C, RGB and, possibly, one or two digital formats in larger broadcast plants. Once we enter the domain of computers, the choices multiply even further.

The D-1 and D-2 video standards are ways of encoding video into a real time digital stream. The digital video on a 45Mb/second telephone company fiber-optic cable is a "packet" signal, in which discreet chunks of picture are given a stamp (a header and a footer segment), and multiplexed into the datastream that's shipped down the pipe.

Bigger differences occur when you look into graphics systems. In 2-D systems, the video is usually stored in separate files for R, G and B, and written in some kind of run-length encoded system to conserve disk space. The coding methods conform to several different standards. It becomes even more complex in 3-D systems. Some files list attributes of objects, such as the number and location of points in the object and the type of lines used to connect them. Other files describe textures in the drawing and the number and positions of lights shining on the objects.

These small object and attribute files are normally stored as ASCII words. These files are precursors to the more complex files that integrate all of the previous information. Preview files display motion paths of items in the course of an animation. Occasionally, a frame in a preview file is rendered into a fully calculated picture file for display. This allows the artist to make a visual check of the animation progress to make sure the computer was given proper instructions and that lighting is correct. Preview and picture files are stored in a binary format.

These files are pictures; hence, these pictures are files. Although you could shuffle these images between various devices in the video domain, it is better to try and keep it all in file format, because this keeps the image quality pristine. However, file transfer requires something beyond traditional video techniques.

### Local area networks

One accepted way of getting signals between various digital devices is the local area network (LAN). A popular choice is ethernet or one of its variations.

An ethernet typically consists of a rather large coaxial cable that is considered to be the ether. It is a passive medium of transmission, the name being drawn from the ether through which radio waves were once thought to propagate. Traffic from the devices connected to the network is diced up into packets. The packets are piped into the ether, and devices that need to receive a given packet do so by recognizing the correct address in the header.

The ethernet cable is tapped by inserting a bus transceiver onto the ethernet cable. The tap physically connects to both the shield and center conductor at one end. At the other end there is a 15-pin D-type connector that can be routed to the

*Harris Technology in Action*

# "We're burning up every other AM in the market with our new DX10."

WSEA AM serves the Delmarva region and South Jersey from Georgetown, Delaware. They recently acquired a 10 kW day/1 kW night directional authorization, a Harris DX 10 digitally modulated solid state AM transmitter—and a new Corporate Chief Engineer, Terry Dalton. "By the time WSEA's owner Great Scott Broadcasting hired me," Terry recalls, "they had already decided on the Harris. I could understand that, since the fifteen year old Gates at WSEA still passes its proof of performance tests. But I needed to be sold on the new Harris transmitter. I'd heard about the DX series' all-solid-state design and its digital modulation, but I didn't expect them to make much difference."

*Chief Engineer Terry Dalton...*

AND "THE BLOWTORCH" WSEA'S NEW HARRIS DX 10 DIGITALLY MODULATED AM TRANSMITTER.

Terry ran his DX 10 into a dummy load at full power continuously for six weeks before putting it on the air. "I was ready to jump on the slightest malfunction," he admits, "but I couldn't find anything. That kind of stability and reliability was one thing that turned my head around.

*On the road...*

OR AT HOME, DX PERFORMANCE IS AUDIBLY SUPERIOR.

The other was performance—in A/B comparisons we ran with the old Gates, the two signals were like day and night. We had NRSC-2 pre-emphasis on both and an Optimod® 9000 with the high end cranked all the way up on the Gates—but the Harris DX was still cleaner and brighter. The low end from the DX 10 was tight and punchy, with none of the old transmitter's boominess."

When WSEA finally put their new DX 10 on the air, they did it with no announcements at all. "That very first day," Terry reports, "we got calls from people picking us up in places where they never could before. Others commented on how much better we were sounding, even on car radios. We were still running 1 kW under our old non-directional authorization. But we were burning up every other AM in the market, including some that put out an audibly overmodulated signal. Our sales department immediately named this new DX 10 'The Blowtorch'."

Terry verified the DX 10's increased coverage personally on a drive to New Jersey. "I used to lose WSEA around Cape May," he says. "This last time, the signal stayed clear all the way to Atlantic City—a 35 mile increase in range without any more power.

Measurements showed me why we're getting out so much further now. The asymmetrics are incredible: I'm running 98/9% negative peaks and 119% positive, with absolutely no distortion or splatter. In tests, I've taken the positive peaks even higher, and it stays clean. Digital modulation and solid state circuitry make a real difference."

"I was ready to find things wrong with the DX 10," Terry admits, "But its performance and reliability have me 100% sold. As far as I'm concerned, any new Great Scott Broadcasting AM stations will have Harris DX transmitters."

We're glad the DX 10 won Terry Dalton over. It shows that DX transmitters are doing everything we expected of them. After all, real innovations should make a difference in the real world.

If you'd like more information on DX series AM transmitters from 10 to 50 kW*, call (217) 222-8200, Ext. 3408. If outside the continental US, fax your request to (217) 224-2764. And for studio equipment to take full advantage of DX transmitter performance, call Allied Broadcast Equipment at (800) 622-0022.

* Ask us about applications to 500 kW.

HARRIS

HARRIS BROADCAST DIVISION
MARKETING DEPARTMENT
P.O. BOX 4290 • QUINCY, IL USA 62035-4290

Optimod is a registered trademark of Orban, Inc.



Circle (12) on Reply Card

computer to be networked. (See Figure 1.)

Some facility users find the large ethernet cable unwieldy and want to avoid the expense of the individual bus tap transceivers. One way to do this is by installing a hub box. This takes the form of a junction box, which ties the computers together by their 15 conductor cables, eliminating the thick ethernet cable. Electronics inside the hub box electronically simulate the large ethernet cable. It is essentially a multiport null modem.

A second approach is the use of a thin ethernet, which uses standard diameter, 50Ω coax. The network cards in the computers terminate in a BNC connector instead of a 15-pin D-connector. A BNC T connector is installed at the rear of each computer and the coax loops to each device on the network.

### Big render

The bottleneck in graphics is always due to the rendering. It takes lots of computer time to figure out what values of R, G and B to assign to each pixel in the picture. One way to break the bottleneck is to allow humans to interact with small, but intelligent terminals, typically PCs, and to forward the relevant data to a large computer specifically tailored for rendering.

Such a network is economical in that many design stations can be accommodated and the terminals need not be located on site. (See Figure 2.)

### SCSI

LANs are not the only method to interconnect computers digitally. The small-computer systems interface (SCSI, pronounced scuzzy), is an ANSI standard that dates back to the early 1980s. When it became apparent that large external storage devices such as the Winchester disk would become popular, manufacturers invented the SCSI interface to avoid creating a plethora of proprietary standards. SCSI interfaces then became available for tape drives, floppy disks and other storage devices. Now there are SCSI cards for nearly all the personal computers, and at least one brand of computer comes from the factory with a SCSI port built in.

The standard as written can support about four Mb/second data rates. This should translate to shifting a single video frame in under a second. However, after dealing with handshaking protocols and certain hardware limitations, it is realistic to expect to move a video frame in 10 seconds or so. Although this is far too slow for any real time applications, it is actually as fast as many of today's graphics systems and still-stores.

The SCSI connector works on a 25-pin D-type connector.

### Merged systems

One of the first implementations of the

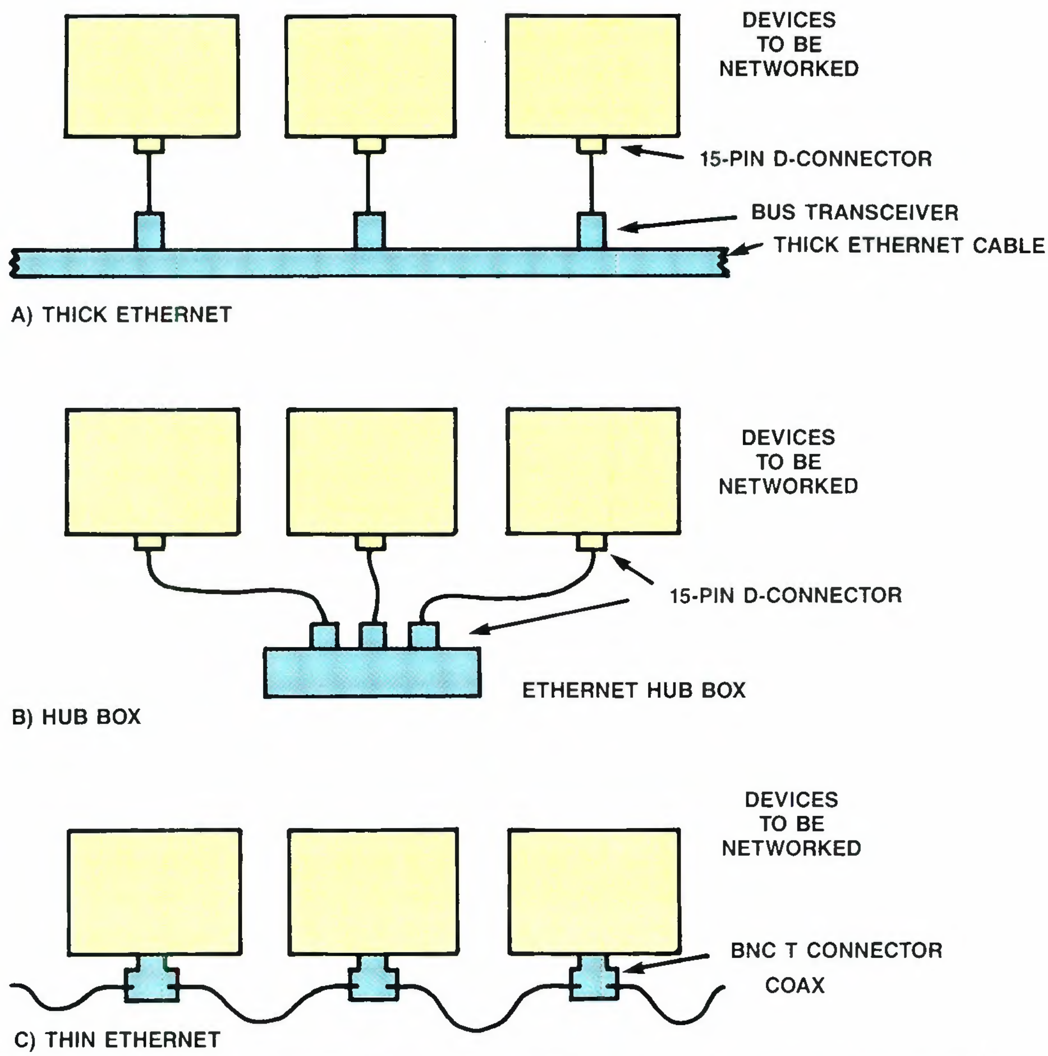



***Figure 1.*** *Different methods of implementing ethernet. Both the nub box and the thin net simplify network contruction for the small number of devices graphic systems usually require.*

# Here's another reason we sell more cart machines than anyone else.

**The Delta series.** The world's most popular cart machine over the last five years.

# And here are three more.

Our Authorized ITC Dealers

Allied Broadcast
Equipment
800/622-0022

Broadcast
Services Company
800/525-1037

Broadcast
Supply West
800/426-8434

*International Tapetronics Corporation—The World Leader in Cart Machines.*

it

1990, ITC

Circle (43) on Reply Card

SCSI ports in broadcasting will probably be the teaming of a digital effects unit with a still-store or paint system. (See Figure 3.)

It works like this: The input video is digitized and stored in an input frame buffer. In a normal effects system (greatly simplified, of course), this video data would be clocked out to the digital signal processor (DSP) device, which performs the desired transformations, and the processed data passed to the digital/analog converter for output. At least one new effects system allows direct access to the frame buffer via the SCSI port. A frame can be captured by the digital effects system, ported for storage or painting and then returned to the effects system, all in the digital domain.

At first, this method of storing or moving single frames of video seems to have little to do with real time video effects, but consider how many productions where the effects work consists merely of sliding a logo or font page around over background video. With the simple interconnection afforded by the SCSI port, the process of capturing, retouching, creating fonts and feeding them into the effects device can all take place in one or two personal computers, coupled via the SCSI port to a digital effects device.

This adds relatively low-cost paint and still-store capability to the digital effects systems. A further advantage is that it may free the user from having to provide video input or output capability to either the paint or still-store system, because those devices could work through the encoder and decoder provided by the digital effects device.

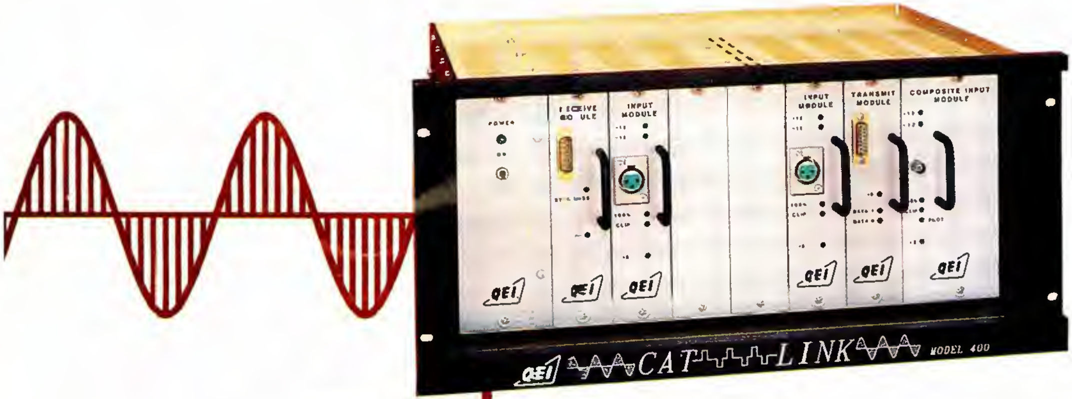
It also is likely that the same PC that hosts the paint system could also support the Winchester drive. It remains to be seen if sufficient horsepower is leftover to also operate an edit controller or external control panel for some future switcher or audio mixer that might be implemented on a PC. If not, then a network, either conventional or SCSI, could integrate the PCs required to handle the task. Either way, computers will certainly affect the way we control production equipment. (See the related article, "Rethinking switchers.")

### New shapes in editing

As quickly as pictures have entered computers, new methods of editing have been developed. The grandfather of all such systems is the laserdisc-based system, in which work tapes are dubbed to disks. Editing then becomes a matter of developing a list of entrance and exit points for the high-speed, random-access disk players. When the finished version is approved and signed off by all parties, a dub can be made of the laser disk output and an edit decision list can be made of the selected cuts. This is taken into post-production, where a finished product is auto-assembled, possibly with the addition of expensive effects found only in the online suite.

Several manufacturers are working to bring such a system down to a desktop reality. Typically, these systems use a computer to control the movements of a couple of VTRs, which are used as a source of images, and on which the finished tape is edited. Creative decisions are made using special menus on the PC. To get the video from the tape into the computer requires some processing. Some manufac-


*Small computer-based editing systems allow cut-and-paste editing and refinements to be made from the desktop environment.*




# The STL/TSL for the 90s is here now.

# And not a moment too soon.

- Two Way Multi-Channel Communications
- Transparent Digital Audio
- Multiple Signal Path Options

It's time for a new kind of STL. Drastic cost increases are just one sign that the phone company is tired of balanced equalized lines and is ready to pull the Class A plug. Meanwhile, microwave spectrum is scarce—in some areas, channels are unavailable.

QEI's new CAT\Link Composite Audio Transmission Link is the *digital* STL alternative. It transmits composite and other signals over a single telco T1 data line*. T1 service costs less than Class A, and it's so reliable that the big banks use it for their vital financial data.

CAT\Link encodes the fully processed *composite* signal and decodes it at your transmitter, so you can run the stereo generator and processing at the studio. At the same time, CAT\Link configurations can send and receive SCAs, control channels, voice communications, RS232 data, AM audio, transmitter readings, and satellite or remote programs.

With CAT\Link, you always get full stereo separation: There are none of the phase or amplitude fluctuations that plague dual-channel STLs. Dynamic range is up to 84 dB, and your processed composite signal can use virtually all of it. So the only thing you'll hear is clear, clean, undistorted audio.

Worried about replacing Class A lines, getting a microwave channel, or sight-line infringement? Call QEI toll-free at 800-334-9154 for full info on CAT\Link, the bidirectional, digital, *easy-wired* STL. And turn the weak link in your signal chain into one of the strongest.

* CAT\Link will also drive over a mile of twisted pair wire, nearly two miles of fiber optic cable, or a 23 gHz STL.

**Quality • Engineering • Innovation**
P.O. Box D • One Airport Drive
Williamstown, New Jersey 08094
24 Hr. Service Hotline 609-728-2020 • Fax 609-629-1751

QEI


Circle (15) on Reply Card

turers use reduced-resolution images, others use head and tail icons that identify individual scene takes.

One manufacturer projects that the day is almost here when the video will be processed directly by the computers in its native bandwidth, that is, VTRs will play through computers for signal processing, not just be controlled devices that are shuttled by the computer.

A different group is promoting digital video interactive (DVI), in which real time, full-color images are compressed into a format that today's computers can handle. The information is processed as if it is data files, but viewed as if it was video. This movement is gaining momentum. A paint system was recently ported to microcode, which enables it to run on the graphics chip that forms the heart of a DVI system. The microcoded paint system runs faster in the DVI mode than in the conventional configuration.

**Ready or not**

When the computer begins to manipulate video directly, the merger between the video domain and the computer world will rock our business. For instance, imagine the changes that would take place in newsgathering if the entire writing and editing processes took place at the reporter's newsroom terminal or if simple commercials could be produced entirely at the copywriter's desk in the ad agency.

The computer/video merger will cause a fundamental change in the way we acquire, process and distribute visual information. How effectively we adapt to these changes may determine our survival.

With computers, pictures aren't just pictures anymore.

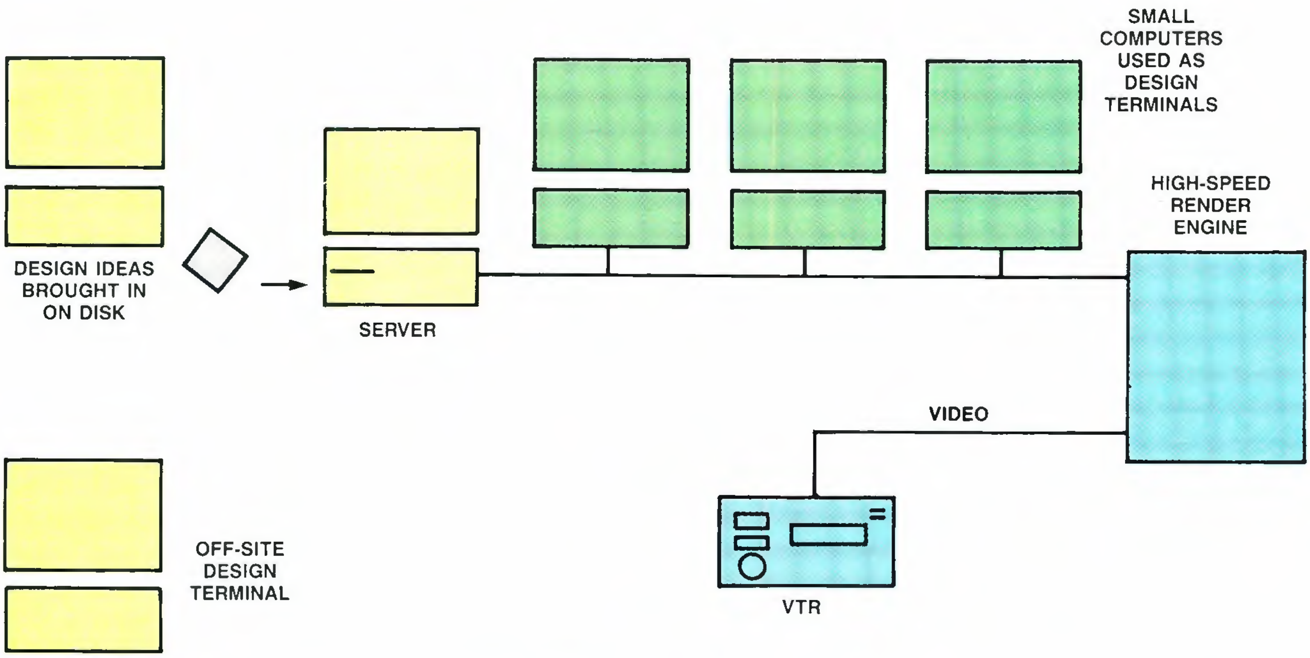



***Figure 2.*** *A LAN allows several small PC-based design stations to feed one large rendering engine.*

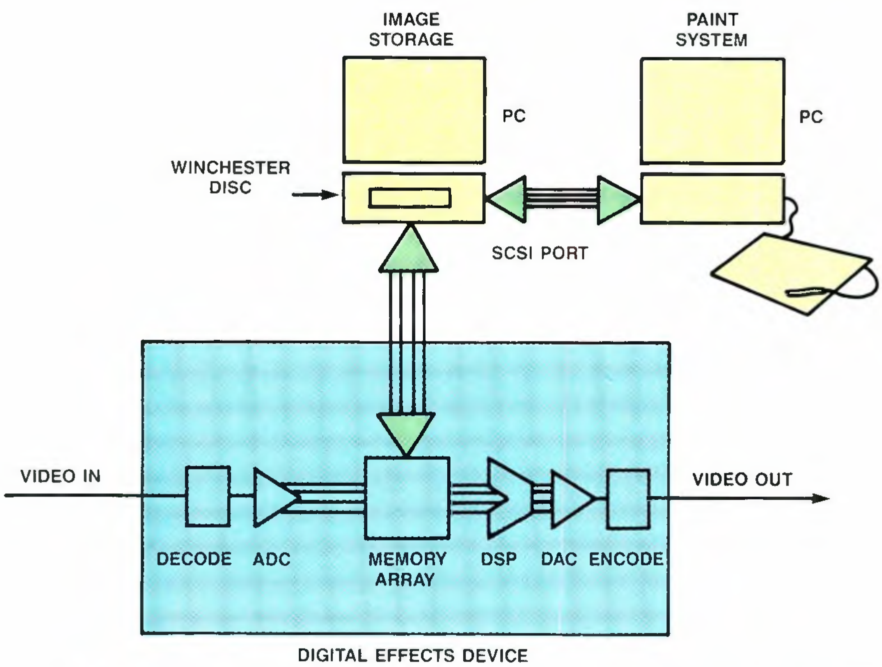
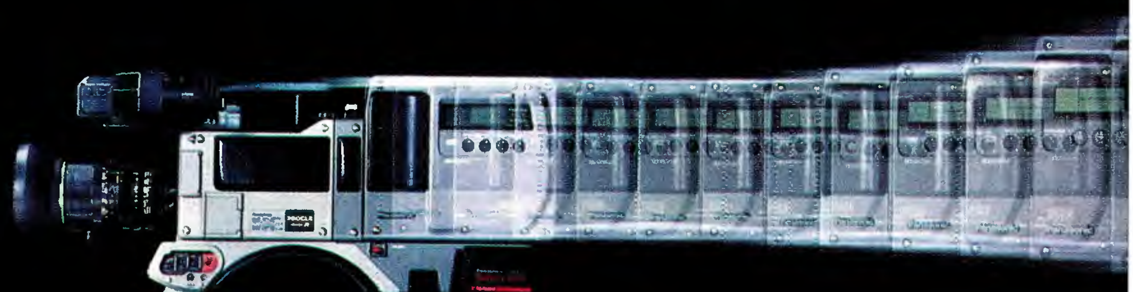



***Figure 3.*** *The SCSI port will allow digital effects systems and PCs to interface easily. This means that add-on PCs could turn a digital effects systems into a still-store and paint system.*

# Panasonic Field Recording



Panasonic® makes it easier than ever to carry away the performance of SVHS. By offering you the smallest, lightest and most versatile SVHS dockable VCR available. The Panasonic AG-7450. It delivers field recording with no strings attached.

Now you can combine the high performance of Panasonic's 300CLE, 200CLE and F70 CCD Cameras with the AG-7450. To create a one-piece SVHS camcorder system designed for one-person operation. Because everything you need for high performance field recording sits right on your shoulder. Which means greater mobility and flexibility when shooting. The AG-7450 can also be used as a stand-alone field recorder with an optional 14-pin VCR adaptor.

And even though the AG-7450 weighs in at a mere 7.5 pounds, it delivers heavyweight performance. Because it provides you with all the exceptional recording and playback characteristics you demand. Like the economy of two-hour recording on a single cassette, Y/C signal separation with over 400 lines of resolution and a signal-to-noise ratio in

# With No Strings Attached.


excess of 47dB. So there's no need to "bump" your original footage for post production.

In addition, the AG-7450 provides street smart features. Like an antirolling system to compensate for gyro error on the video head. Four channel audio (two hi-fi and two linear) with independent level controls. And an optional vertical interval/longitudinal time code (VITC/LTC) generator/reader that docks directly to the back of the unit.

So if you're looking for a lightweight dockable VCR that performs like a heavyweight, take a good look at the AG-7450. You won't have to look any further. It's Panasonic field recording. With no strings attached.

For more information and your local dealer, call your nearest regional office.
Eastern Zone: (201) 348-7620
Central Zone: (312) 981-4826
Southern Zone:
Dallas Region: (817) 685-1122
Atlanta Region: (404) 925-6837
Western Zone:
Seattle Region: (206) 285-8883
Los Angeles Region: (714) 373-7275

**Panasonic**
**Professional/Industrial Video**

Circle (18) on Reply Card

# Digital audio mixing

**By David Shapton and Mark Mattingley-Scott**

**Once exclusive to expensive recording studios, digital consoles now are within the budgets of broadcasters.**

You don't have to mortgage the station to purchase a mixing console with digital features. Thanks to technology and mass production, broadcast stations today can afford to purchase consoles offering the advantages of digital mixing, automation and the quality of digital processing.

### Digital sound

It's reasonable to assume that all digital consoles sound alike, but that's not necessarily true. After all, 16-bit digital is 16-bit digital, and as long as the arithmetic in the signal-processing chain is correct, it would seem that the output should be the same as the input, aside from whatever level changes, equalization and mixing took place.

This statement may be sweeping, but it is correct. What nobody tells you is that processes such as equalization and volume control actually are rather difficult to implement within the digital domain. This is why two digital consoles may not sound alike. The complexities involved in effects processing may force a manufacturer to make some design compromises in the product. That's not to say that the resulting product is defective; it's just that perfect quality and low cost aren't necessarily achievable simultaneously.

Shapton is head of audio at Digital Automation, Essex, England. Mattingley-Scott is principal research engineer at Thorn/EMI's central research laboratories.

The perfect digital processor would have an infinite sampling rate, use an infinite number of bits (not just 16, 24 or 32) and, unfortunately, be impossible to make. Consequently, the digital technology we work with today doesn't provide us with perfect sound. The positive side is that even if digital sound isn't perfect, it still may sound nearly perfect to the human ear. The results can be better than analog in just about every respect.

### True digital audio mixing

Let's make a distinction between the two types of digital mixing. Digital mixing techniques may involve changing the audio from analog to digital and back several times. In a true digital mixing system, the audio path remains digital from the moment the audio enters the console to the production of the master tape. A simple and obvious test for this criterion is to count the number of analog-to-digital (A/D) and digital-to-analog (D/A) converters. Excluding monitoring and foldback, there should be only one A/D and no D/A converter in the actual signal path. In fact, the only D/A converter the signal should encounter is the one in the consumer's CD or R-DAT player for playback.

However, even if digital signal processing effects are used, the mixing system still might not be truly digital. Outboard processing, even if listed as digital, may incorporate input and output A/D and D/A converters.

Take, for instance, the typical digital reverb. In most cases, the inputs to these devices are analog. So, even in the case of digital mixers, the signal has to go through a D/A to reach the analog input of the reverb, then through the reverb's A/D, where it is digitally processed, then out through the reverb's D/A and back into the mixer through its A/D. Other problems are inherent in designing a truly digital mixing environment.

### Sampling-rate conversion

Sampling-rate conversion is the process of converting between two different sampling rates, such as from the CD standard of 44.1kHz to DAT's 48kHz. Other applications include pitch change, variable speed and conversion between broadcast and NTSC videodisc audio standards.

To convert from one sampling rate to another, it is first necessary to multiply the original samples. (See Figure 1.) This converts the input sampling rate to a higher rate. The resulting signal then is decimated (divided down), converting the new, higher sampling rate back down to the desired output sampling rate. As long as the input and output rates can be written as a fraction (such as 97/116), the conversion process is only extremely difficult.

If the two rates do not have a good rela-


# Designed for production quality... With an eye on your budget.

SVHS

Panasonic presents two very versatile, high-grade color monitors--the BT-D1910Y and the BT-M1310Y. Built for performance, these BT-Series monitors offer you the quality and reliability you've come to expect from Panasonic. Not to mention a wide array of features at an affordable price.

Our BT-Series provides you with the controls and connections necessary for studio applications--while serving a host of industrial, educational and professional video needs.

For maximum performance and versatility, both monitors offer complete, direct compatibility with the new S-VHS format--in addition to conventional signals. And video reproduction on the BT-Series is superb. As a matter of fact, the BT-M1310Y boasts a horizontal resolution of more than 560 lines, while the BT-D1910Y offers you greater than 550 lines.

What's more, each monitor provides you with a full set of front panel controls. Like Line A/B split, S-Video input connectors, Blue signal-only switch, pulse-cross circuit, preset picture off/on, comb/trap filter selectable and normal/underscan switch, just to name a few.

So when you are looking for professional quality, but still need to keep an eye on your budget, look into the Panasonic BT-Series high-grade monitors.

For more information and your local dealer, call your nearest regional office.
Eastern Zone: (201) 348-7620 Central Zone: (312) 981-4826
Southern Zone:
Dallas Region: (817) 685-1122 Atlanta Region: (404) 925-6837
Western Zone:
Seattle Region: (206) 285-8883 Los Angeles Region: (714) 373-7275

**Panasonic**
Professional/Industrial Video

tionship or they change constantly, such as with a flanging effect, then the conversion is much more difficult, and more sophisticated mathematical techniques must be used. Let's look at an example of a sampling-rate conversion problem.

To convert 44.1kHz to 48kHz, the 44.1kHz must first be multiplied up, then decimated back down to the desired frequency. (See Figure 2.) Fortunately, this can be done in stages. The sampling ratio (R) can be written as:

$$R = \frac{48,000}{44,100} = \frac{(2^5 \times 5)}{(3 \times 7^2)}$$

This equation may be factored to give small individual changes in the sampling rate:

$$R = \frac{48,000}{44,100} = \frac{4 \times 4 \times 10}{3 \times 7 \times 7}$$

This can be implemented as successive interpolations and decimations by factors of 2, 3, 5 and 7. The intermediate frequencies follow:

1. Multiply by 4 from 44,100Hz to 176,400Hz.
2. Decimate by 3 from 176,400Hz to 58,800Hz.
3. Multiply by 4 from 58,800Hz to 235,200Hz.
4. Decimate by 7 from 235,200Hz to 33,600Hz.
5. Multiply by 10 from 33,600Hz to 336,000Hz.
6. Decimate by 7 from 336,000Hz to 48,000Hz.

Other combinations are possible. The particular choice of intermediate sampling rates depends on the application as well as the digital signal processor being used.

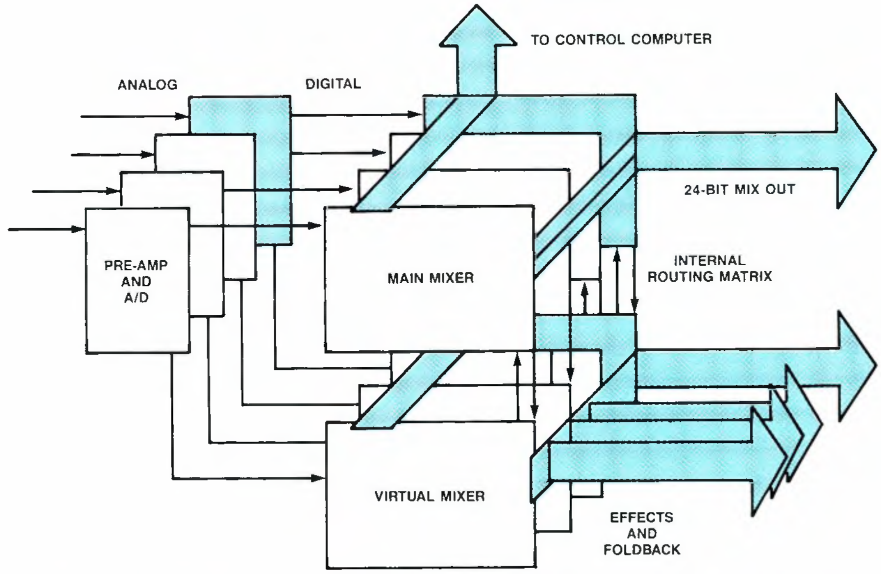



***Figure 1.*** *The concept of a fully digital console is represented here. Today, many consoles offer digital features, but are not truly digital.*

### Dynamic range

One of the most discussed issues of digital processing is the dynamic range. The amount of dynamic range in the digital domain (not including the effects of A/D conversion) is a function of the digital word size. The rule of thumb is 6dB for every bit — 8-bit processing provides 48dB, and 16-bit processing gives you 96dB. (To help put this in perspective, note that a vinyl album pressing is capable of about 70dB dynamic range.) Even though it might be desirable to incorporate a higher number of bits, the product ultimately will be quantized to 16-bit resolution if transferred to compact disc.

In the analog domain, dynamic range is a function of just about everything, from the type of integrated circuits used to the wiring layout of the power supply. It is possible, however, to design analog mixing systems with significantly greater dynamic range than a 16-bit digital system can produce. That is why the critical parts of a digital mixer's internal architecture need more than 16 bits.

### Volume control

Volume control seems straightforward and simple. All you have to do is multiply the current sample by the volume coefficient (a number that represents the current position of the fader). Unfortunately, even this process involves trade-offs.

The easiest problem to solve is the resolution of the faders. A convenient number of steps, or possible volume levels, is 256. This is the largest number that can be represented by eight bits. But a fade with only 256 levels or steps wouldn't sound very smooth. One way to solve this problem is to insert another 256 steps between each of the fader levels. This provides up to 65,000 steps for a full fade. A basic fader resolution of 400 levels has been suggested, but given accurate interpolation, this might not be necessary. Besides, the next logical level really would be 512 steps, which represents 9-bit resolution, but 9-bit processors are uncommon and, therefore, impractical.

Once you've solved the resolution problem, there is still another important matter to handle. What happens when the signal levels are low, meaning that the quantization is down to only a few bits? Quantization noise is the deviation from the desired signal that results from having to represent a continuous signal using a finite number of levels or steps.

Figure 3 shows a low-level signal that's been digitized with only three bits. Note that the digital representation only approximates the actual analog. The quantization noise is represented by line (b) in the figure.

In any digital system you can hear quantization noise if the signal level is quite low

*Continued on page 42*

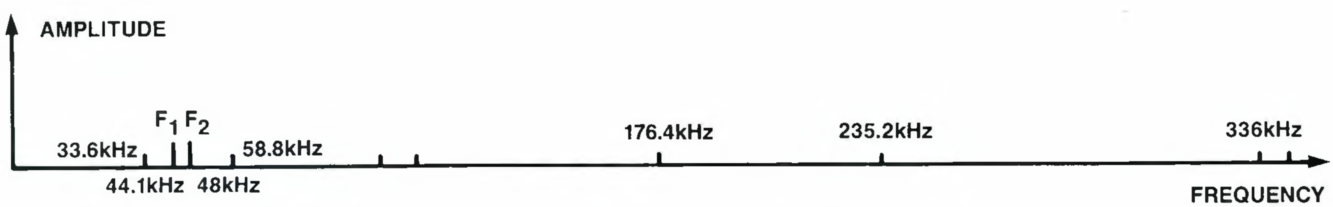



***Figure 2.*** *Sampling-rate conversion is not always easy. Shown here are original signal samples, which have been upconverted (multiplied) to a higher rate. The multiplied samples then must be divided back down by the proper rate to get the desired output sampling rate.*

# With Dolby SR, your audio won't be generations behind your video.


No matter how good the video, second-rate audio is no longer acceptable to home viewers. They've been spoiled by the superb sound of Compact Discs, Hi-Fi video cassettes and Laser Discs.

With Dolby SR, your video program, too, can be accompanied by first-rate audio. That's because Dolby SR adds more than 25 dB to the audio dynamic range of analog video or audio recorders. Tape hiss, hum, distortion, print-through, and modulation noise are virtually eliminated.

Two-channel Dolby Model 363

Recordings made with Dolby SR are astonishingly quiet and clean, and stay that way through successive generations. Even if you use Dolby SR only in the later stages of postproduction or distribution, you'll still end up with a better sounding product. And it's easy and economical to equip analog VTRs and audio tape recorders with Dolby SR two-channel or multitrack units.*

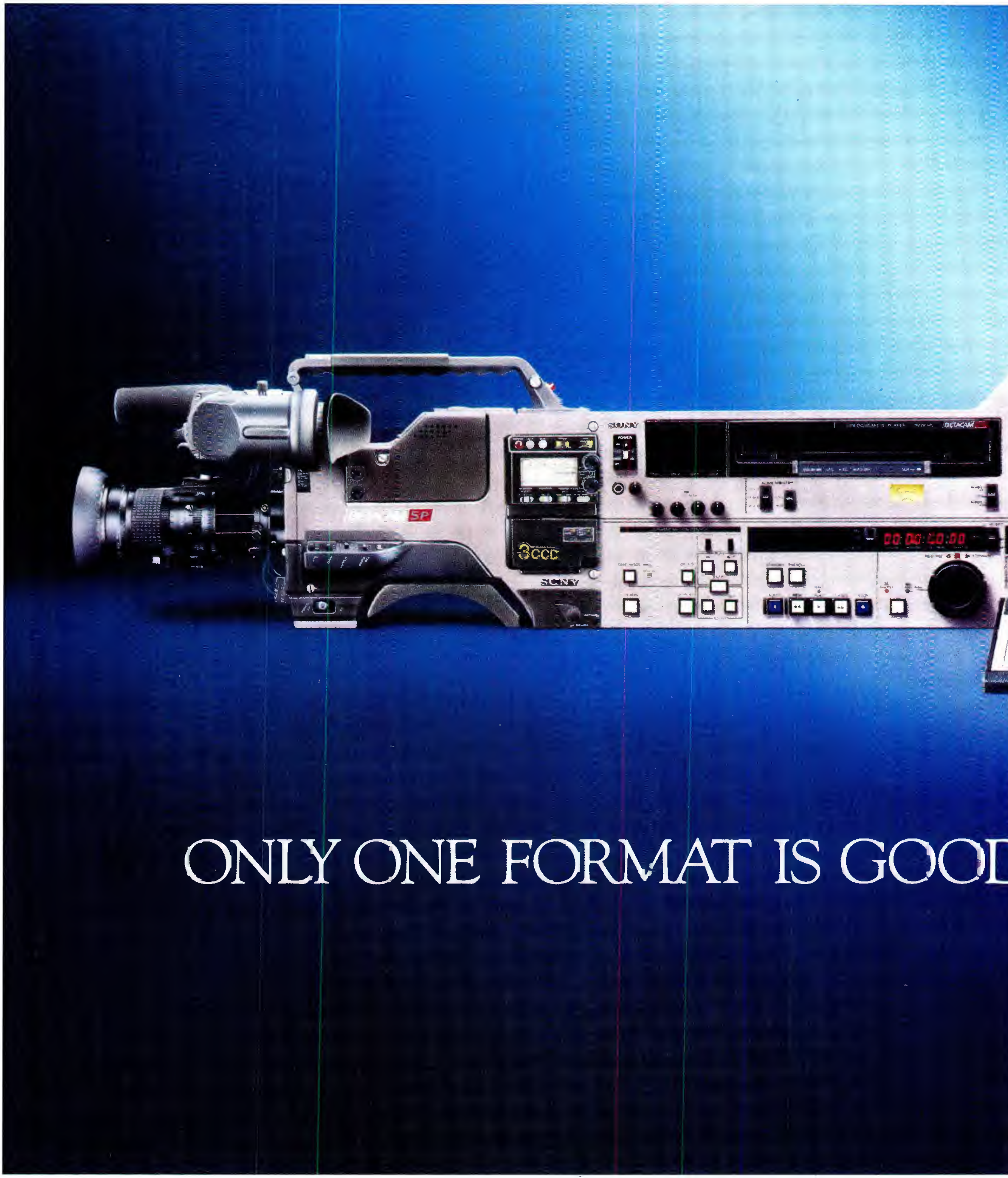
With more than 30,000 channels in use, film sound and music recording professionals throughout the world depend on Dolby SR every day. You, too, can depend on Dolby SR for audio quality that matches your video quality.

*The Sony BVH-3000 series VTR (pictured) is available with Dolby SR and A-type noise reduction built-in.

Dolby Laboratories Inc., 100 Potrero Avenue, San Francisco, CA 94103-4813 Telephone 415-558-0200 Telex 34409 Facsimile 415-863-1373
346 Clapham Road, London SW9 9AP, Telephone 01-720-1111, Telex 919109 Facsimile 01-720-4118


Dolby®

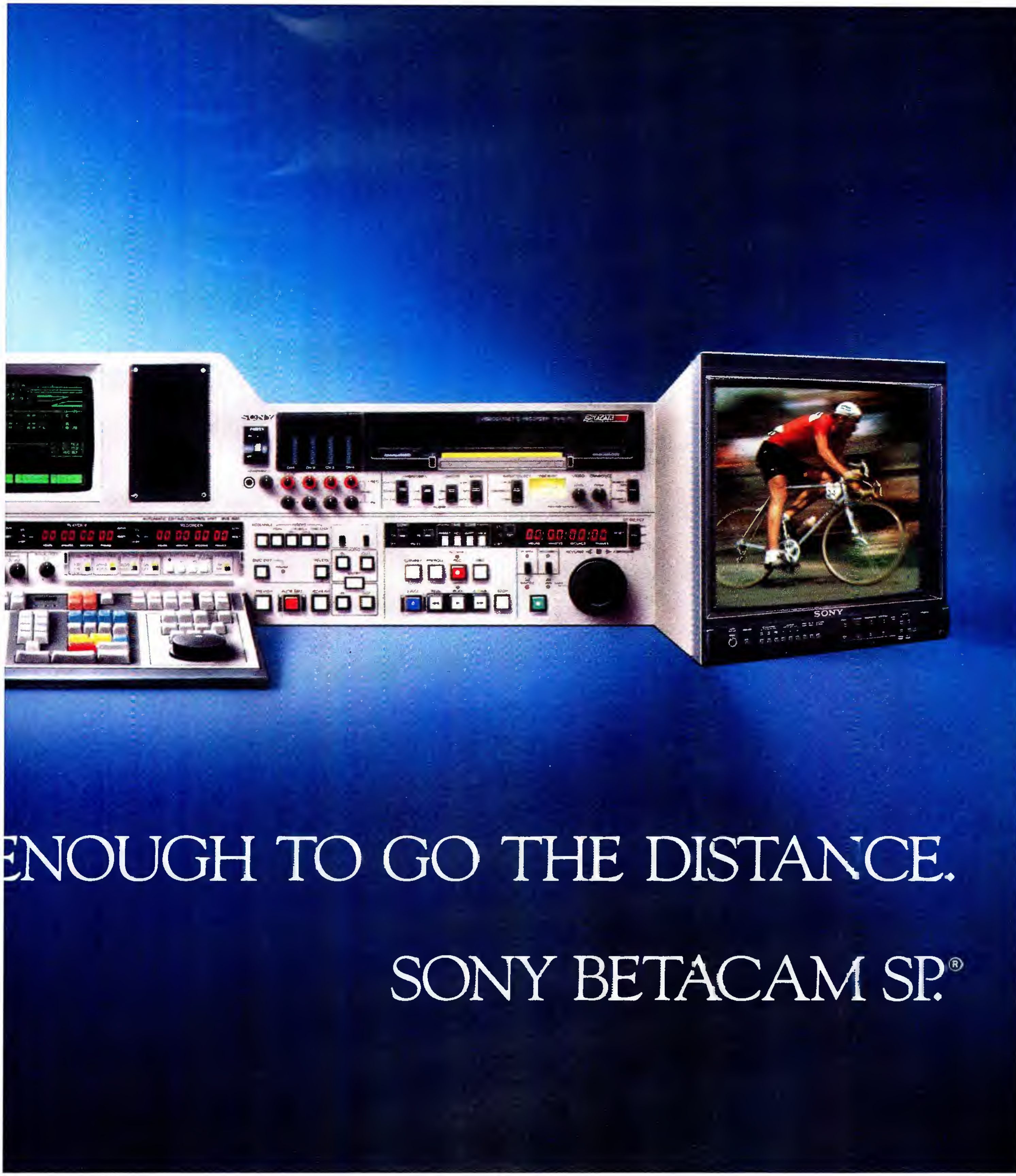
Circle (22) on Reply Card




You *can* go all the way. From acquisition to editing to on-air without ever changing formats.

With Sony Betacam SP® products. The total system that gives you total confidence. With innovative products to meet virtually every production need.

Best of all, Sony Betacam SP® products deliver the performance and reliability that made them the world-wide standard in EFP. As well as ENG. Which is exactly what you would expect from the leader in innovative video technology.




And only Sony offers the most extensive selection of Betacam SP® products available. Which gives you the performance and flexibility you need.

Go the distance with Sony Betacam SP® products. There's no telling how far they can take you. To find out more, contact your Sony Broadcast Sales Engineer. Or call 1-(800) 635-SONY.

Sony Communications Products Company, 1600 Queen Anne Road, Teaneck, NJ 07666. 

SONY®

BROADCAST PRODUCTS

*Continued from page 38*
and you monitor it at high levels. As it turns out, the problem often is unnoticeable. With a 16-bit system operating at −48dB, you still would have the benefit of 8-bit resolution. It would be something like trying to watch television from a distance of three inches. Yes, you would see the dots, but why would you be so close to the screen anyway?

### Signal processing

The algorithms used in digital audio signal processing usually are quite simple, compared with conventional computer programs. The major difference is that the audio algorithms must be executed in real time. A simple reverberation algorithm could require the execution of 300 lines of program code in one sample period — as little as 1/44,100-second. And digital equalization can be as demanding.

All mixers are complicated devices. They have to route signals to external devices over many channels and bring them back to the right place. These days, these external devices may be digital effects or digital multitrack tape machines that use the same type of processor found in the digital mixer. In some cases, it's possible to reduce the overall complexity by handling the processing on-board the mixer.

### System architecture

Although the complexity of interconnecting various devices is reduced if the console performs the task, it makes the mixing extremely processor-intensive. Think of it as adding 56 channels of digital audio at 44,100 samples per second, then multiplying each sample by a number that represents the position of the fader.

Most digital mixers use emitter coupled logic (ECL) in the processing circuits. The technology is fast and powerful, but it's essentially a central-processing resource. The outside world of audio devices still must be dealt with. Also, ECL processing consumes a lot of power — a large digital console may use kilowatts.

Even mixers with this architecture must pass the signal to external effects, which adds more overhead to the complexity. Remember, every time the signal leaves the mixer and returns, it undergoes several stages of D/A/D conversion and suffers an inevitable loss of quality.

The situation will improve as new fixed-rate effects devices become available. Even so, external effects processing still is likely to be less versatile and more complex and expensive than internal processing.

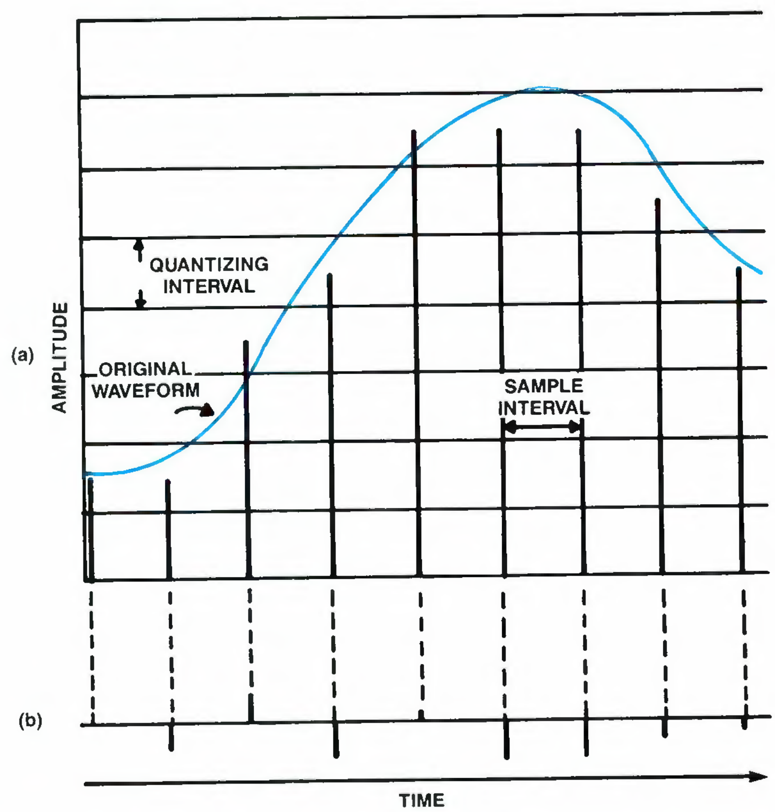



***Figure 3.*** *Low-level signals can suffer from quantization noise. Here, a low-level signal has been digitized by the three remaining bits of the A/D converter (a). The deviation from the actual signal amplitude represents the quantization error, or noise, and is shown along the bottom line (b).*

### Automation

Digital mixing lends itself to automation. A digital mixer is essentially a computer, and computers don't care whether they're mixing Mahler's Fifth Symphony or working on a model of the national economy. Every aspect of a digital mix can be stored along with time code, and later be recalled as desired. This is dynamic automation. Support functions such as editing, copying, deleting, edit decision lists and mix merging have to be provided and displayed as well.

In console design, the major design decisions include the form in which the mix information is stored and the resolution at which it is stored. If mix data storage and processing power are sufficient, then the optimum method of storage, in terms of accuracy, is to note every point through which a changing parameter passes and the time at which it passes.

A more economical (and arguably as accurate) method involves storing vector descriptions of parameter changes. At its simplest, this means noting the beginning and ending points of a change and the start and stop times. More complicated movements might be described in terms of velocity of change. This vector description can require as few as four bytes of information, compared with other implementations, which might require up to 65,000 bytes of data.

### Ergonomics

There is no simple answer as to what constitutes the optimum layout and functionality of a control surface. An arrangement that is ideal for one operator might be virtually unusable for another. Acceptable ergonomics may not be simply a function of the console design, but also of what the operator is used to. When looking at consoles, you may want to take into account the reaction of your operators to the appearance of an all-digital console. Many operators are likely to be more impressed with a board the size of an aircraft carrier than an anonymous 19-inch rack-mounted module. It would make little difference to some users, even if the rack-mounted unit were far more powerful than one of another design.

With digital mixers, and this applies to digitally controlled analog desks as well, there is a temptation to design the console surface around multifunction controls. These controls may be assigned to any channel. The theory is fine, but the practice is limited by the extent to which the multiple functions of the controls can be understood.

Grouping of functions should be logical to the user. The current status of controls

must be displayed clearly. Most important, the signal path from one function to another and the options available should be straightforward and intuitive.

Buying that first digital console may prove to be more difficult than you ever imagined. Give yourself plenty of time to consider the options, and ask a lot of questions.

**Editor's note:** This was adapted from an article that appeared in *Recording Engineer/Producer* magazine, an Intertec publication.

## Derivation of bits to dB S/N

A frequent question concerns the signal-to-noise (S/N) ratio of a digital device. Although complex formulas are available to help in analyzing the issue, here is a much simpler approach.

Consider a number of binary digits, say 16. The number of different numbers that can be represented by these 16 bits is $2^{16}$, which is equal to 65,536. A number of bits (h) are used to represent all the numbers from $-2^h$ to $+2^h - 1$. To find the equivalent range in decibels based on 16 bits, use the formula:

$$20\log_{10} \times \frac{\text{biggest number}}{\text{smallest number}}$$

This is the standard equation for finding the dynamic range of a voltage or current. Substituting the biggest and smallest number into it creates this equation:

$$R_{16}\text{ bits} = \frac{20\log_{10} 65{,}536}{1}$$

Using a scientific calculator, you'll find this is approximately 96dB.

This equation can be simplified to:

$$20 \times (\text{number of bits}) \times \log_{10} 2$$

Working out $20\log_{10}2$ gives you 6.0205999, or about 6 if you aren't too fussy. You now have a relationship between the number of bits and the dynamic range. Just multiply by 6:

$$16 \times 6 = 96.$$



Circle (24) on Reply Card

# AKG's 568EB. Stand Back.

AKG's C568 short shotgun offers you real directivity in a remarkably small and convenient condenser microphone. Only 10" long, the C568's sensitivity, wide frequency response, durable metal housing, and integrated impedence converter/preamp easily meet the demands of live on-air or recording applications. A perfect balance of pressure gradient and interference principles means the C568 can be up to three times as far from a sound source than normal mics and still yield the same ratio of direct to indirect sound. Used close, it reduces indirect sound levels by 8 dB for improved isolation. So whether it's for ENG, film, theatre or church sound reinforcement, or music applications, AKG's C568 means business. And at half the price of the competition. Just stand back and take a listen.

AKG acoustics

**Focusing on new technology.**
77 Selleck St. Stamford, CT 06902
(203) 348-2121

# Using MIDI in the production room

By Brad Dick, radio technical editor

**MIDI provides new tools to help stations beat the competition.**

Radio and TV stations fight a never-ending battle to "stand out from the crowd." As broadcasters work to set themselves apart from the competition, they continually search for new tools to help express the unique qualities of their stations. One tool they've turned their attention to is MIDI, or musical instrument digital interface. Through MIDI, stations can create new, more complex sounds fast and inexpensively.

MIDI originated from the musician's desire for more control over new signal processes and the capability to sequence (automate) tasks. The proliferation of MIDI gear has not only revolutionized the art of music, but also opened the door to production effects broadcasters once regarded as unattainable.

It was the widespread use of microprocessor-driven sound-generating devices that made MIDI possible. The interface is a serial data language designed to be used by the microprocessors in synthesizers, sequencers, drum machines, signal processors and computers. The computers may be stand-alone units, used primarily for programming, or computers built into consoles or other signal processors. As a compute-type language, MIDI is not intended to be recorded on audio tracks. It must be used with FSK (frequency shift keying) or SMPTE time code when tape synchronization is needed. Despite this, MIDI presents many advantages to the broadcaster, not the least of which is cost-effective production effects. Today's MIDI equipment offers production effects that used to be available only in large recording studios.

Most modern professional and some consumer electronic musical instruments come equipped with MIDI ports. These ports allow the instrument to be controlled by external MIDI data from devices such as a personal computer or other MIDI device. However, the use of MIDI is not limited to musical instruments. It may be used to control audio mixers, lighting dimmers, synchronizers and a growing assortment of mechanical and electrical devices. Important to the broadcaster is the MIDI's capability to interface with devices that convert MIDI to SMPTE time code and vice versa. This allows the interface to control ATRs and VTRs.

## MIDI basics

If you're having trouble getting a clear picture of MIDI, think about the way a piano roll controls a player piano. The holes in the paper roll are interpreted by the piano as commands to play specific notes. With MIDI, the piano roll is the controller, and the piano is the sound generator (synthesizer). The controller may be a keyboard, computer or musical instrument.

A typical music-type MIDI setup is shown in Figure 1. A computer with sequencing software is used to control the sound sources through the master controller, in this case a keyboard. In this configuration, MIDI information may originate from the master keyboard or computer, be memorized and then played back. The computer could be replaced by a MIDI sequencer.

A MIDI setup for post-production work is shown in Figure 2. A MIDI-to-SMPTE converter is needed to control the ATR or VTR. The remainder of the audio equipment is controlled directly by MIDI data. The setup may be as large or as small as your budget and needs dictate.

The MIDI protocol is a 16-channel party-line event code that allows each component in the system to communicate with the others. Communication is handled through MIDI out, in and "thru" jacks. A device may have one, two or several of these jacks.

The controllers usually are computers, keyboards, sequencers or drum machines. Receivers accept the data from the controllers and either execute or memorize the corresponding instructions. Receivers usually are tone-generating and sound-processing devices, but computers, keyboards, sequencers and drum machines also receive data.

MIDI operates at a speed of 31.25kbaud with 10-bit bytes. Each byte is 320$\mu$s long.

# Rigid Coaxial Transmission Lines Deliver Low Losses...High Gains.


;ablewave Systems delivers everything you need and ›xpect from Rigid Coaxial Transmission Line per- ormance...superior quality, plus optimum mechanical ınd electrical specifications.

To achieve this, Cablewave Systems fabricates high :onductivity, hard-drawn copper tubing with precision nachined, pin-type Teflon dielectric insulators. Standard i0 ohm transmission line is offered in sizes from 7/8″ thru 93/16″; 75 ohm in 6 1/8″ and 9 3/16″. All utilize EIA bolt type langes 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 (25) on Reply Card

Unlike other serial interfaces, it does not use error correction — the datastream is just too slow. A complete MIDI message takes a maximum of 30 bits, but most commands require fewer. This allows at least 1,040 MIDI messages per second, each requiring 960s.

The MIDI interface relies on a serial, 5mA, current-loop system. Each input/output/"thru" connection is opto-isolated from the others to avoid ground loops. A typical MIDI interface is shown in Figure 3.

The current-loop design precludes the use of simple parallel wiring for multiple outputs. If you need to couple several devices (that don't have MIDI "thru" jacks) together, use a multiple "thru" box with isolation circuitry, as shown in Figure 4.

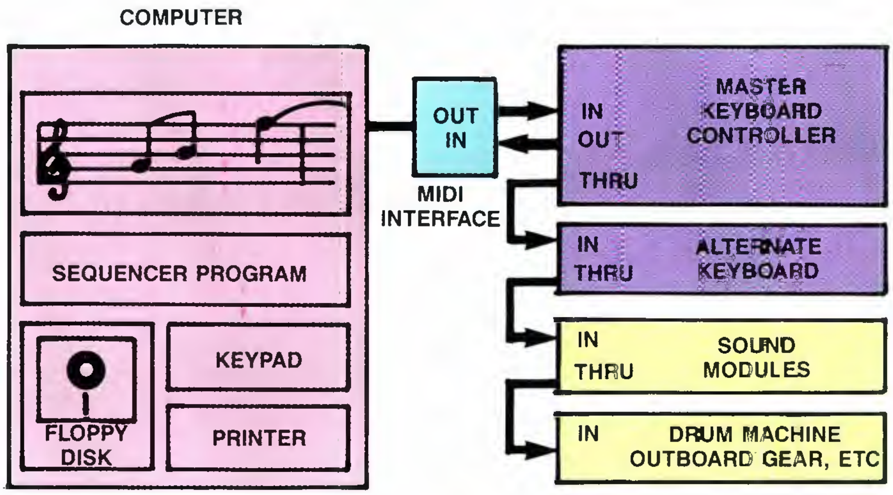



*Figure 1. A MIDI setup may be complex or simple. Here, a computer is used to control two keyboards and several sound-generating devices.*

### MIDI data messages

The MIDI specification lists many different types of messages. The equipment is designed to respond only to those messages appropriate to the device. The official MIDI 1.0 specification is primarily a software specification. The five specific types of MIDI messages may be grouped into two broad categories: *channel messages* and *system messages*. Channel messages allow selective transmission and reception of data. System messages are cues available to the entire MIDI system. A summary of the types of messages is shown in Table 1.

### Sequential events

Once the basic MIDI principles are understood, they may be applied in various ways. If you plan to use MIDI, it's convenient to think of the commands in terms of a carefully defined sequence. A sequence is a data file containing the MIDI information for a particular session.

Sequencers are used to develop the list of commands that control the other devices. They may be used to emulate the operation of a 16-track recorder and con-

***It takes teamwork to produce the industry's best-performing router. It takes confidence to guarantee it for ten years.***

At Utah Scientific, people know how to work together to bring you the best in product design, product performance, and product support. Products like the AVS-2, the new generation of Utah Scientific routers.

With the best operating specs in the business, the AVS-2 offers these exclusive features:

- ☐ surface mount component technology—increased packaging density for maximum size reduction with no sacrifice in signal integrity
- ☐ up to 525 crosspoints per rack unit including power supplies
- ☐ 1280 x 1280 matrix sizes with 8 separately addressable levels
- ☐ HDTV compatible—video frequency response flat to 30 MHz
- ☐ matrix cards automatically assigned to location—change card positions without reprogramming
- ☐ full matrix salvo capability—reconfiguration in one vertical interval
- ☐ only multi-sourced components are used—no hybrid circuitry.

And even though the AVS-2 is a revolutionary new design, we have the confidence to guarantee it for ten full years—parts and labor.

That means you can have confidence every time you buy a Utah Scientific product. Confidence that you are buying the best. Confidence that our team of experts is available to help you whenever you need it. Confidence that your Utah Scientific switcher will keep working for you year-after-year with the best reliability record in the industry.

Call us today for more information about the AVS-2 or any other Utah Scientific product.

US UTAH SCIENTIFIC

*Confidence in Quality.*

Utah Scientific, Inc.
4750 Wiley Post Way
Salt Lake City, Utah 84116-2878
(801) 575-8801 Toll Free: (800) 453-8782

Dynatech Broadcast Group

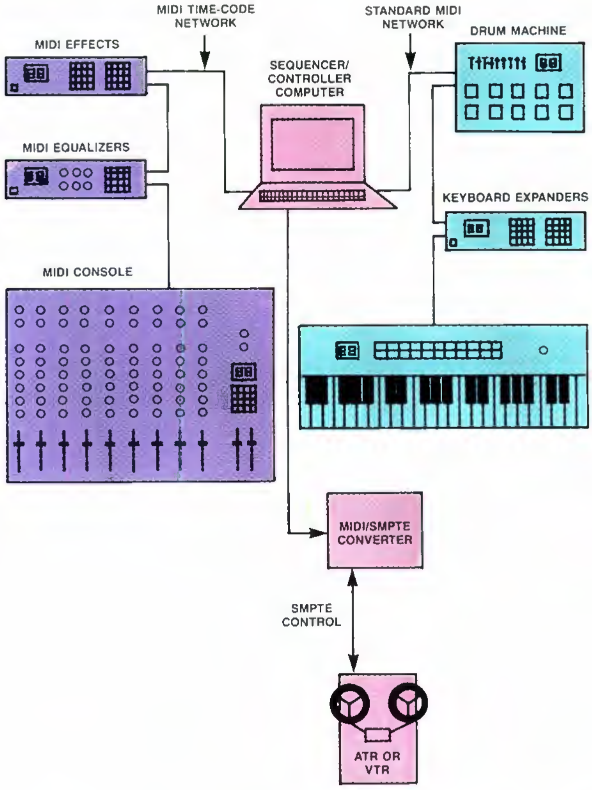



***Figure 2.*** *A broadcast or post-production setup usually requires a MIDI-to-SMPTE converter to drive an ATR or VTR. The remainder of the equipment is controlled by MIDI.*

sole. The difference between a tape recorder and sequencer is that a recorder stores the actual performance, and a MIDI sequencer memorizes and stores only the commands and data needed to direct the connected instruments that will create the performance. Typical sequencers feature the capability to merge and reassign tracks, control channel volume, autolocate and punch in and out.

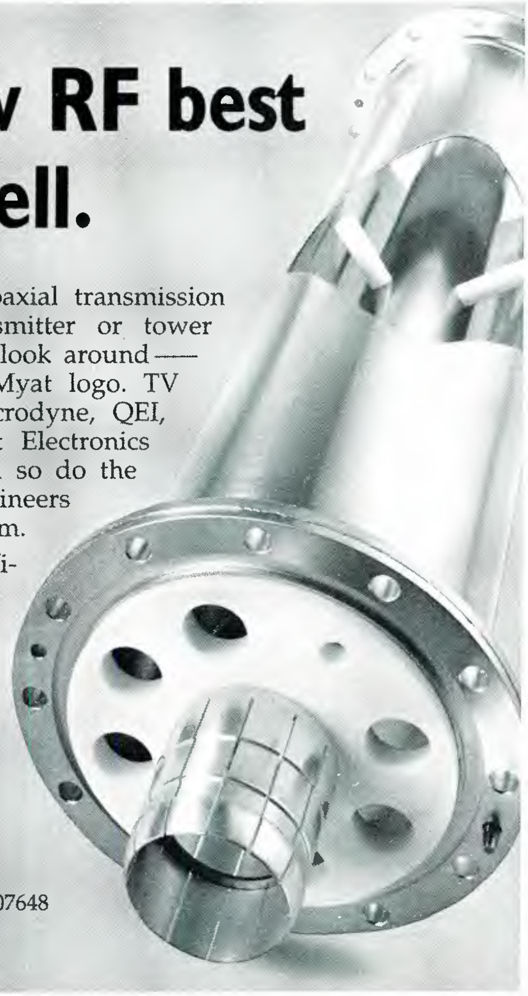
Sequencers, in the hands of experienced operators, may provide many more functions than tape recorders. They can transpose and loop tracks, edit and insert or erase notes at any point and display the whole score. Some provide automatic panning and programmable tempo, as well as the capability to store the entire sequence on floppy disk.

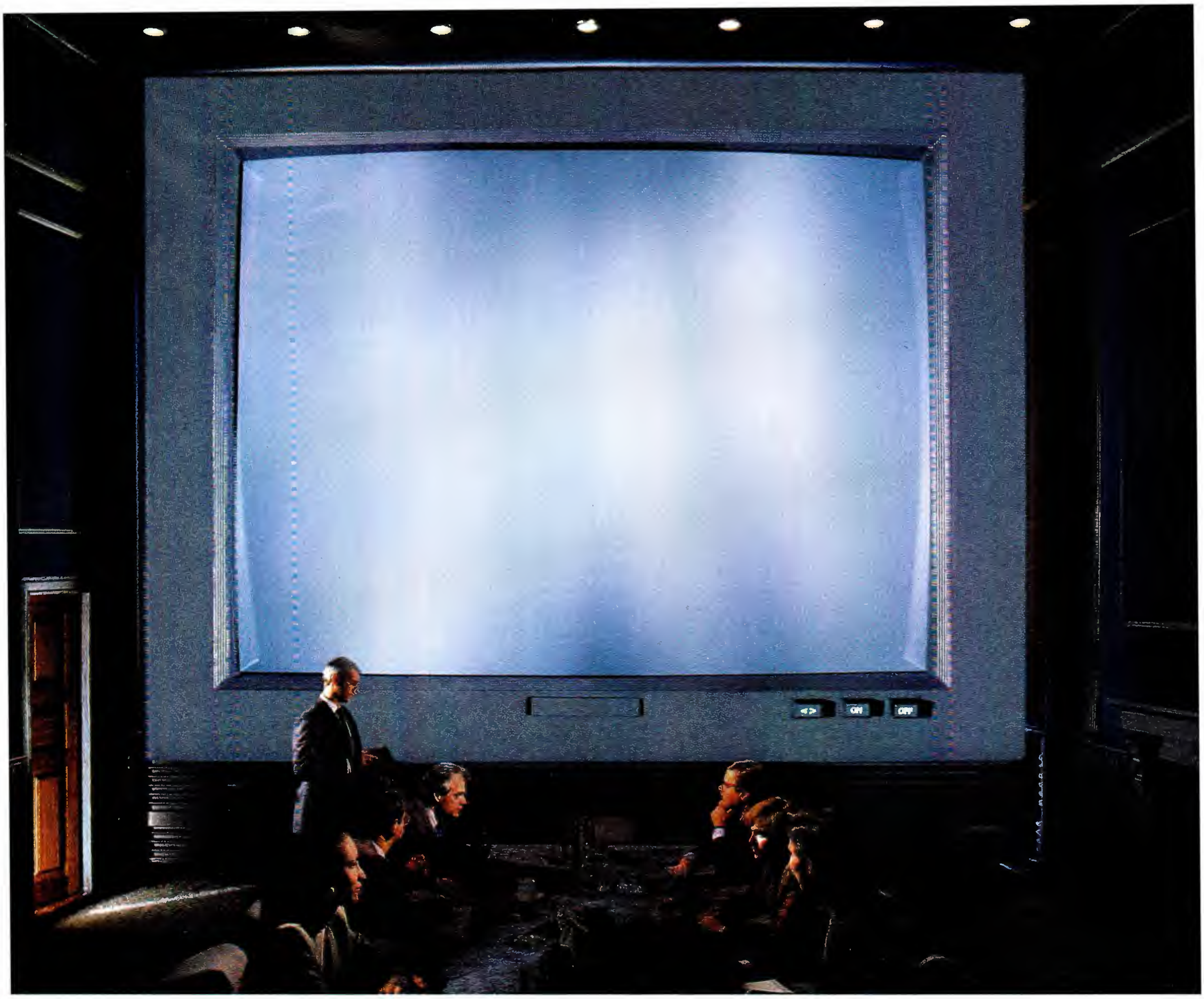
The sequencer may be a device that looks like a keyboard or, more often, a computer equipped with special software. The advantages of using a computer are low cost, operator familiarity and the capability to provide visual programming. Sequencing software comes in all sizes and is priced according to power.

A graphics-based, professional sequencer program creates a virtual sequencer transport with tremendous edit-

*Continued on page 54*







# What our improved definition video converter brings to a business meeting.

The very best picture possible. The kind that grabs a boardroom's attention. And holds it. The kind of visual impact that only NEC can give you with the ImageSmart™ Improved Definition Converter. And that, surprisingly, doesn't cost thousands of dollars in new equipment to achieve.

Simply plug your current NTSC video source into the ImageSmart Converter. And you'll get higher definition and clearer, more impressive images from your multiple frequency monitor or projector.

Because where a standard video signal has 320 lines of vertical resolution, our improved definition technology has 450 lines. That gives you an image that is 40% better with the ImageSmart Converter than without it. And in addition to getting better images, you'll get less video noise, truer color, and text that is easier to read. NEC also includes a remote control for maximum flexibility of your video equipment.

So next time you walk into a business meeting, you'll put on a presentation that is clear, precise. And larger than life.

©199? NEC Technologies, Inc.

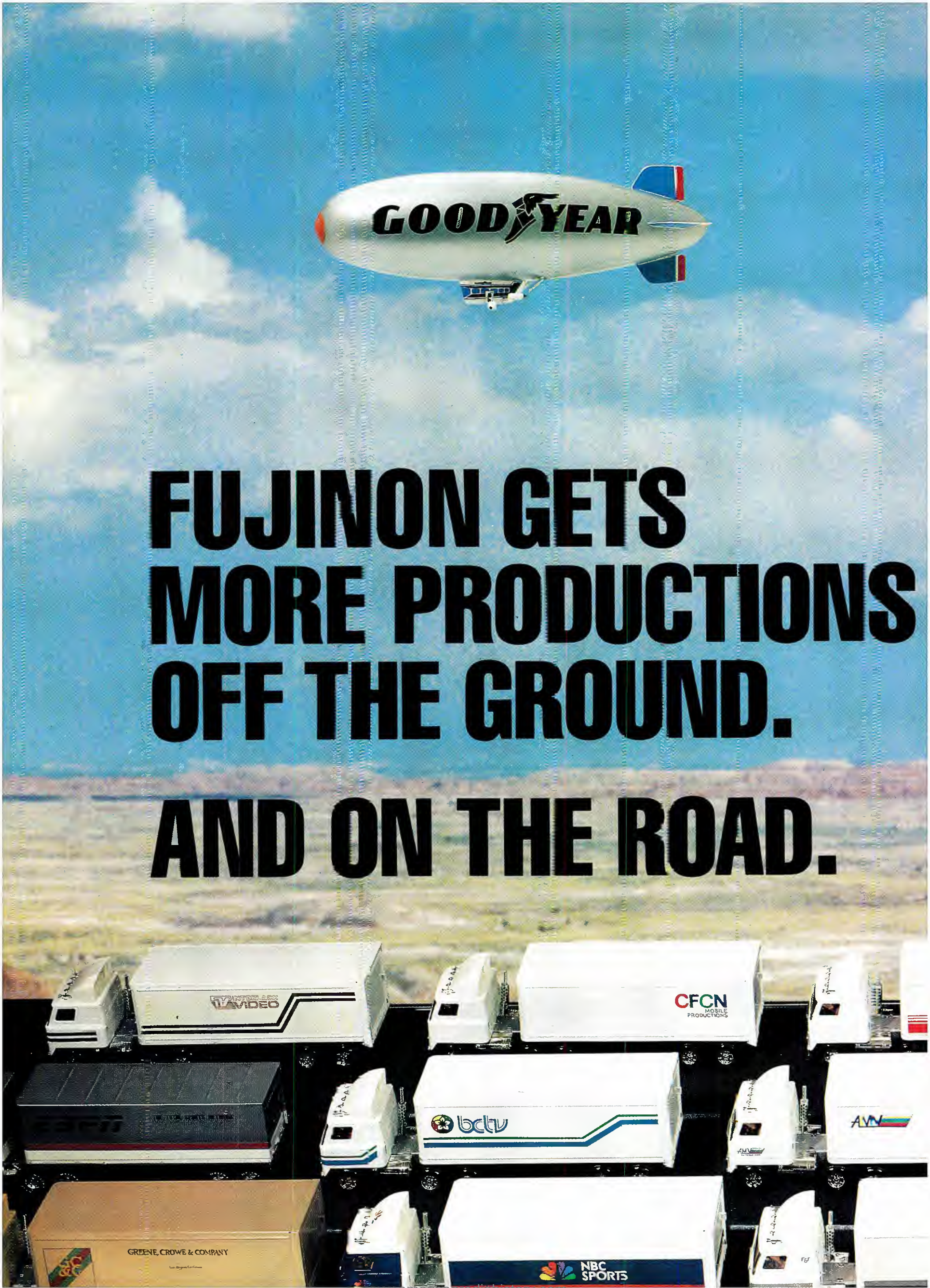
C&C
Computers and Communications

For more information call (708) 860-0335.

ImageSmart is a trademark of NEC Technologies, Inc.

NEC

Circle (28) on Reply Card


GOODYEAR
FUJINON GETS MORE PRODUCTIONS OFF THE GROUND.
AND ON THE ROAD.
CFCN
MOBILE PRODUCTIONS
bctv
AVN
GREENE, CROWE & COMPANY
NBC SPORTS

*Continued from page 50*

ing capabilities. Most of the programs are similar to hybrid word processing and paint programs. They offer cut, copy, paste, insert, delete, merge, volume, transpose and repeat for individual tracks or selected portions of tracks up to thousands of individual addresses per measure. Some programs allow you to work with 64 or more tracks, although the output of each track must be assigned to one of the 16 MIDI channels. Some sequencers can address two serial ports, providing a total of 32 MIDI channels.

For most musical applications, the sequencer is employed as a programmable, multichannel "player piano roll." But for non-musical, video applications, the sequencer may be thought of as a multichannel, SMPTE-compatible editor, controlling MIDI devices such as synthesizers, effects and samplers as well as ATRs and VTRs.

### Synthetic sounds

One of the more common applications of MIDI is in conjunction with a synthesizer. The desired, user-created sounds are stored and then recalled from the synthesizer via MIDI control. Alternatively, the synthesizer keyboard can be played

**MIDI 1.0**

| CHANNEL MESSAGES | | SYSTEM MESSAGES | | |
|---|---|---|---|---|
| **CHANNEL VOICE** | **CHANNEL MODE** | **SYSTEM COMMON** | **REAL TIME** | **SYSTEM EXCLUSIVE** |
| •Note On | •OMNI On | •Quarter Frame | •MIDI Clock | •Sample Dump Standard |
| •Note Off | •OMNI Off | •Song Position | •Start | •MIDI Time Code |
| •Polyphonic Key Pressure | •Poly | •Song Select | •Stop | •MIDI Files Standard |
| •Control Change | •Mono | •Tune Request | •Continue | |
| •Program Change | | | •Active Sensing | |
| •Channnel Pressure | | | •System Reset | |
| •Pitch Wheel Change | | | | |

***Table 1.*** *Except for the simple hardware specifications, the MIDI 1.0 specification is primarily a software description. The five basic types of messages may be grouped into two categories: channel and system messages.*

# COMPACT, POWERFUL, FLEXIBLE...

# ...AND TOUGH

Designed and built to withstand daily operation into the next century, the ergonomically designed AMS VCS offers more facilities and flexibility than any other console, within a compact, yet reassuringly conventional work surface.

Complete console set ups can be stored and recalled instantaneously in live situations or for later transmission. Featuring a unique offline set-up editing package, complete with high definition graphics, precious studio preparation time can be significantly reduced.

Faders are freely assignable to channels so that a single person can centrally operate the entire console. For occasions when more than one operator is required, two separate Assign panels accessing all console parameters are simultaneously available.

Fourteen day memory storage is automatic in the event of mains power failure and a sophisticated automatic maintenance program pinpoints faults to a single card.

Time tested in Europe and the United States, much copied but never equalled, this concept in consoles is the result of over 20 years of console design for broadcasters and leads the way for the future.

**The AMS Virtual Console System**
**The most technologically advanced stereo console available.**

1985 1986

For information and literature contact...

AMS Industries plc
Billington Road, Burnley BB11 5ES, UK
Tel: (0282) 57011 Fax: (0282) 39542

AMS Industries Inc
1180 Holm Road, Suite C, Petaluma, CA 94954, USA
Tel: (707) 762 4840 Fax: (707) 762 4811

**SEE US AT NAB STAND No 6338**

directly. However, the synthesizer doesn't have to look like a small piano; some are rack-mounted and designed to be controlled by a computer or other keyboard synthesizer.

Generally, all synthesizers can generate user-selectable synthesized sounds (called timbres), one at a time. Some keyboards allow players to split them, making all notes above a particular note one timbre and all notes below it another timbre. The newer generation of keyboards are multitimbrel: They can play many sounds simultaneously.

Multitimbrel synthesizers typically play four to 24 different selectable instruments. The outputs can be mixed internally to a 2- or 4-channel output and controlled by data on one of the 16 MIDI channels. Most synthesizers also provide individual pan and volume control for each MIDI channel.

**Sampled sound**

In the broadcast/production setting, a *sampler* might be more useful than a synthesizer. To create usable sounds from scratch on a synthesizer, the operator must have a bit of musical ability. A sampler, on the other hand, takes an existing sound, samples it and provides the operator vast control over what it "sounds like."

The sampled sounds can be coupled to the sampler from a microphone or line-level external audio source. And, you don't have to look all over for sounds. A wide variety of vendors offer CDs and tapes specifically produced for sampling. These sources provide clean samples of virtually every musical instrument ever conceived.

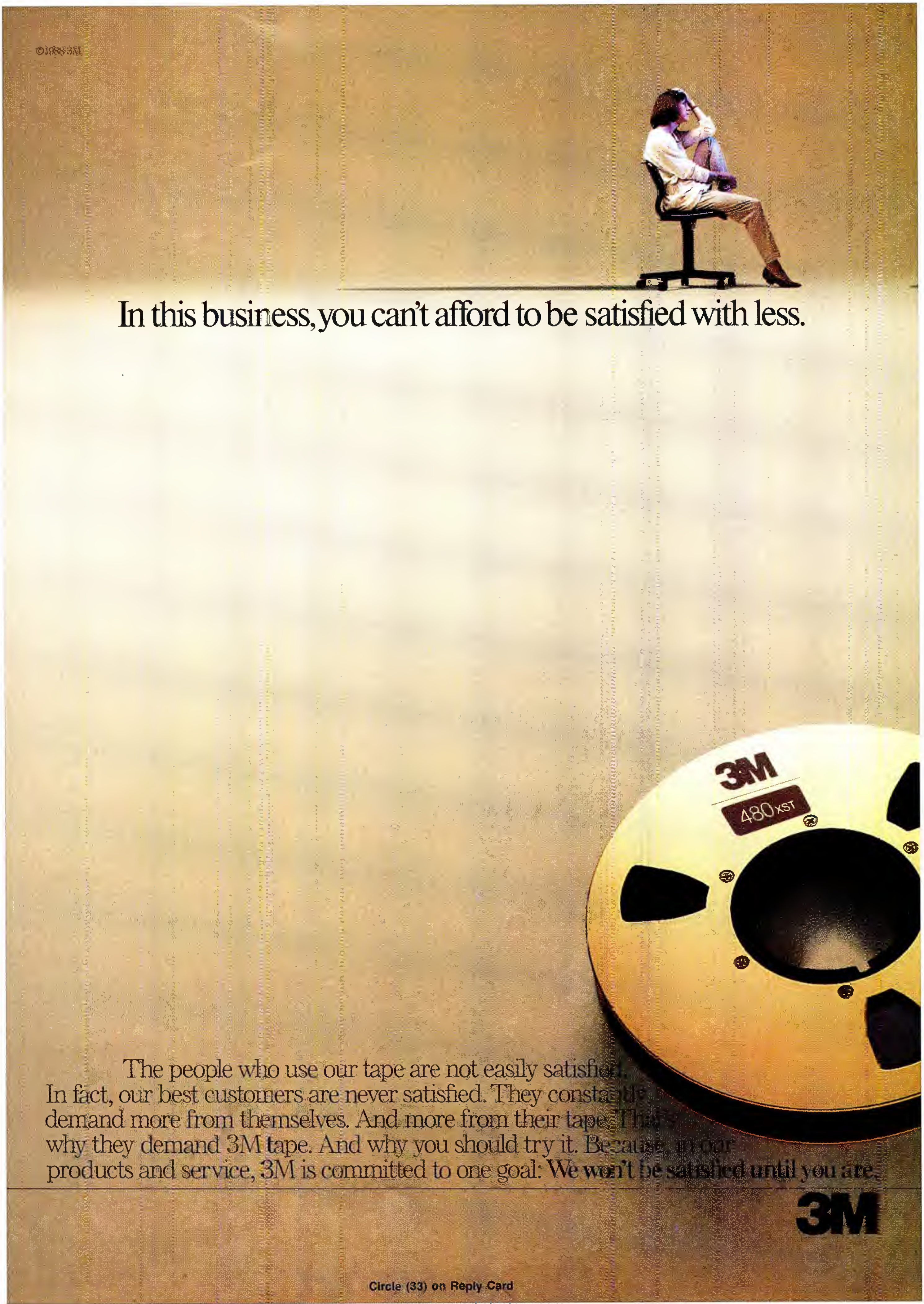
Sampled sounds may be stored internally to the sampler or externally on a hard disk. Once digitized as a sample, a sound also may be processed in various ways, including pitch change, equalization, lengthening/shortening and other special effects. If you need a door-closing effect that lasts 2.2 seconds, a sampler can do it for you. Cleaning up audio effects or looping background noise under an effect are two other common tasks for samplers. They are particularly adept at cleaning the heads and tails of audio bites.

The usefulness of sampling makes it highly desirable in video post-production and commercial production. Another attractive aspect of MIDI-based sampling is that the effects may be time-locked to another event, such as video. For example, if you're spotting sound effects for video, you can first load the effects for a segment into the sampler. Then create an edit decision list (EDL) with a sequencer or computer, which represents the trigger time for each effect. By triggering the effects from the time-code track on the video, the sampler automatically will synchronize the sound effects with the video on playback. Any needed changes in timing may be made on the EDL, checked and then recorded.

Most of today's 16-bit samplers use linear encoding that provides 96dB of dynamic range, and many support stereo audio. Some systems provide a graphics interface to permit easy and intuitive programming of the signal parameters, such as envelope and loop points. A few of the high-end sampling systems even permit waveform display, cut-and-paste audio editing, precision tuning, graphics envelope editing and reel-rocking functions.

Stations are beginning to use keyboard samplers and sequencers as cart machines. For example, each effect or audio byte is assigned to a different key. Simply by playing the keyboard as if it were a piano, the operator can play back the sounds upon command. The number of effects that can be stored depends on the amount of storage available. Keys can be reassigned and new samples taken and recorded in a matter of seconds, making the




©1988 3M
In this business, you can't afford to be satisfied with less.
3M
480 XST
The people who use our tape are not easily satisfied.
In fact, our best customers are never satisfied. They constantly
demand more from themselves. And more from their tape. That's
why they demand 3M tape. And why you should try it. Because, in our
products and service, 3M is committed to one goal: We won't be satisfied until you are.
3M
Circle (33) on Reply Card

devices quite efficient in a busy production studio. Sampling such as this may represent the ultimate cart machine, especially when short-length bytes are needed.

Another advantage of these production techniques is that the sounds never deteriorate through generation loss. Because the sounds (samples) are stored in the digital domain, none of the typical noise and mechanical problems develop.

All these features make the job of creating and editing sounds quicker and easier than ever before. Perhaps best of all, the technology makes it easier for people to express their creative talents, without the limitations imposed by the layering of analog audio.

### MIDI console automation

MIDI is useful whenever it's critical for exact and complex sounds to be carefully timed. Connecting a synthesizer and sampler to a sequencer forms the basis for a powerful automated sound-effects machine. The only missing element is automated mixing.

Many new consoles provide automation features through MIDI. Received MIDI commands are translated into control voltages or on/off signals for VCAs, digitally controlled amplifiers or switch functions. Console actions are under the direction of a controller operating from an EDL. Any necessary mixing changes are made in the EDL.

The particular type of automation design scheme used with MIDI is the subject of much debate, but there are at least two major approaches. One type of console automation is called *snapshot* automation. As shown in Figure 5, a MIDI sequencer directs a controller located within the console. A representation of all the settings of the automated switches and faders at a particular time (snapshot) is stored in the console's memory. This snapshot is then assigned a number, say 24. Setting No. 25 would represent another snapshot with different control settings. This type of automation is well-suited to stage or theater applications, where the levels and mutes can be broken down into scenes and cues.

Another type of MIDI console automation is dynamic control, illustrated in Figure 6. This type of control is useful in mixdown situations. All the switches and faders are scanned continuously, approximately every 30ms. During each scan, the fader or switch position is compared with the stored representation of the previous

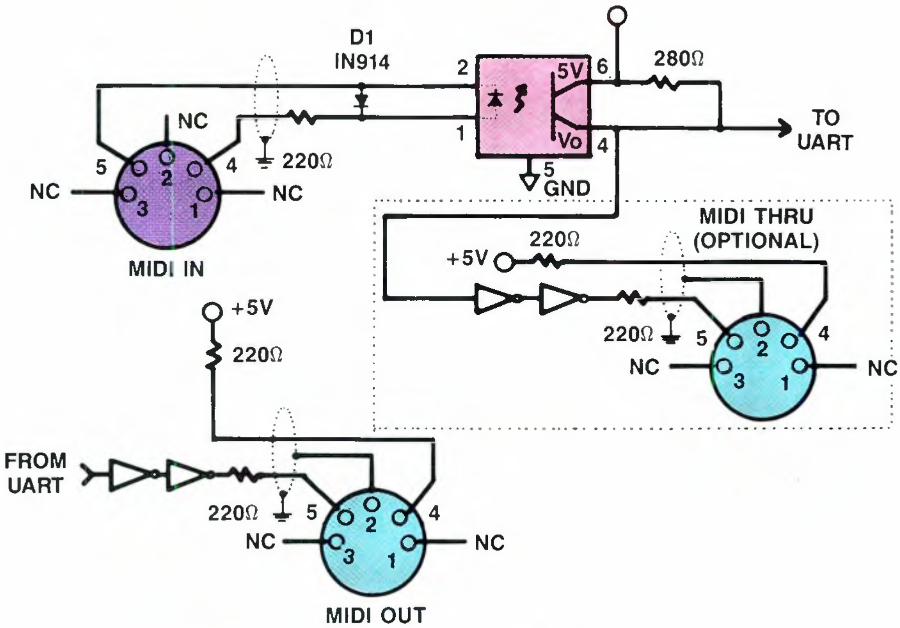



***Figure 3.*** *All MIDI connections are opto-isolated to prevent ground loops. The circuits are simple, as shown here.*

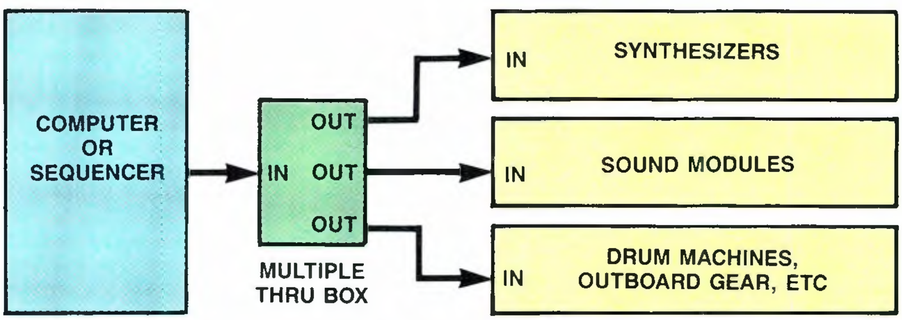



***Figure 4.*** *Some devices may not be equipped with MIDI "thru" jacks. In these situations, it's necessary to use a multiple-"thru" box to interconnect more than one device. You cannot simply parallel the lines, as with audio.*

# This switcher handles standard bandwidth like it's going out of style.

TVS/TAS-3000 Distribution Switcher

The new TVS/TAS-3000 video/audio distribution switcher from BTS handles standard bandwidth switching in stride. But the fact is, standard bandwidth may not be the standard much longer. And that's why the TVS/TAS-3000 is not your standard switcher.

With the advent of wide bandwidth video, you'll need a switcher that can handle the new higher bandwidth signals. The 3000 will. It provides a video bandwidth of more than 50 MHz, measured with a full-amplitude sine wave or video signal. Which makes it upwardly compatible with HDTV or computer graphics—no matter what the standard.

The TVS/TAS-3000 also delivers the cleanest signal and expands to accommodate any matrix size to meet your specific needs.

And if high bandwidth capacity isn't a requirement, BTS still has you covered with our best-selling switcher, the TVS/TAS-2000. The 2000 represents the same advanced technology and quality as the 3000 in a standard bandwidth switcher. BTS also offers a full-range of control panels and distribution amplifiers for a complete system designed, tested and guaranteed by one supplier.

All BTS switchers undergo 100% computerized factory testing and are protected with a 5-year warranty. In the unlikely event you do have a problem, simply return the board for a free replacement.

Dependable, performing switchers from BTS. Anything else is substandard. Call for information and technical specifications today: **1-800-562-1136, ext. 21.**

BTS
The name behind what's ahead.™

BTS is Broadcast Television Systems, a joint company of Bosch and Philips. P.O. Box 30816, Salt Lake City, UT 84130-0816.

Circle (34) on Reply Card

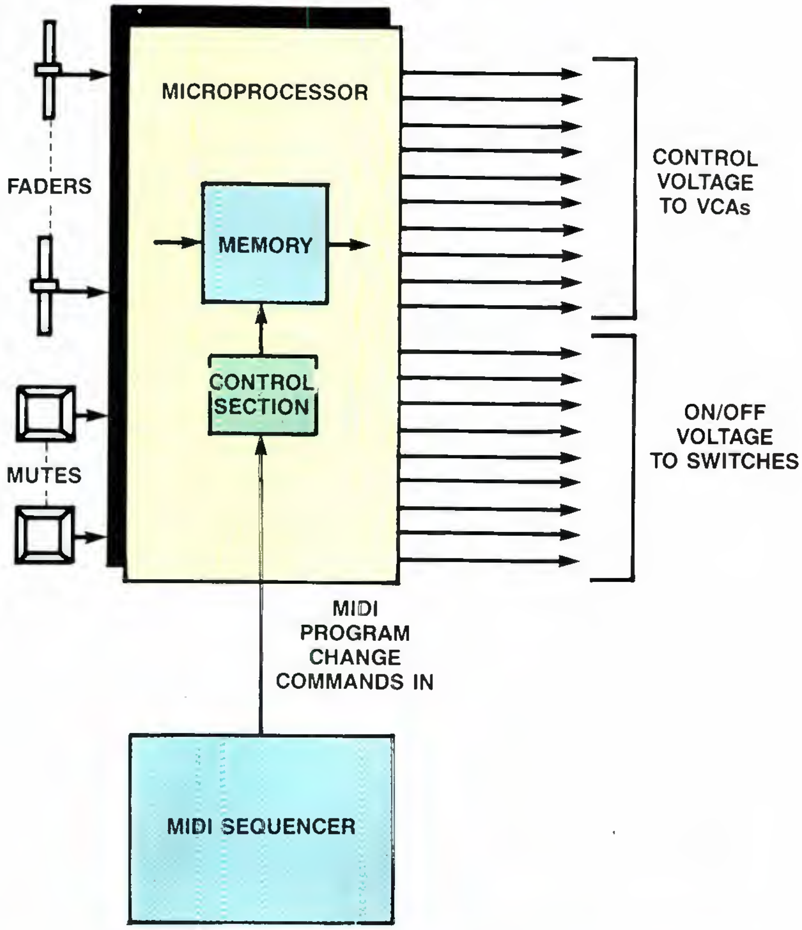



***Figure 5.*** *Snapshot MIDI-based automation is well-suited for theater or stage productions.*

scan. If a position has changed, the data in memory is updated. In this way, slow-moving as well as stationary faders can be represented.

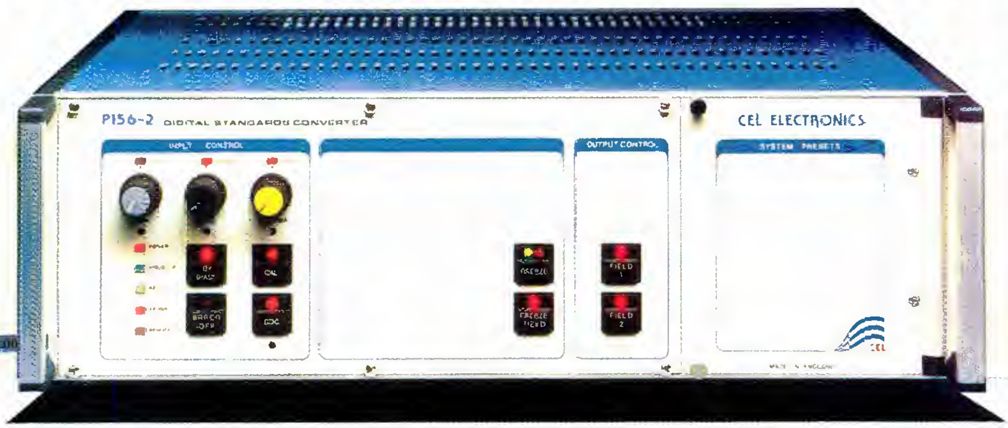
With snapshot automation, the actual memory usually is located within the console. Snapshot selection may be made from the front panel or from the MIDI controller.

With dynamic automation, however, the data representing control position and movement is sent by either "MIDI controller change" or "note on/off" commands. These commands could be provided by either a regular music sequencer or a special-purpose sequencer dedicated to the needs of console automation. This type of automation requires little memory within the console. On the other hand, the requirements placed on the sequencer are much more complex than in snapshot automation.

**Production example**

So much for the theory. What practical things can you do with MIDI? An engineer hired by a major fast-food chain to generate the music for its commercials encountered a new problem. The voice-over in the commercial didn't sound exactly like the client wanted it to. Although the tal-

# SETTING WORLD STANDARDS




CEL is crossing international boundaries in bringing its popular Standards Converter to many countries.

This industry standard product is specifically designed and produced for VHS and U-Matic/SP high and low band requirements. The P156-2 has consistently shown its worth, and with a world leading market share, goes on proving its value.

And values don't stop there. Look around the world and you will not find a competitor product within sight. The P156-2 – your passport to the market leader from CEL.

**Circle (40) on Reply Card**

CEL

The Art of Image Control

**CEL Electronics Ltd, Chroma House, Shire Hill, Saffron Walden, Essex, CB11 3AQ. Tel: (0799) 23817, Telex: 817807, Fax: (0799) 28081**

ent was called back to re-record that portion of the commercial, the client still was not satisfied. The client wanted a certain emphasis placed on one of the two key words in the commercial.

To correct the problem, the engineer loaded the two words into a sampler. Each syllable of each word then was disassembled and assigned to a separate key. The words were played back from the keyboard, with the intonation exactly where the client wanted it. Although this may seem a bit extreme, it illustrates the possibilities.

### Be a hero

MIDI offers stations production tools that used to be too expensive and time-consuming. MIDI-based editing may be as simple as using a sequencer coupled to a synthesizer or sampler as an electronic cart machine. And it may be as complex as linking an automated console to a video post-production setup with full SMPTE time-code control.

It won't solve all your production woes, but MIDI does provide a lot of control over audio. First, it makes it unnecessary to use the old-fashioned (and dangerous) method of razor-blade editing on master tapes. Second, a producer who used to be limited to perhaps three layers of audio can use digital storage and automated mixdown for almost unlimited layering.

Also, MIDI provides cost-effective control over a wide range of audio effects devices and video recorders. This combination provides creative users tremendous opportunities to make their stations really stand out on the dial. So next time you're thinking about making changes in production equipment, consider how MIDI technology might play a role. It could make your station more competitive, and make you a hero.

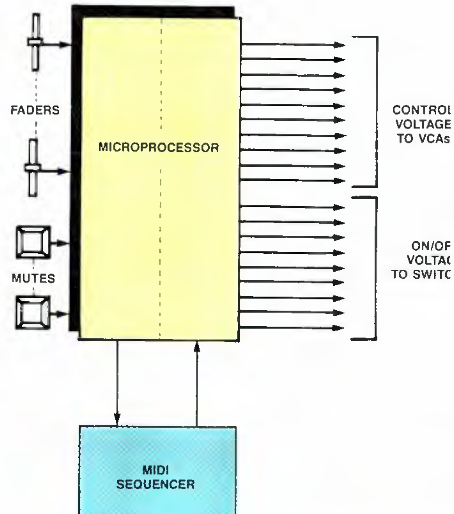



***Figure 6.*** *Dynamic MIDI-based automation could scan all faders and switches continuously. This design is much more processor-intensive.*

Bibliography

Cooper, Jim. "MIDI-Based Automation." *Recording Engineer/Producer*, February 1989.
Jostins, Peter. "MIDI and the Mixing Console." *Recording Engineer/Producer*, February 1989.
Lewer, Mark. "A User's Guide to MIDI." *Recording Engineer/Producer*, June 1986.
Maddox, Richard. "MIDI: What's in it for Broadcasters?" **Broadcast Engineering,** February 1989.
Soseman, Ned. "Fun With Electricity." *Video Systems*, October 1989.
"Understanding Synchronization." A Tascam publication.

GET IT RIGHT

GET IT FROM ALLIED

WIN A FREE PAIR OF MVPs for your station!

# MOST VALUABLE PLAYER


Tape cart reliability and convenience, plus the competitive edge of direct-to-air CD sound. That's why so many Allied customers call the Denon CD Cart Player™ their most valuable playback device.

Once they're in Denon's unique CD Carts, nothing touches your valuable CDs except the DN-950FA's laser beam. Your library is safe from dust, grease and scratches. And Denon CD Carts make playing a CD as quick and easy as slapping in a cart. There's no fumbling with jewel cases, waiting for doors to open or close, or searching for cue points.

That's because the DN-950FA *is* a cart player. It's built "DJ-proof" for heavy-duty broadcast use, with a rugged computer-type disk drive and 3-pin XLR outputs. And it has "goof-proof" broadcast-ready features like remote control, quick cue/review, end-of-message, Index cue, selectable 2% speed increase and reliable manual cueing to $^1/_{75}$th of a second. It's even designed for rack mounting.

The Denon DN-950FA has earned its "Most Valuable Player" title in thousands of on-air and production studios around the world. It looks, handles and acts like any other cart player. But with digital CD technology, it sounds better than any tape cart player can.

When you order the DN-950FA, make sure you put another "MVP" on your team—Allied Broadcast. We introduced the Denon CD Cart Player to the US. We've sold and installed hundreds of units. So get it right—get your Denon DN-950FA from the CD Cart Player experts. Call your Allied representative today.

**Enter Allied's CD Cart Player Drawing and win 2 Denon DN-950FAs plus 100 ACD 5 CD Carts and 1 rack mount adapter!**

Just send a sheet of your station's letterhead signed by the PD, CE or GM to:

Allied/Denon Prize Drawing
Dept. BE
P.O. Box 1487
Richmond, IN 47375

Entries must be postmarked by April 23, 1990. Winner will be picked by random drawing on April 30, 1990. Only FCC-licensed radio stations in the U.S.A. are eligible.

ALLIED BROADCAST EQUIPMENT
A HARRIS COMPANY

800-622-0022

CANADA 800-268-6817

STUDIO EQUIPMENT • HARRIS RF PRODUCTS • SATELLITE GEAR • TRADE-INS • TURNKEY SYSTEMS



Circle (42) on Reply Card

# The more things change

**By Dennis Ciapura**

**A product from the past reigns as the ultimate in AM receiver technology. Can we bring it back to the future?**

Today's AM receivers provide many features. They are small, lightweight, portable and inexpensive, but what about the audio quality they offer? In light of the current emphasis on AM improvement and the NRSC drive to get receiver manufacturers to produce higher-fidelity AM radios, let's step back and take a look at how far AM receiver technology has come in the past 50 years.

The best radio receivers built just before World War II were the products of companies such as E.H. Scott and Silver McMurdo. The Scott Philharmonic is representative of the state-of-the-art in receiver technology at that time. The receiver selected for this review is an AM/FM model that has been maintained in its original electronic configuration with no component replacements that would alter its performance capabilities in any way.

### Receiver features

One of the more useful features of the Philharmonic is a selectivity control that provides continuously variable bandwidth from 2kHz to about 12.5kHz. This is accomplished by symmetrically detuning the four IF stages with a gang of variable capacitors. A potentiometer that varies the AGC voltage also is ganged to the same shaft to compensate for the gain change as the Q is lowered. Figure 1 shows the audio bandwidth at several settings of the selectivity control.

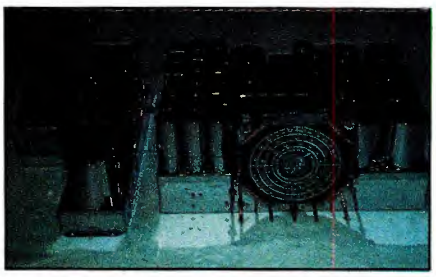
Ciapura is vice president, technical operations, for Noble Broadcast Group and president of TEKNIMAX Telecommunications, a San Diego-based technical management consulting firm.

The AM response relative to the current NRSC AM transmission characteristic is quite interesting. Figure 2 illustrates the response deviation from NRSC at the full bandwidth setting. Note that the receiver's response varies only ±3dB, from 30Hz to 10kHz.

Earlier, pre-FM versions of the Philharmonic also broadened the RF stage. The frequency response actually went out to 16kHz and included a 10kHz notch filter in the audio. Experience in the field with the broadcast source fidelity of the day probably indicated little program content past 10kHz. The extended frequency response of the 3-speaker system in the AM/FM version made the additional noise more noticeable, so the simpler IF-only adjustment approach was adopted.

### AM receiver performance

The AM sensitivity measured 1$\mu$V for a 10dB S+N/N, exactly matching the manufacturer's advertised specification. The noise floor dropped to −47dB in the wideband mode with 1mV input. The AM sensitivity from band to band was also checked and proved to be nearly equal from the broadcast band up to 30MHz. The THD at 400Hz, 30% modulation was 0.9%, and it stayed near 1% up to 80% modulation.



*The 1939 Scott Philharmonic AM/FM receiver.*

The receiver also includes a noise limiter for use on the shortwave bands. The filter helps extract weak signals from high-impulse noise interference, and it works extremely well. Newscasts from Europe, which were embedded in heavy interference when received in California, were completely intelligible with the noise filter on. Even though the clipper did cut slightly into the program peaks, the distortion was minimal considering the reception improvement.

Everything about the Philharmonic, from its electronic features to its construction, is a statement of quality. The tuner chassis and power amplifier are chrome-plated, including every tube shield and transformer case. Even the dial assembly is a fine instrument, with 2-speed tuning and a precision logging scale.

### FM section

In the late 1930s and early '40s, the FM band covered 41MHz to 50MHz and used 50$\mu$s de-emphasis. The FM section of the Philharmonic consists of two RF stages, a mixer and four IF stages. The last two stages are biased to function as limiters ahead of a discriminator-type detector.

The FM response was ±1.5dB, from 50Hz to 15kHz, and THD measured 0.8%

*Continued on page 68*

# *How to get an engineer to babysit your transmitter 24 hours a day, 7 days a week, and like it.*

Babysitting the transmitter is no one's idea of a good time. Somehow, nothing seems to go sour from nine-to-five. You get "beeped" or called at the most inopportune moments. They're in a panic and you've got to jump in the car, race to the site and start problem solving. What a nuisance.

### *What You Need Is A Not So Silent Partner.*

With the VRC-2000 on duty, it's like having a full time engineer in the plant. And we mean full time, 24 hours a day,

VRC SAYS EXHAUST TEMP IS CLIMBING, IT KICKED IN BACK-UP A/C AND I PICKED UP THE SPARE!

7 days a week. The VRC-2000 is a complete system for monitoring and controlling your transmitter.

The VRC-2000 continually evaluates transmitter performance. When something goes awry, it starts calling immediately, up to five people in rotation, until it reaches a responsible party and corrections are made. No dead air. No lost revenue.

### *All You Need Is A Standard Telephone Line And A Willing Ear.*

The VRC-2000 doesn't require a dedicated line, a standard telephone line is sufficient. That saves you money. You can use any conventional dial-up telephone or radio link. Gentner's patented voice remote control gives you the lowdown. Within parameters that you establish, the VRC-2000 will even make certain programmable adjustments, then call to tell you what it has done.

### *Full Control And Documentation From A PC.*

The VRC-2000 is more than just a friendly voice, it can be programmed and controlled by a PC so you can manage your transmitter and get a complete data trail on transmitter activity. Whether you use hard copy printout or review the data from the PC's monitor, identifying problems and developing solutions couldn't be quicker or easier.

### *Let Gentner Show You How To Get A Good Night's Sleep.*

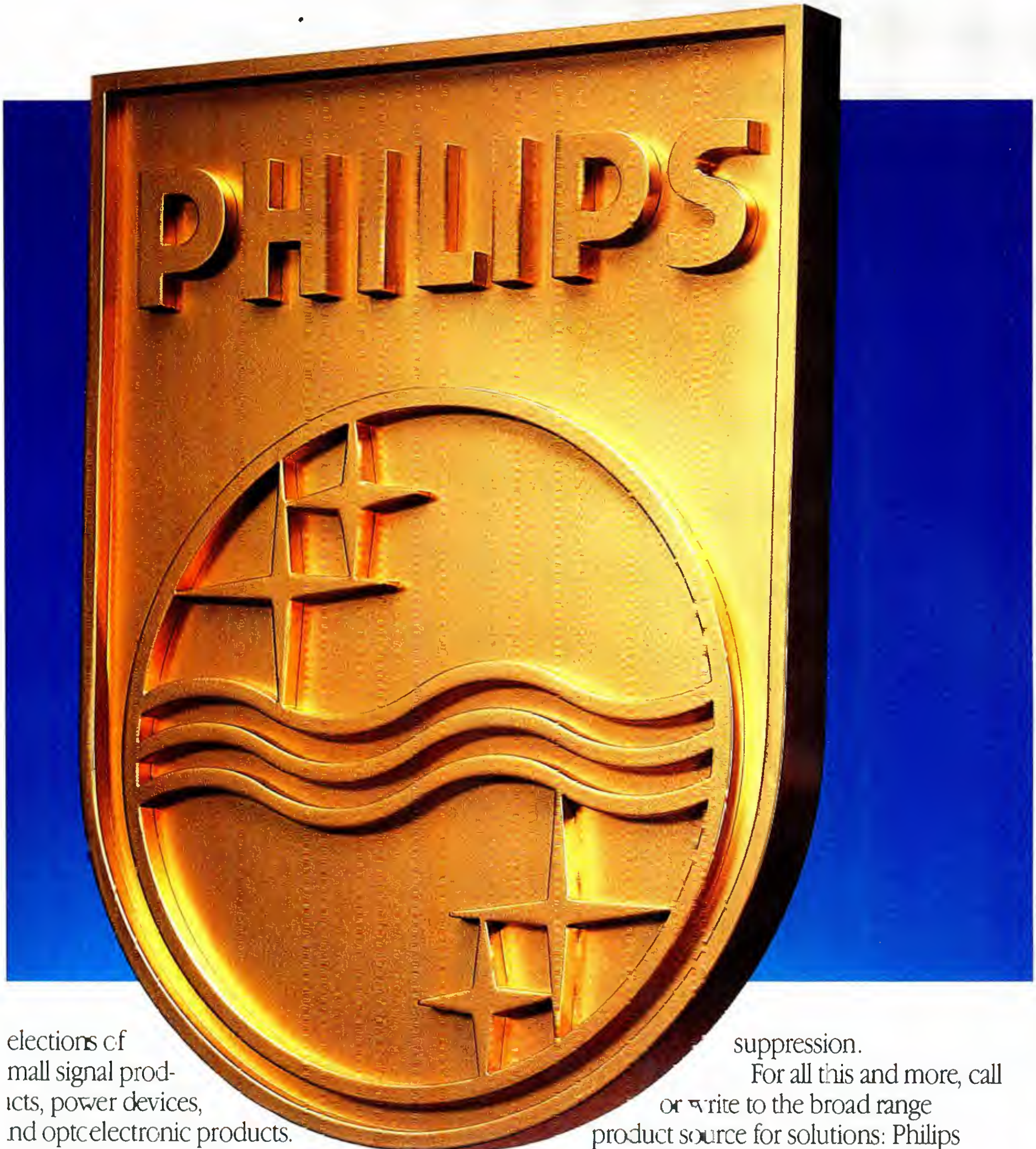
Give us a call. We'll hook you up with your Gentner dealer so you can get all the facts. Then put VRC-2000 on call. You'll play harder and sleep a whole lot better knowing your not so silent partner is on duty, 24 hours a day, 7 days a week.

BOTTOM OF THE 9TH VRC CALLED TO TELL ME IT SWITCHED TO STANDBY, I HIT A TWO RUN DOUBLE!

**GENTNER**

*Gentner Electronics Corporation*
*1825 Research Way*
*Salt Lake City, UT 84119*
*(801) 975-7200*
*Fax: (801) 977-0087*

Call me, I'm interested. Circle 47 on reply card.
Send literature. Circle 46 on reply card.




elections of
mall signal prod-
icts, power devices,
ind optoelectronic products.

In Professional Components: camera tubes, CCD image sensors, UHF Klystrons, and much more.

In Materials: a broad range of ferrite cores or power supply and telecommunications equipment (pots, U E and I cores, and toroids). Plus beads, chokes and rods for EMI/RFI suppression.

For all this and more, call or write to the broad range product source for solutions: Philips Components Discrete Products Division.

**Philips Components**
**Discrete Products Division**
A North American Philips Company
2001 W. Blue Heron Boulevard
P.O. Box 10330
Riviera Beach, FL 33404

**1-800-447-3762**
Fax: 407-881-3300

*More Products. More Solutions.*

**PHILIPS**

Circle (48) on Reply Card

at 50% modulation with 1mV input. Sensitivity was 10μV for 30dB S/N, which again met the manufacturer's specification exactly. Noise dropped to −61.5dB at 1mV input.

### Audio section

As you might expect, the set's audio section exhibited the same quality as the tuner. The power amplifier consists of four 6L6s in push-pull, parallel operation, providing 40W of Class A output. Negative feedback is used to further reduce distortion. The amplifier drives a 12-inch woofer and two 5-inch tweeters through a 12dB/octave crossover network. The near-field 1/2-octave pink noise response of the overall audio system was ±6dB, from 45Hz to 12kHz.

Under the same test conditions, this would be excellent performance for any modern amplifier/speaker system combination. The audio also includes a gated noise filter with a variable threshold. When switched on, it rolls down the high end when no high-frequency content is present. The frequency response returns to flat as soon as treble program content is sensed. Its action is similar to the modern Burwin and DNR processing. The circuit was intended to function as a scratch filter for phonograph inputs and noisy broadcast or shortwave conditions that don't require the clipper-type noise filter.

### Pleasurable listening

Listening to the receiver is an amazing experience. At 3/4-bandwidth (8kHz) or greater, the AM audio sounds almost like FM, and the capability to cut the bandwidth just enough to eliminate interference when receiving weaker stations is marvelous. In most cases it's not necessary to cut back to less than 5kHz. In fact, it is even possible to listen to most foreign broadcasts at 4kHz or 5kHz bandwidth.

The Scott Philharmonic is indeed an admirable radio, particularly for its AM performance. For broadcasters, however, it also serves as a vivid reminder of how much AM receiver performance has been allowed to degenerate over the last 50 years. It is incredible that the consumer electronics industry can produce a color television that fits in the palm of your hand, but we're still negotiating for AM receivers with performance that was achievable a half-century ago!

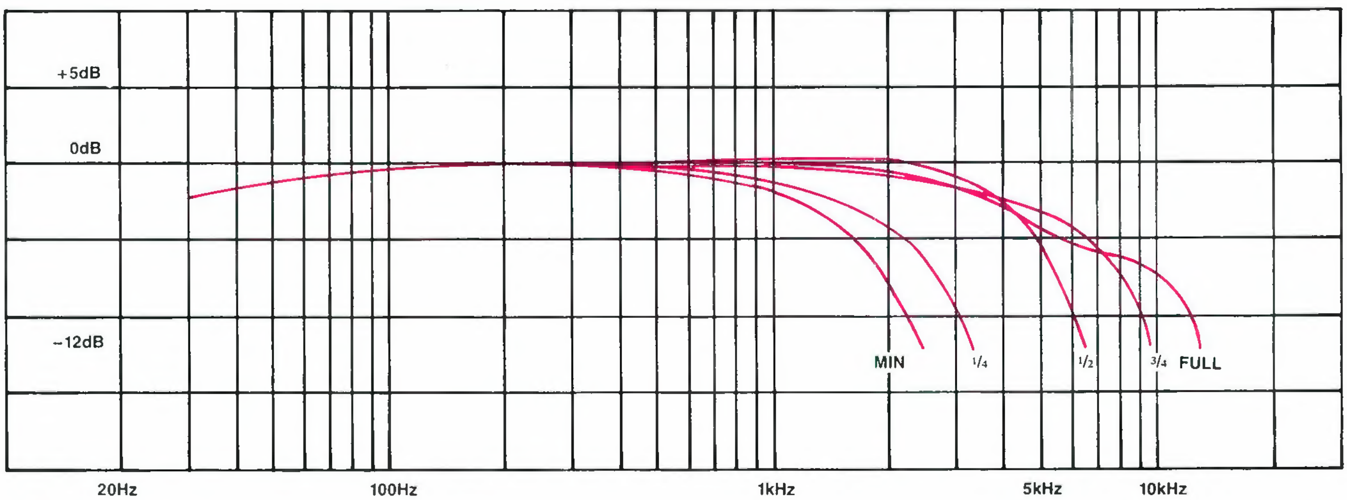



***Figure 1.*** *Early radios permitted the user to select the amount of audio bandwidth desired. Shown here are the response curves at five different bandwidth settings.*

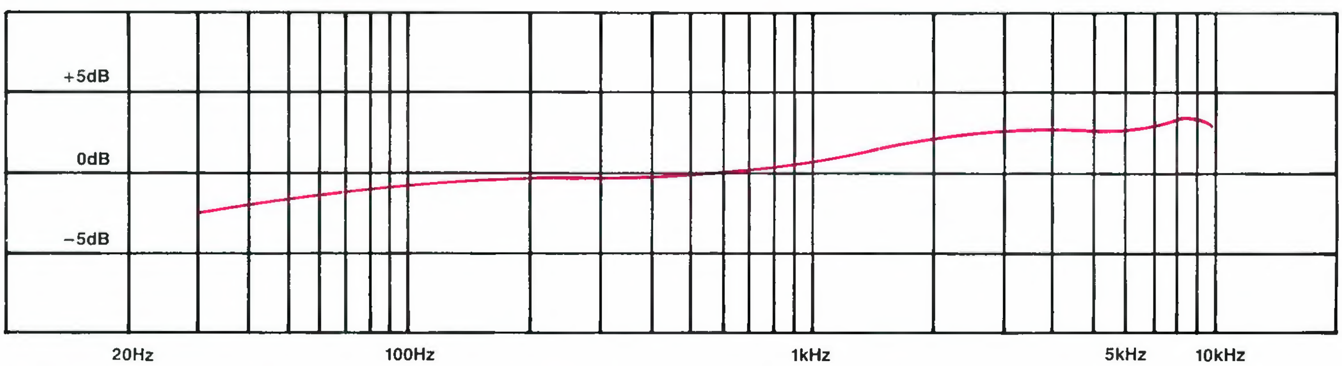



***Figure 2.*** *At the full setting of the bandwidth control, the radio's response was flat out to 10kHz.*

# No dropouts in Russia.

Tape dropouts mean trouble for videotape professionals. No wonder so many of them choose to work with Sony Professional Videotape. Including the producers of two recent documentaries shot in Russia, who minimized dropouts by shooting with Sony Videocassettes.

Sony cassettes were never at a loss for picture, whether covering sub-zero, Northern Russia nights or getting impromptu interviews with people on the street in Moscow.

Not that this surprises those of us at Sony Professional Videotape. After all, we've designed all our products around one basic premise: durability. To be frank, the demanding shooting conditions of Russia aren't as tough on our tape as we are.

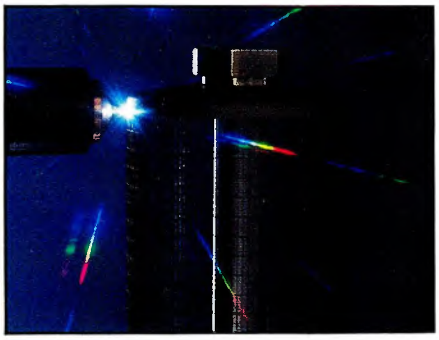

XBR U-matic® cassettes, for instance, feature a molded-in anti-static cassette shell and components to reduce transient dropout potential by neutralizing static charges. Combine this with base film that's been given Sony's exclusive Carbonmirror™ back coating and dropout potential is reduced even further.

No matter which Sony Professional Videotape you're working with, there's one thing you know for sure. Its greatest ability is durability. Whether it's U-matic, Betacam,® 1" or Digital tape. So take on the world. With Sony Videotape. On location in Moscow, Russia or in a studio in Moscow, Idaho, you need a tape that's tough as Sony. After all, there's no better way to lower the dropout rate.

**SONY.**



Circle (49) on Reply Card



# Throwing effects for a loop

By Jay Flora and Susan Crouse-Kemp

Extensive keying and complex digital effects quickly exhaust the capabilities of even large, multiple mix/effects (M/E) switchers. Smaller switchers with fewer M/E units reach their limitations even sooner. This bottleneck between switcher and effects system occurs because almost all of today's switchers treat the digital effects device as a video source, when in reality, it only processes video that is supplied to it. This limits the availability of the M/Es, and the additional external processing actually can degrade the quality of the signal.

The authors are employed in the video systems division of Ampex, Redwood City, CA. Flora is staff engineer and project leader, and Crouse-Kemp is product manager.

Addressing this problem, particularly in smaller production switchers with fewer M/Es, called for a re-evaluation of the true functions of switchers and digital effects systems. As a result, Ampex developed a proprietary digital-effects loop architecture called *Digi-Loop*, incorporated in the AVC Vista production switcher. The system breaks the switcher's video path internally, routes the video to an external effects device for processing, then brings the results directly back into the switcher. This streamlines the handling of digital effects within the switcher. It also allows the operator to route signals into the effects system entirely from the switcher control panel, preventing the external patching and routing that digital effects systems often entail.

### Basic switcher architecture

A quick review of basic switcher architecture and effects integration principles will illustrate how the digital effects loop

*Continued on page 74*

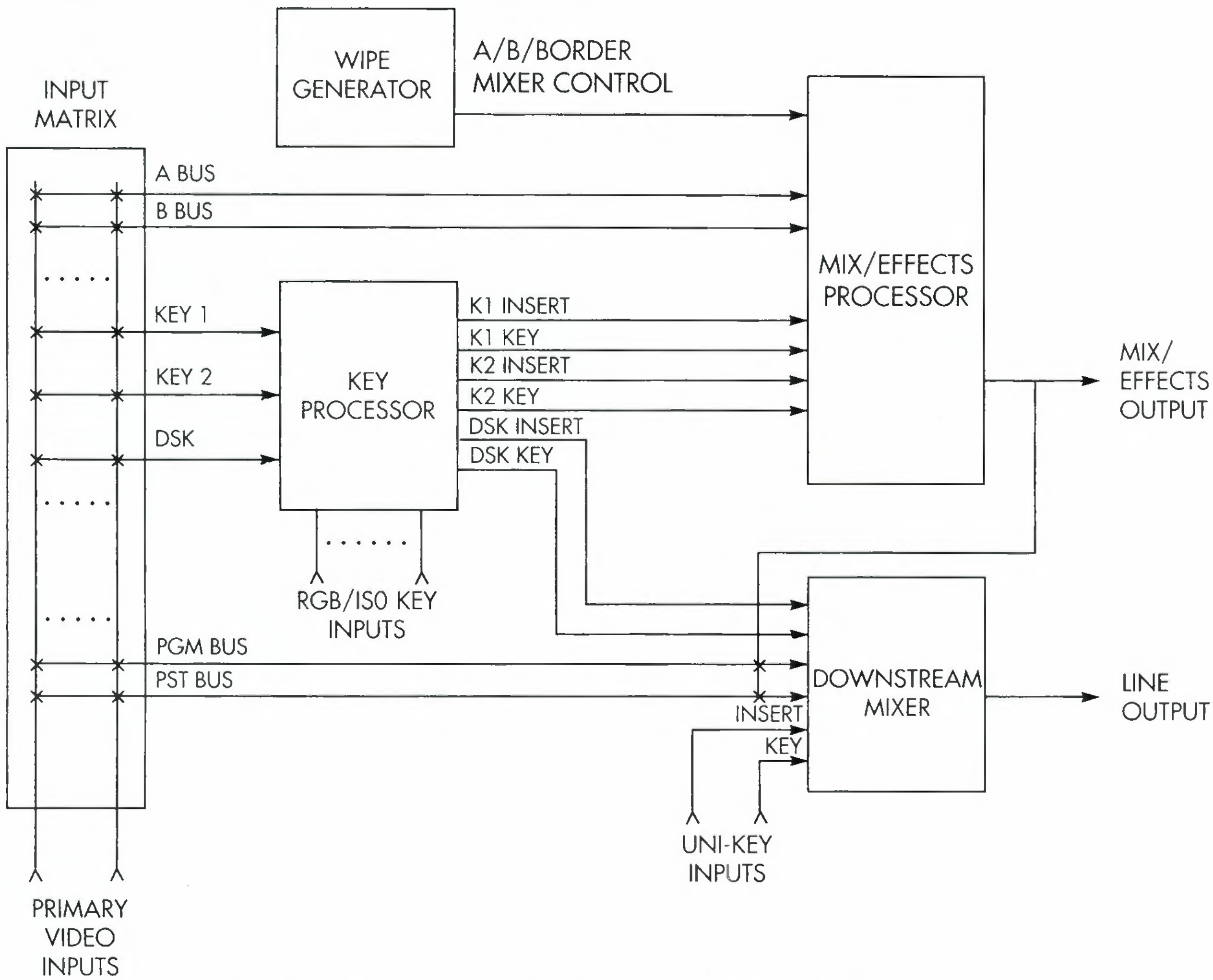



***Figure 1.*** *Typical production-switcher architectures provide three functions: input selection, mixer control and output combining.*


# DISCOVER A HOT NEW TALENT. GIVE LEADER'S SYNC/TEST GENERATORS A FREE SCREEN TEST.

Notice the sleek, high-tech profiles. Now move in for a close-up look at Leader's impressive line of video sync/test generators. Then call us and we'll outfit your production, post-production, or service facility with one of our state-of-the-art sync/test generators for a free 2-week trial period—with no obligation.

You'll find Leader's affordable, full-line coverage includes a model ideally suited for your needs. The model 411 is a sync and test signal source, perfect for use in production and post-production facilities. It features digital gen lock and its own internal clock and can be driven by either. The 411 generates sync timing with test patterns having the tight tolerances only possible with digitally synthesized signals. And a 10-bit DA ensures excellent accuracy for all test signals.

The sophisticated and versatile LCG-420 modular sync/test generator is right on the mark for video analysis and evaluation of broadcast cameras and VCRs. The new 408, incorporating the latest in CPU technology, is your best choice for service and repair. And for portable applications, try our compact, battery-powered LCG-409 pattern generator. But whichever you choose, you'll discover the quality and reliability that are built into every Leader product.

So call and ask about our free "Screen Test"—it could make *you* the hot new talent! For our full-line catalog, in NY call 516 231-6900. Or call toll-free:

**1 800 645-5104**

**LEADER**
FOR PROFESSIONALS WHO KNOW THE DIFFERENCE

**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.

**Circle (51) on Reply Card for product information.**
**Circle (52) on Reply Card for product demonstration.**

# Introducing the Jazz Di


Jazz. That may strike the professional video producer as a strange name for an effects system. But Jazz music is open-ended. It can change mid-stream. It's not elitist or highbrow. Jazz is always creating and recreating within an ever-evolving structure.

That's how we came to name our new system. It can evolve, adapt, modify or improvise. All to suit your service or your customer's needs. It's advanced enough to offer every compatibility. Yet it boasts a startling simplicity in operation. And an even more surprising price tag. So as your company changes, Jazz can change right along with you.

OUR KEYFRAME EDITING ALLOWS YOU TO PRE-PROGRAM ALL YOUR EFFECTS. (AND STORE ALL YOUR SECRETS ON DISKS.)

How? Well Jazz is easily upgradeable through both hardware and software. And we're looking forward to bringing you 3D, machine control and even graphics capabilities. But for now, you get to play with all this Jazz:

Flip and Tumble. With Jazz, you can change the axis. Or you can change the size. Which means you have an infinite number of possibilities.

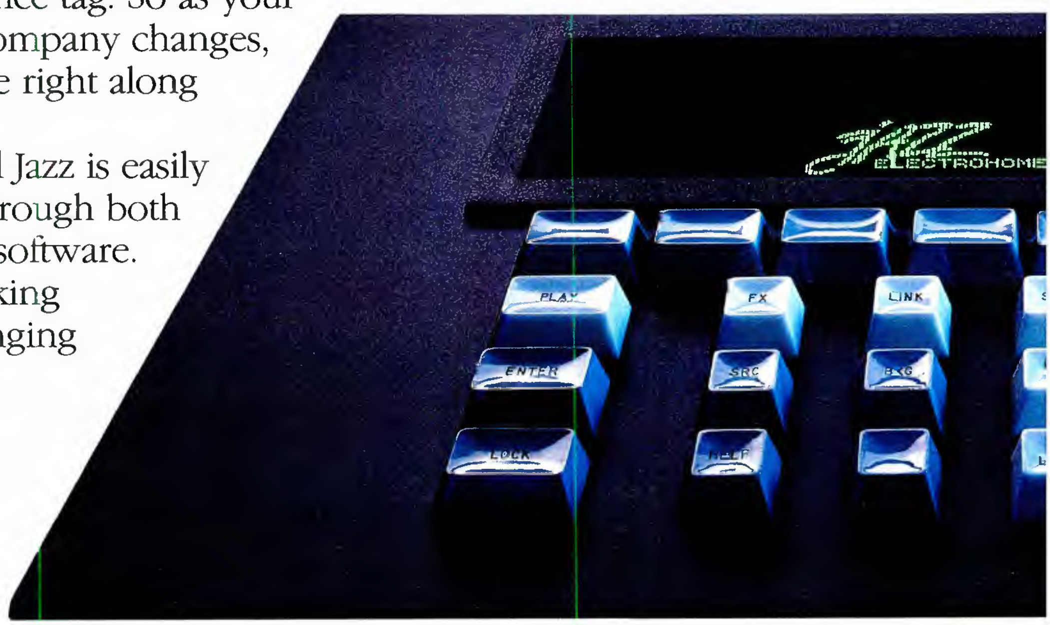
Or you can Rotate if you like. That means clockwise or counter-clockwise. With variable speed in both directions.

Maybe you want to blow it out of proportion? Jazz offers you infinite Overexpansion just in case you want to reframe that perfect shot.

And our Posterization is as pretty as a picture. It operates

**$14,995**

JAZZ FITS INTO ANY BUDGET. AND ANY SYSTEM. IT'S EASY TO INTEGRATE AND A CINCH TO UPGRADE.




DON'T LET THE SIMPLE INTERFACE FOOL YOU. JAZZ IS ONE OF THE MO

# ·al Video Effects System.

to an infinite level with a surprising smoothness.

You can crop an image. Pan a crop over an image. Pan an image within a crop. Or just pan a cropped image. Sounds confusing? It's not. And if you want to change it again, you can. It's easy and it's fast.

That brings us to another key function. Jazz's Link Function allows you to manipulate a keyframe like never before. And virtually eliminates the kind of guesswork and legwork usually associated with creating key sequences.

And Jazz also creates Mirror Image. Horizontal and Vertical Inversion. Borders of any size or color. And a whole lot more effects than can be talked about in one ad.


NO COMPLICATED NUMBERS OR QUOTIENTS HERE. JAZZ PLAYS RIGHT ALONG WITH YOU USING A SIMPLE SET OF WORDS.

Of course it all comes together with our Keyframe Editing capabilities. It's the ultimate in cut and paste. You just step through the keyframes and modify any or all of the variables that have been recorded. And we don't have to tell you how helpful that is when a job is tight for time or money.

How can we sum it up? It's fast, clean and direct. You don't have to be a techno-wizard to operate it. And you don't have to be a financial wizard to see that it's profitable. Jazz keeps your production services flexible. And it keeps your company growing.

So if you're looking for a new system, or a change of systems, look to the one that's always changing. Jazz from Electrohome.


JAZZ IS FAST ENOUGH TO STICK WITHIN A BUDGET. AND IT'S SO INTUITIVE, IT'S A JOY TO OPERATE!

JAZZ
ELECTROHOME

Jazz is a trademark of Electrohome Limited.

OWERFUL TOOLS FOR ODAY'S PROFESSIONAL RODUCER.

For more information call Marilyn Weber at 1-519-749-3134.

Circle (53) on Reply Card

*Continued from page 70*
is implemented.

Figure 1 depicts a conventional switcher with one M/E unit and a downstream mixer/keyer. The switcher performs three primary functions. First, an input matrix selects and routes video sources for backgrounds in effects, downstream mixing and key-processing circuitry. Second, transition signals are synthesized in the wipe generator to control the wipe edges between background A and B video signals in the effects mixer. Third, a key processor creates key (hole-cutting) and insert (hole-filling) signals and directs them to the video mixer. The key processors shown in Figure 1 produce multiple key and insert signals for use in the M/E unit and downstream mixer.

The M/E processor is a multichannel mixer that combines the key-insert and background bus video. The M/E output can be re-entered as a background into the switcher. A downstream mixer combines downstream insert video with the program and present background videos.

**Typical effects integration**

A method of combining a multiple M/E switcher with a digital effects device is illustrated in Figure 2. For simplicity, wipe generation, keying and mixer functions are combined into the M/E block.

Typically, the digital effects system is fed from an auxiliary video matrix, which may be a part of the switcher's structure or an external routing panel. The effects system's output is then returned to the switcher as input.

Most effects systems supply a key output to define a raster boundary. This is a signal directed to the mixer to control how the digital effect device's output combines with background video. The boundary key typically connects to an isolated-key input of the key processor. It also may be used through the wipe generator to produce colored borders around the transformed raster.

Some digital effects units have a key channel input, which permits an externally supplied key signal to be manipulated in parallel with the video. If such an input is not available, a second effects channel must be identically programmed to transform the key signal. Key or pattern-wipe boundary outputs from an M/E are used to drive the key input of the effects device. Unfortunately, this approach requires two M/E units — one for the key input to the effects device and a second one for entering the effects output as an isolated key or external wipe signal in the switcher. The configuration is inefficient because it precludes any other effects processing with those M/Es.

**Digital effects as keyer**

A digital effects unit has the functionality of a keyer in that it processes inputs and generates key signals with which the video mixer combines the key with backgrounds. Now, suppose that an effects device is inserted between the keyer and mixer. The M/E units are now released from their digital effects duties to perform their normal functions. Video inputs for effects are supplied directly by internal switching buses, while the effects device

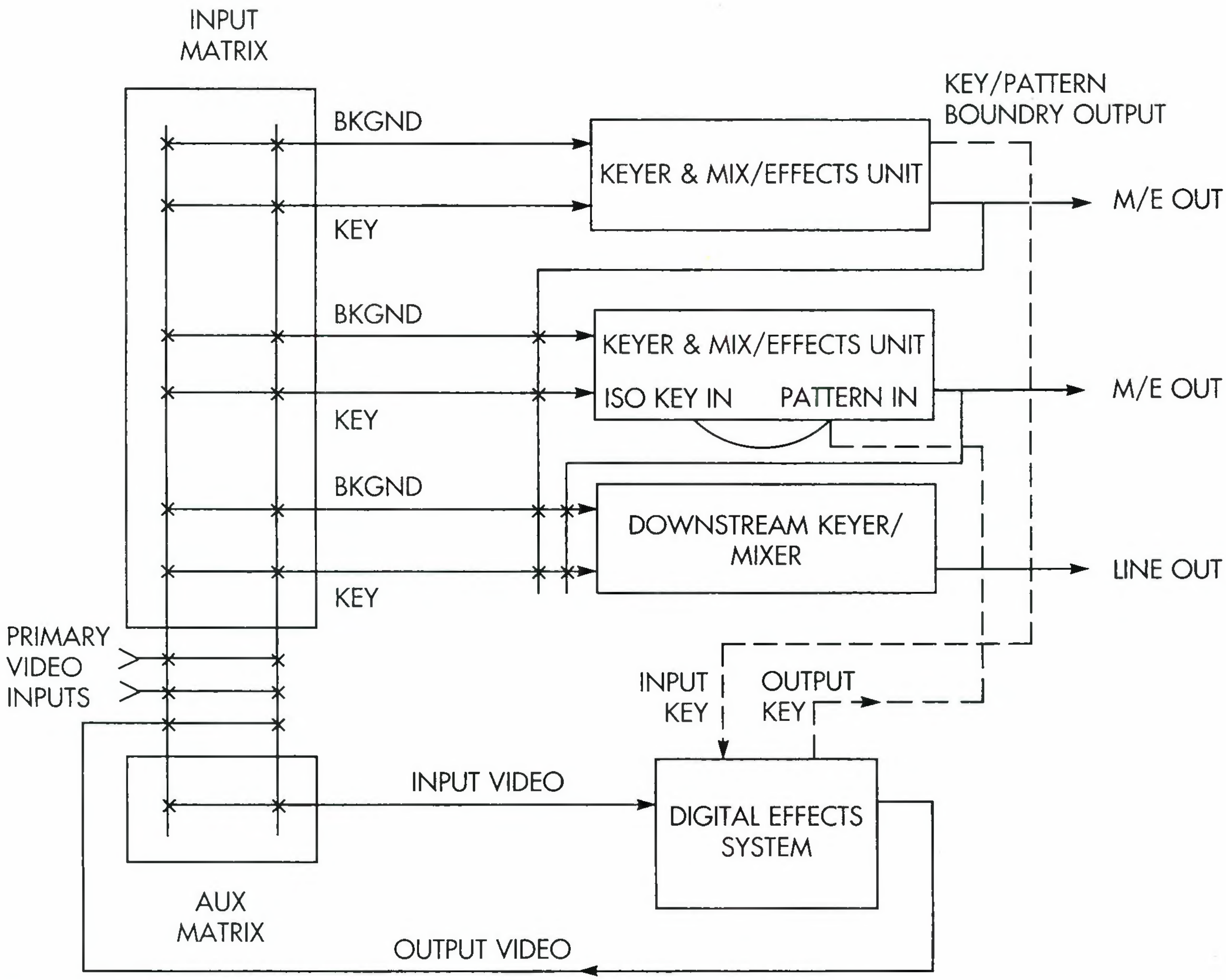



***Figure 2.*** *In typical multiple M/E switchers that use digital effects systems, the effects system output is treated as an input video source.*

# Just what you're looking for in a television generator.

# The performance. The price.

**Tektronix offers the industry's most complete line** of sync and test signal generators. Each one precisely matched to your specific application requirements. You don't pay for capability you don't need and won't use. Ask your Tek representative for a demonstration. There's a perfect fit, whatever your format.

| | |
|---|---|
| **TSG-170A**<br>**TSG-170D** | NTSC sync and test signal generators.<br>Correctly SCH-phased outputs.<br>Genlock sync generator with timing presets.<br>Character identification with ID presets and tape leader countdown. |
| **TSG-170D Only** | D-2 digital video output plus parallel and serial audio outputs.<br>Ideal for the NTSC house with D-2 in its future. |
| **TSG-370** | Simultaneous and independent component and NTSC composite test signal generators.<br>Up to eight color black outputs for equipment synchronization.<br>Ideal for component edit suite operation and maintenance.<br>A hedge on the future for NTSC houses contemplating but not yet using analog component. |
| **TSG-422** | 4:2:2 digital component test signals per CCIR Rec. 601 and SMPTE RP 125.<br>Full test signal complement including signals for testing co-siting, dynamic range and digital/analog blanking width.<br>Receiver test facilities including digital gray signal and data-to-clock timing offset.<br>Genlock and color black outputs. |
| **1910** | NTSC Test Signal Generator/VITS Inserter.<br>NTC7, FCC, ANSI T1.502 and EIA RS-250-B test signals.<br>Provisions for insertion of externally generated signals.<br>Remote control via RS-232-C. |

**Tektronix**®
COMMITTED TO EXCELLENCE



**Circle (54) on Reply Card**

output boundary or key signal drives the mixer directly. The keyer in the path can supply the effects device with an associated key signal, if desired. This is the concept of Digi-Loop.

Figure 3 illustrates an analog video switcher with the effects loop architecture. The loop breaks the video path internally, routes the video to an external effects device and returns the results to the mixer. The connection permits the supply of key inputs to the digital effects system without using M/E facilities, external routing or auxiliary switching for source selection. Additional switcher input channels are not required for the digital effects return, because it enters the mixer input directly. In such a digital effects loop, the effects equipment acts as an extension of the basic switcher functions.

### Flying in perspective

The digital path between keyer and mixer enables the creation of a variety of effects that would otherwise be difficult to perform. Keys can be introduced and removed exactly as they would be without the digital effects in the path — the key can be cut, dissolved or wiped in, and the operator can select a key source or recall a setup from the keyer memory, preset with the correct clip and gain levels. But, configured this way, the digital effects system acts as a modifier to the keyer. Because the key and insert video signals are manipulated in parallel through the effects device, correct keying control is preserved at the mixer, regardless of the perspective transformations performed. This means that the effect can fly onto and around the screen. (See Figure 4.)

With a 2-channel loop, one channel can give perspective to an image, while the second produces overlaid effects in the same prioritized fashion as any other key source. (See Figure 5.)

### Analog-pattern key holes

With an analog-pattern wipe signal applied to the effects key channel, a pattern, rather than a key, can be associated with an insert video signal. If all keyers have full input selection, any input source can be used for insert video. The wipe-control signal can be used with an M/E output to frame a subject with an analog border pattern. The two are transformed simultane-

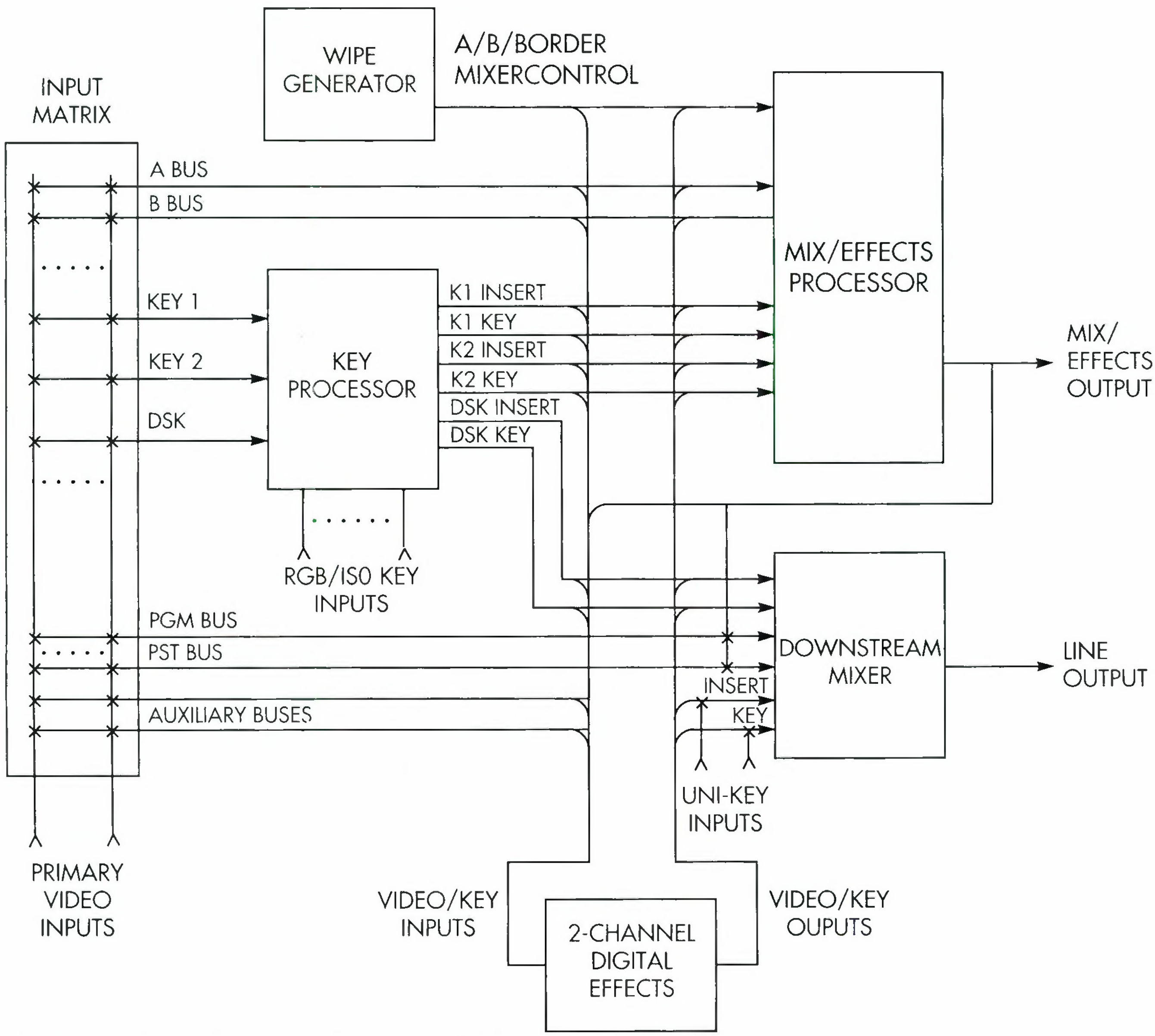
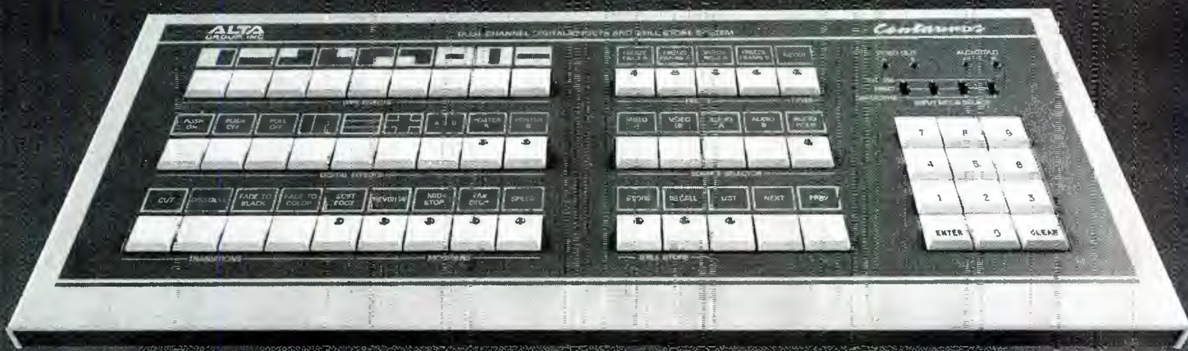



***Figure 3.*** *A video production switcher that features a digital effects loop.*



# 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<br>100 frames | **250 fields<br>125 frames** | 207 fields<br>207 frames | 200 fields<br>200 frames |
| Synchronizer | — | **Dual** | — | Dual |
| TBC | — | **Dual** | — | — |
| Production Effects | 1 wipe<br>dissolve<br>— | **9 wipes<br>dissolve<br>7 digital** | 1 wipe<br>dissolve<br>— | 3 wipes<br>dissolve<br>3 digital |
| Warranty | 1 year | **2 years** | 1 year | 1 year |
| Single Channel<br>Dual Channel | $19,900<br>$24,900 | **—<br>$16,900** | —<br>$31,500 | $26,333<br>$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 (57) on Reply Card

ously by the digital effects unit. (See Figure 6.)

### Extra downstream mixer input

Another practical advantage of the Digi-Loop architecture is that it can provide an extra input to the downstream mixer — a unity gain key. This channel is equal to the downstream key channel of the mixer, but without key source generation or keyer circuitry. It can be used with sources that supply an isolated key signal, such as titling/graphics generators, still-stores or other units with anti-aliased or linear key outputs.

The unity-gain external key input on the downstream mixer enables re-entry of an M/E output or an auxiliary bus signal after effects processing. The input has priority over the PGM/PST background videos, but under the downstream key. If a processed M/E output is re-entered through this route, an over-the-shoulder shot may include analog or digital wipes inside a reduced-size raster. The analog-wipe system of the switcher can supply pattern-shape key signals for any sources routed to the external key input.

### Digital wipes

Digital wipes between A and B bus video signals are implemented by the digital effects device boundary key signals, which replace the analog-wipe control output. The operator selects a digital wipe in the same fashion as an analog counterpart, and initiates a transition between the sources. Virtually any digital effect that makes a transition between two sources can become a digital wipe. With two digital effects channels, the operator can perform various slide-on, slide-off transitions.

***Figure 4.*** *Using a 1-channel ADO effects systems and an AVC Vista switcher with Digi-Loop, the first pillar (background video) is wiped over the airplane key to simulate the jet actually flying through the columns.*

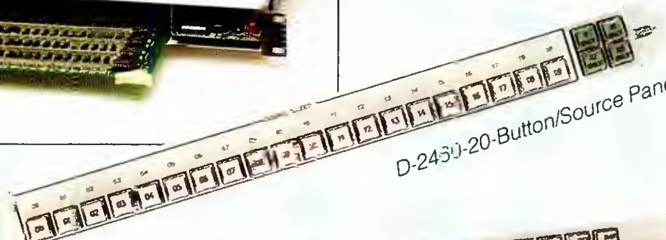

***Figure 5.*** *This image displays several layers of switcher and digital effects. The M/E has two keys and a wipe sent through the effects loop. The downstream key "Business Report" is keyed over the entire image.*

### Single panel control

To maximize the power of this architecture, entirely new operator interfaces have been developed. In many cases, this has involved incorporating effects device controls into the switcher control panel. Switchers that feature soft panels, in which knobs and faders are labeled dynamically by the control-panel processor, allow for the seamless integration of switchers and effects systems. Such menu-driven displays dramatically increase the production power available to the operator while reducing the overall size and complexity of the switcher's control panel.

CELEBRATING OUR 20th YEAR

# DATATEK D-2500 SERIES
# 20 x 10/20 x 20 ROUTING SWITCHERS

D-2430-20-Button/Source Panel

D-2450 Alpha-numeric X-Y Panel

D-2460-20/10 Pushbutton X-Y Panel

## VIDEO
## STEREO AUDIO
## RS-422 DATA
## RELAY

The Datatek D-2500 series — latest addition to Datatek's extensive line of routing switchers — provides 20x10 routing, expandable to 20x20, of video, component video, stereo audio, bi-directional RS-422 data and bi-directional 2-wire or 4-wire relay. Each of these units can operate independently or in combination with the others, or as part of larger Datatek routing switcher systems.

- Video – 40 MHz bandwidth
  Stereo Audio – .05% THD at +26dBu
  RS-422 Data – at 2MBaud rate
  Relay – 2 wire or optionally
  4 wire/crosspoint
- Basic units 20x10 expandable to 20x20
- Each unit can operate alone or in combination with the other 20x10's
- 8 Independent control levels for 10 destinations; 4 Levels for 20 destinations
- Plug-in modules, accessible behind snap-on front cover
- RS-232C or RS-422 Control included as standard for computer or control via modem
- Battery backup RAM for up to 10-year matrix memory retention
- A simple terminal can be used to reconfigure these units, with input/output transcoding, salvo edit, salvo execute, etc.
- Optional Redundant Power Supplies
- Wide selection of control panels available; X-Y, Alpha-numeric, pushbutton per source, etc.
- Very cost effective

**Circle (59) on Reply Card**

DATATEK CORP.

*For more information, please contact us:*

1121 BRISTOL ROAD, MOUNTAINSIDE, NJ 07092 • PHONE: 201-654-8100
TOLL FREE: 800-882-9100 • FAX: 201-232-6381 • TELEX: 833541

### Taking it to the limit

Conventional switcher architectures treat digital effects systems as a video source. This restricts the availability of the switcher's M/Es, because they are frequently tied up generating key and input signals for the digital effects unit to process. Furthermore, using the digital effects unit upstream causes unnecessary processing of the digital effects system's output.

In contrast, the Digi-Loop architecture does not define the effects system as a video source. Instead, it breaks the switcher's video and key paths internally, routes the signals to an external effects device for processing, and brings the results directly back into the switcher, without ever tying up an M/E.

The video switcher is the focal point in most production facilities. If the digital effects system is viewed as an additional processing module, as it is in the Digi-Loop architecture, the switcher may become the control center for digital effects as well.

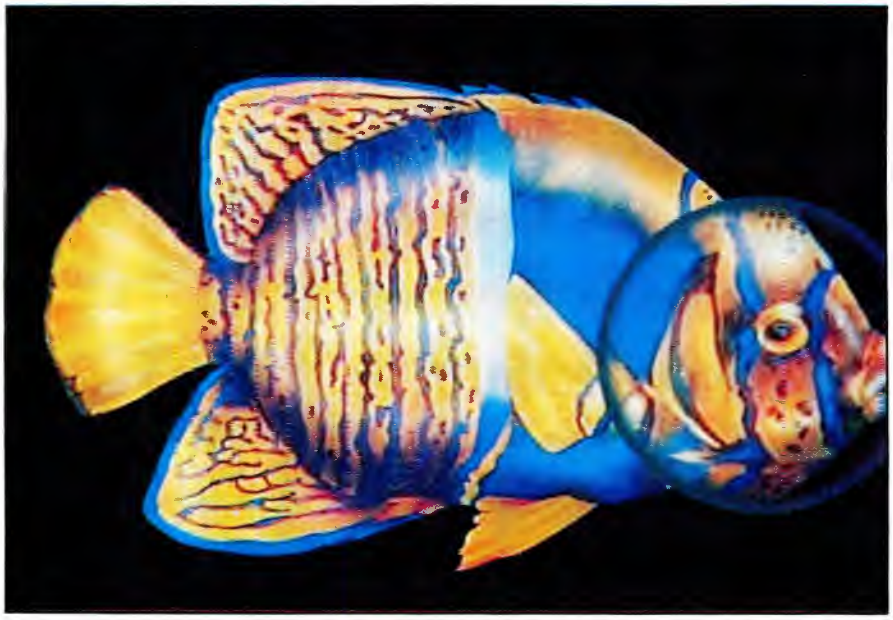
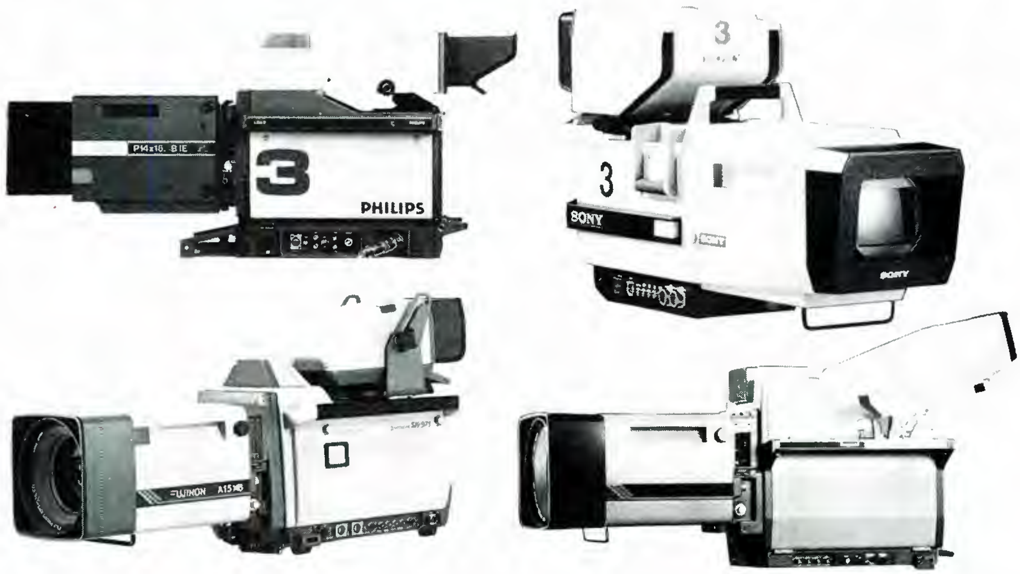


***Figure 6.*** *To create the magnifying glass effect, the fish source was sent through the effects loop, where part of it was enlarged and used to fill a soft-bordered circular pattern keyed over the original.*

**Editor's note:** Digi-Loop and AVC-Vista are trademarks of Ampex. ADO is a registered trademark of Ampex.

# Would you trust these cameras on anything less than a Sachtler?




**Real fluid control and up to 200-lb. capacity.**
Trust Sachtler's patented friction-free fluid system to give you maximum control of your studio cameras. Vertical and horizontal camera movement, starting and stopping motion, controlled precisely and smoothly without vibration.

**Dynamic counterbalance.**
Multiple camera/lens/prompter combinations are handled with ease thanks to the adjustable 15-step counter-balance. The settings are instantly switchable. There are no cams to change.

**Stability and control up to 75" height.**
The OB-2 tripod gives you an elevation range up to 75-inches, with complete camera stability and control.

**The Sachtler Warranty.**
The entire system is warranted for **3 years, plus 5 years** on the Fluid Modules. The best warranty in the industry.

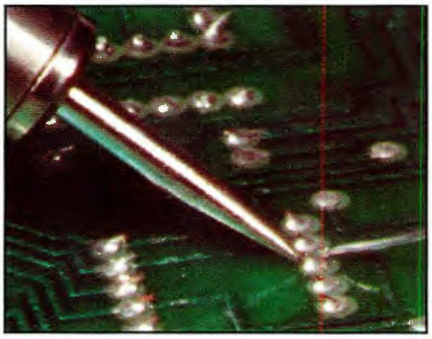
Call or write for more information.

**sachtler®**
**corporation of america**

55 North Main Street
Freeport, N.Y. 11520
Phone (516) 867-4900
Telex 140 107 sac frpt
Fax (516) 623-6844

California office:
3316 West Victory Blvd.
Burbank, CA 91505
Phone (818) 845-4446

**Circle (60) on Reply Card**



# The phono pre-amp is still in style

By Richard Majestic

The CD rapidly is supplanting the LP as the most popular audio medium for professional and consumer audio entertainment. But that doesn't mean we no longer need a high-quality phono pre-amplifier. Stations still will need to be able to play LPs and 45s for many years.

Because of the variety of phono cartridges available, one type of phono pre-amplifier may not provide the optimum performance available from each type. A better approach is to use a pre-amplifier matched to the characteristics of the cartridge your station uses. The three phono pre-amplifiers described here meet the needs of a variety of phono cartridges and provide excellent results.

Majestic is an engineering manager for Voice of America in Washington, DC, and an applications consultant for Precision Monolithics, Santa Clara, CA.

## Moving-coil amplifier

All the circuits used in the following designs rely on low-noise circuit topologies. Shown are both high accurate active and passive equalization designs with selectable old RIAA or RIAA/IEC (Electro-Technical Commission) curves. These circuits incorporate both unbalanced and balanced output circuit configurations. The first two pre-amplifiers shown will work well with moving coil (MC) and moving magnet (MM) (or variable reluctance) transducers.

Figure 1 shows the MC design, and Figure 2 shows a similar circuit optimized for the MM input configuration. Both circuits use the PMI SSM-2015 bipolar, true differential IC amplifier. The IC provides high common-mode rejection and low-noise operation. The circuit provides adjustable MM input loading, which ensures accurate RIAA filtering. Because of the wide bandwidth stages, in-band phase shift is minimized, providing good phase and frequency-response accuracy.

The circuit in Figure 1 is set for an input loading (RL) of 100Ω. Be sure to check your phono cartridge because some require 10Ω loading for maximum reproduction accuracy. Use only film resistors for the loading.

The input circuit gain is 44dB, and it pro-

Continued on page 86

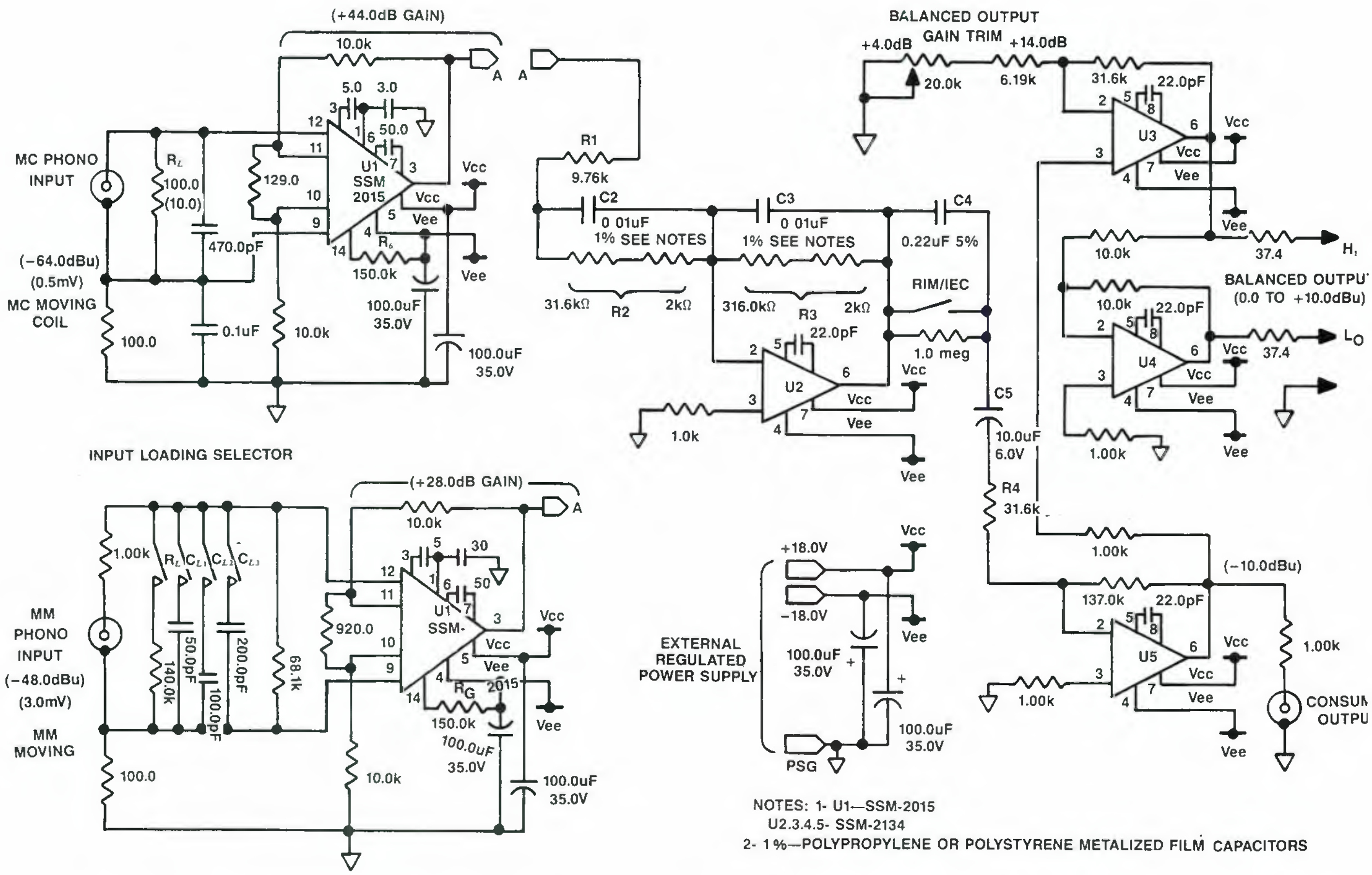



*Figure 1. The moving coil and moving magnet pre-amplifier circuit provides high common-mode rejection and excellent sonic performance.*

# How to take control of a broadcast station.


MCS-2000 Master Control Switcher

Go ahead, be ambitious. Controlling a broadcast station is no small potatoes, but these advanced products from BTS make it easy by giving you total control of all on-air programming from two workstations.

The MCS-2000 Master Control Switcher together with the BTA-2300 Automation System automate many of the routine operations that are currently handled by staff, which makes both your people *and* your equipment more efficient and productive. Computerizing your station also drastically reduces programming errors. Since that prevents make-goods, the system quickly pays for itself.

You simply pre-program the BTA-2300 Automation System to air all programs, station and commercial breaks exactly as you want, in real time. The Master Control Switcher accesses material from whatever sources you select: Betacarts, character generators, live feeds or satellite systems, for instance.

BTA-2300 Automation System

The MCS-2000 is user configurable, so you can select (and change) which buttons access which sources. Since it uses the existing outputs from the routing switcher, you don't need a second router. And its on-air bypass feature lets it serve as a simple production switcher if necessary.

The computer system is not only powerful, it's extremely flexible, allowing you to revise the program on a moment's notice. And there's no more reliable automation system available. Both products go through 100% computerized factory testing and have a 5-year warranty.

So take a controlling interest in the station. Find out more about the MCS-2000 Master Control Switcher and the BTA-2300 Automation System. For complete information and technical specifications, call BTS at **1-800-562-1136, ext. 31.**

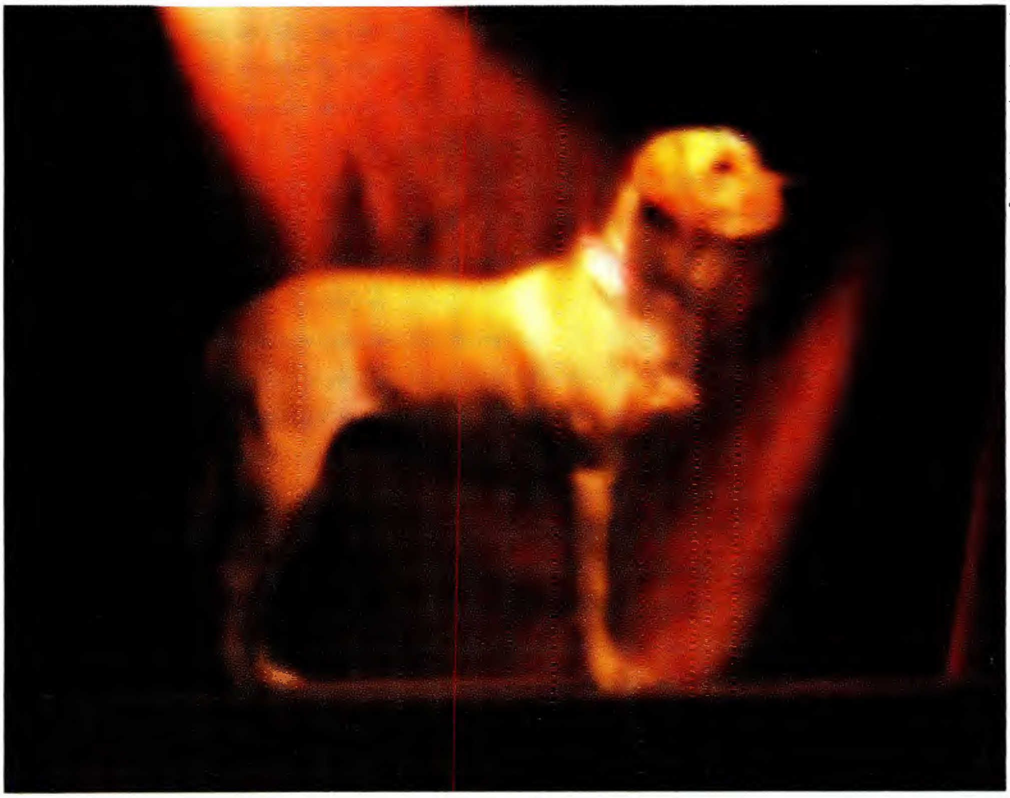
**BTS**
The name behind what's ahead.™

BTS is Broadcast Television Systems, a joint company of Bosch and Philips: P.O. Box 30816, Salt Lake City, UT 84130-0816.

**Circle (63) on Reply Card**

Introducing the GraphicSmart™ Projection System.

When we tell you that our new GraphicSmart Projection System creates superior big-screen images, we're not just wagging our tail. Because in addition to giving you clearer images, GraphicSmart gives you better color quality, brightness and higher definition. Whether you're displaying video images or computer graphics, our digital convergence memory technology allows you to program almost 100% accuracy from a wireless remote control. Resulting in a consistent, sharp picture on your screen. That same technology allows you to switch from a video to a data source in the middle of your presentation. Without having to readjust your image, turn on the lights or get up from your chair. And if you think that's a bright idea, wait till you see what our 600 lumens of light will do for your picture. The GraphicSmart Projection System also has a wide horizontal scanning



Simulated picture from photograph.

With any large screen projector you know it's a dog.

C&C Computers and Communications

GraphicSmart is a trademark of NEC Technologies, Inc.

frequency range. Giving you the flexibility to project higher resolution computer graphics. And the freedom to make a presentation in any size. From five feet to twenty-five feet diagonally, with all the color quality and definition you demand. You'll find GraphicSmart's projector has a sleek design that won't compromise the look of your boardroom. And the projection system includes interface cables, wired or wireless user and set-up remote controls, power cables and a ceiling mount. It also comes with the NEC name. Plus, all of the experience that goes with being a leader in the fields of digital technology and multiple frequency monitors. So, if you've been looking for a superior projection system, remember—you won't find a better breed than GraphicSmart. For more information call NEC at (708) 860-0335.

Simulated picture from photograph

With ours you know it's a girl.

NEC

*Continued from page 82*
vides a −20dBu signal level at point A. This level should be adequate for most MC cartridges. Resistor $R_b$ sets U1 bias and contributes to symmetrical amplifier slewing. If you need to adjust the gain of U1, the following equation will determine the value of $R_G$:

$$G_{dB} = 20\log\,(3.5 + [20\times10^3/R_G])$$

The next stage (U2), contains the RIAA-RIAA/IEC equalization filter. This stage acts as an active-feedback type of filter. The circuit's gain at 1kHz is −2.5dB. The RIAA curve requires a gain of 19.3dB at 20Hz, and attenuation of 19.6dB at 20kHz. The open-loop gain of U2 is greater than 100dB at 20Hz, and 60dB at 20,000Hz, ensuring equalization accuracy.

Three filters make up the RIAA reproduce curve. The time constants are 75$\mu$s, 318$\mu$s and 3,180$\mu$s. A fourth time constant, 7,960$\mu$s, is used for the IEC curve. The IEC filter was introduced to help maintain flat frequency response down to 60Hz.

The 75$\mu$s filter is formed by resistors R1 in parallel with R2 and capacitor C2. The 318$\mu$s pre-emphasis filter is formed by R2 and C2. The 3,180$\mu$s filter is composed of R3 and C3.

The high-pass filter (IEC 7,960$\mu$s) represents the fourth pole and is formed by R4 and C4. The combination provides 3dB attenuation at 20Hz, then rolls off at −6dB/octave. The RIAA/IEC switch allows selection of either reproduce response curve. Table 1 lists frequencies and relative levels for both the RIAA and RIAA/IEC reproduce curves.

For the audio purist, C5 can be eliminated for a directly coupled design, thus reducing envelope and group-delay distortion. All amplifier feedback circuits are directly coupled and referenced to circuit ground. The closed-loop gain also is kept low. Because the amplifier input offset voltage is low, only small dc voltages can be expected at the output of the directly coupled version.

The high-level amplifier, U5, provides +12.7dB gain. It feeds the unbalanced outputs, which output a nominal −10dBu level. The IC is followed by a balanced-output buffer amplifier with an output level adjustable from 0dBm to +10dBm. The output source impedance of 75Ω will drive 600Ω loads to +30dBm level (clip point).

**Moving-coil amplifier**

The passive, split multifilter RIAA/IEC pre-amplifier design is shown in Figure 2. The circuit relies on the same IC. Following the input pre-amplifier, two stages of passive equalization are used. The signal is amplified by U2, and U3, SSM-2134 IC amplifiers. The overall gain of the circuit at 1kHz is 38dB.

RIAA equalization requires a gain of 19.3dB at 20Hz and attenuation of 19.6dB at 20kHz. The open-loop gain of U2 and U3 is greater than 100dB at 20Hz, and 60dB at 20kHz. The closed-loop gain of U1 is 22.5dB and 16.6dB for U2 and U3.

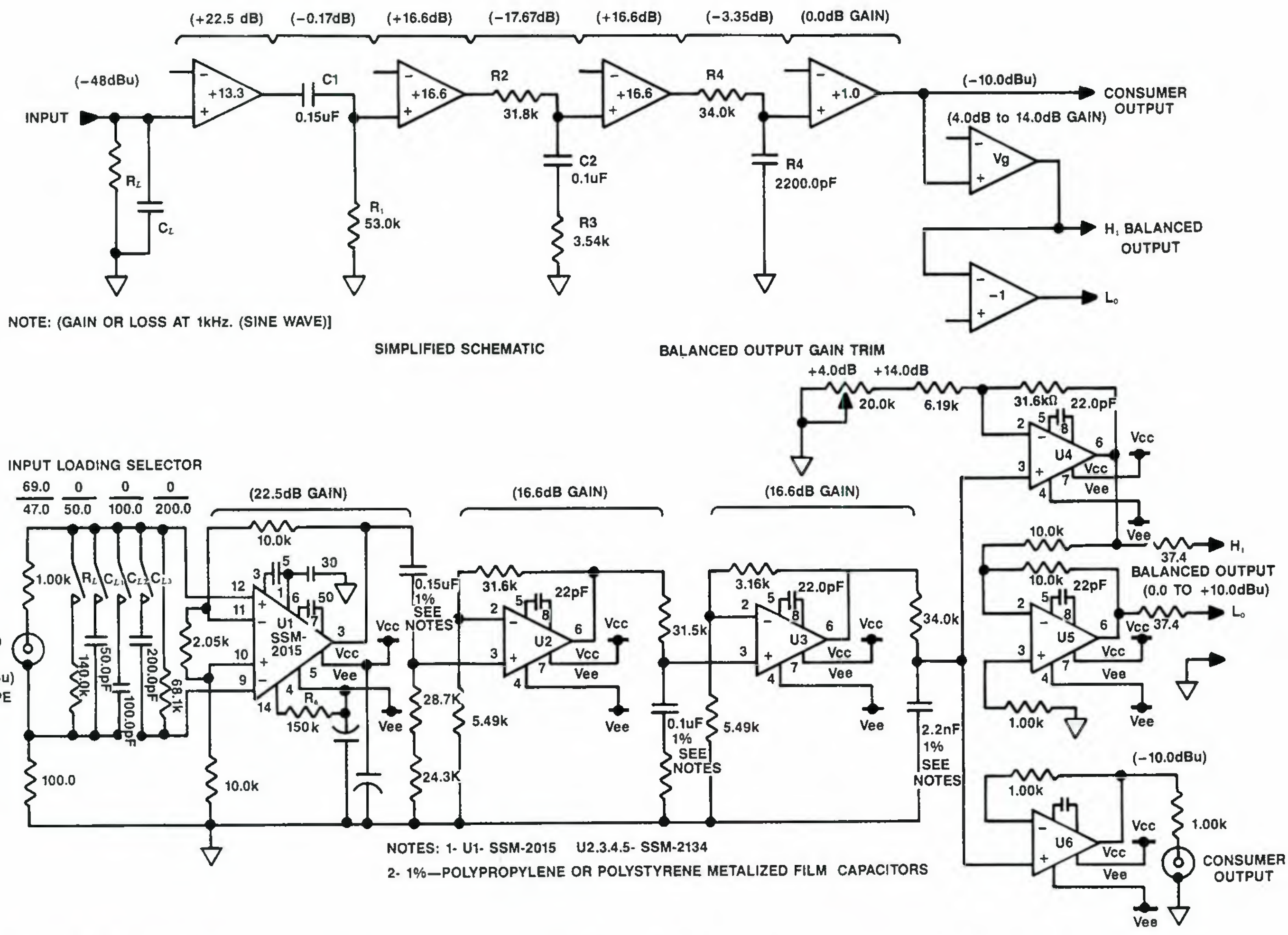



***Figure 2.*** *This design uses a passive multifilter to achieve RIAA/IEC equalization. It is intended primarily for moving magnet or variable reluctance phono transducers.*

# Rack up twice the performance in the same amount of space.


## The Problem

How to upgrade and increase your microphone mixing capability without sacrificing your valuable rack space or your budget.

## The Solution

The new ELX-1R.

## Here's Why

The ELX-1R is a portable, four-channel mic/line mixer.

It's half the size of our nearest competitor, the Shure M267, and fits into a single rack-mount space. Think of it. By utilizing two ELX-1R's, you can double your mixing capabilities in the same amount of space it takes to mount one M267.

Also, it's less expensive than the M267 because our rack mount is standard—you have to pay for theirs.

And it offers you the kinds of features that theirs doesn't . . .

Like half the distortion. Or individual input LED clip indicators. Or a 10-segment, three-color LED PPM bargraph display. Or ¼″ auxiliary phone connections, as well as professional XLR input-output. Or positive action push-button switching.

And last but not least—better specs across the board and a two-year warranty opposed to one.

## You Decide

Naturally, we don't expect you to take our word on this . . . you have to see for yourself. Contact your local EV dealer today. Ask for our comparison chart and an engineering data sheet. Better yet, ask for a no-pressure demonstration.

We think you'll be pleasantly surprised.

EV®
Electro-Voice®
a MARK IV company

600 Cecil Street
Buchanan, Michigan 49107
Phone: 616/695-6831

In Canada: P.O. Box 520
Gananoque, Ontario K7G2V1
Phone: 613/382-2141


Circle (65) on Reply Card

| FREQUENCY (Hz) | RIAA/IEC RELATIVE LEVEL (dB) | RIAA RELATIVE LEVEL (dB) |
|---|---|---|
| 2.0 | − 0.2 | |
| 2.5 | + 1.8 | |
| 3.15 | + 3.7 | |
| 4.0 | + 5.7 | |
| 5.0 | + 7.6 | |
| 6.3 | + 9.4 | |
| 8.0 | +11.2 | |
| 10.0 | +12.8 | |
| 12.5 | +14.1 | |
| 16.0 | +15.4 | |
| 20.0 | +16.3 | +19.3 |
| 25.0 | +16.8 | +19.0 |
| 31.5 | +17.0 | +18.5 |
| 40.0 | +16.8 | +17.8 |
| 50.0 | +16.3 | +16.9 |
| 63.0 | +15.4 | +15.8 |
| 80.0 | +14.2 | +14.5 |
| 100 | +12.9 | +13.1 |
| 125 | +11.5 | +11.6 |
| 160 | + 9.7 | + 9.8 |
| 200 | + 8.2 | + 8.2 |
| 250 | + 6.7 | + 6.7 |
| 315 | + 5.2 | + 5.2 |
| 400 | + 3.8 | + 3.8 |
| 500 | + 2.6 | + 2.6 |
| 630 | + 0.8 | + 0.8 |
| 1kHz | 0.0 | 0.0 |
| 1.25kHz | − 0.8 | − 0.7 |
| 1.6kHz | − 1.6 | − 1.6 |
| 2.0kHz | − 2.6 | − 2.6 |
| 2.5kHz | − 3.7 | − 3.7 |
| 3.15kHz | − 5.0 | − 5.0 |
| 4.0kHz | − 6.6 | − 6.6 |
| 5.0kHz | − 8.2 | − 8.2 |
| 6.0kHz | −10.0 | −10.0 |
| 8.kHz | −11.9 | −11.9 |
| 10.kHz | −13.7 | −13.7 |
| 12.kHz | −15.6 | −15.6 |
| 16.kHz | −17.7 | −17.7 |
| 20.kHz | −19.6 | −19.6 |

***Table 1.*** *Comparison of RIAA/IEC and relative RIAA levels.*

### Moving magnet amplifier

A low-cost, passive MM RIAA/IEC preamplifier is shown in Figure 3. It provides features similar to those of the circuits shown in Figures 1 and 2. The input circuit provides adjustable resistive and capacitive input loading. The wide bandwidth stages minimize in-band phase shift and provide good phase and frequency-response accuracy.

### Common features

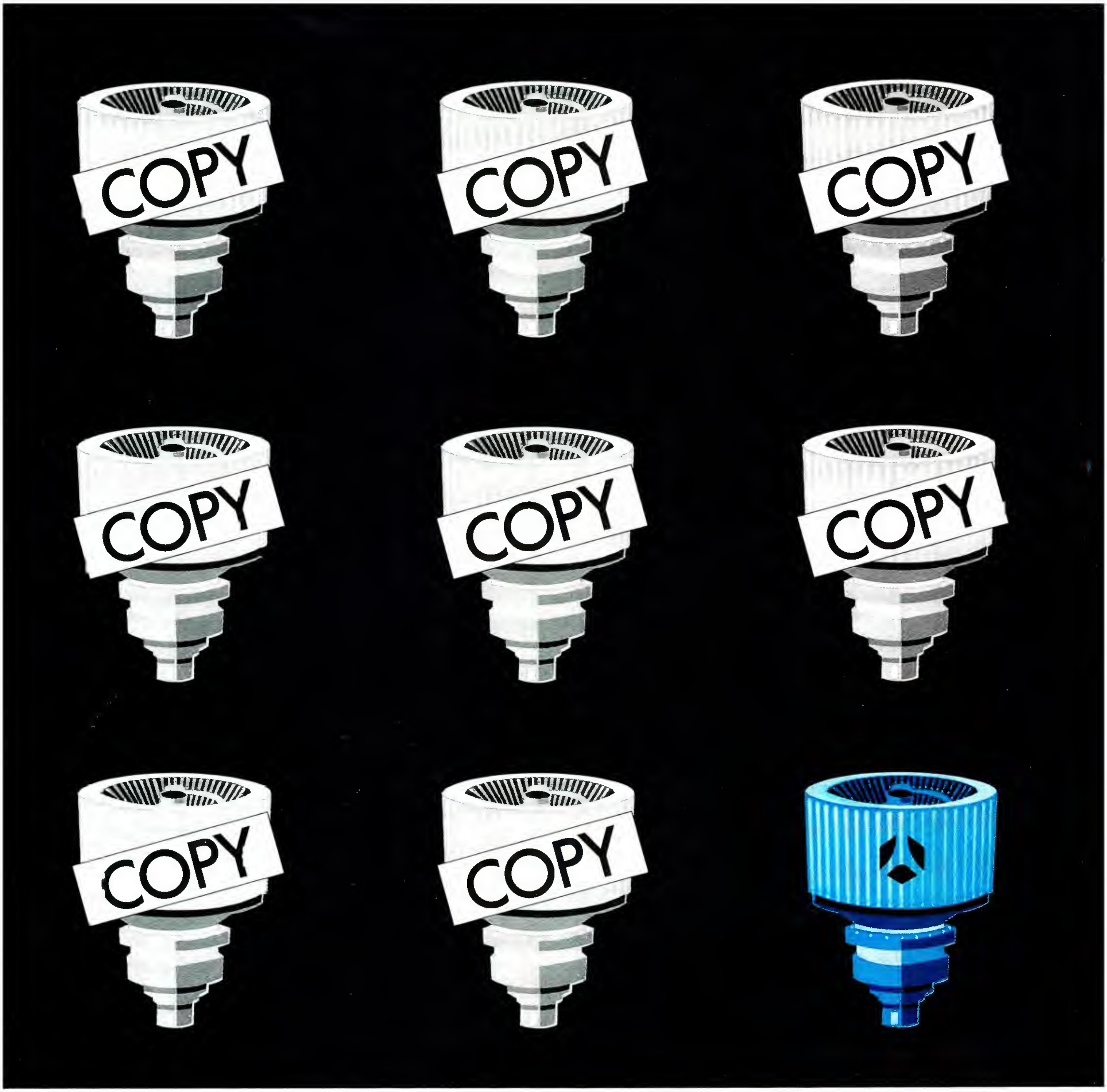
Several circuit details are common to all three designs. For a phono transducer cartridge to deliver the performance the designer intended, it should be loaded with the proper resistance and capacitance. The MM input circuits have adjustable transducer loading. Most transducers now available require a resistive loading of 69kΩ or 47kΩ and capacitance loading of a few picofarads. This is primarily dependent on input wiring, and the circuit provides up to 350pF in the 50pF steps.

Greater common-mode noise rejection can be obtained by increasing the value of the 100Ω resistor and 0.1μF capacitor connected between the input RCA jack shield connection and the main circuit ground point. The values shown satisfy most requirements for the 1m cables supplied with the newer tone arms.

All circuits described are signal non-inverting and constructed with bipolar IC amplifiers for low-noise operation. The designs are compensated, providing wide bandwidth and circuit stability. Typical performance specifications for the SSM-2015 and SSM-2134 ICs are shown in Table 2.

| | |
|---|---|
| MC NOMINAL INPUT LEVEL | −64dBu (0.5mV) [SSM-2015 only] |
| MC INPUT IMPEDANCE | 100Ω [SSM-2015 only] |
| MM NOMINAL INPUT LEVEL | −48dBu (3mV) |
| MM INPUT IMPEDANCE, RESISTIVE | 69kΩ or 47kΩ |
| MM INPUT IMPEDANCE, CAPACITIVE | 50pF to 350pF |
| COMMON-MODE REJECTION | >50dB, 20Hz-20kHz |
| COMMON-MODE VOLTAGE LIMIT | ±10V peak |
| NOMINAL OUTPUT LEVEL, BALANCED | +8dBu/dBm |
| MAX OUTPUT LEVEL, BALANCED | +30dBu/dBm |
| OUTPUT IMPEDANCE, BALANCED | 70Ω |
| GAIN CONTROL RANGE, BALANCED | 0.0dBu to 10dBu/dBm |
| NOMINAL OUTPUT LEVEL, UNBALANCED | −10dBu |
| MAX OUTPUT LEVEL, UNBALANCED | +24dBu |
| OUTPUT IMPEDANCE, UNBALANCED | 1kΩ |
| OUTPUT VOLTAGE SLEW RATE | 6V/μs |
| RIAA REPRODUCE CHARACTERISTIC (20Hz-20kHz) | ±0.25dB |
| RIAA/IEC REPRODUCE CHARACTERISTIC (2Hz-20kHz) | ±1.0dB [+0.5dB SSM-2134] |
| WIDEBAND FREQUENCY RESPONSE (±1.0dB) | 0.0Hz to 70kHz |
| SIGNAL-TO-NOISE RATIO (20Hz-20kHz) | >90dB |
| THD + NOISE (%20Hz to 20kHz, ANY OUTPUT) | 0.01% @ +8dBu |
| IMD (SMPTE 60Hz, 4kHz, 4:1) | 0.02% |

***Table 2.*** *Typical performance specifications for the SSM-2015 IC. Where different, performance specifications for the SSM-2134 IC are shown in brackets.*




# ALL TETRODES ARE NOT CREATED EQUAL.

Beware. If it's not an original Thomson tetrode, you're not getting Thomson performance, reliability and longevity.

Isn't your station worth it? We carry a full stock of our tetrodes, so you can buy direct from the source.

Circle (67) on Reply Card

All tetrodes are available for immediate delivery. To order, simply contact us at the address below.

**THOMSON ELECTRON TUBES AND DEVICES CORPORATION**

For additional information, mention code **TS**

40 G Commerce Way - P.O. Box 540 - Totowa, New Jersey 07511. Tel.: ( 201 ) 812-9000 - Fax: ( 201 ) 812-9050.

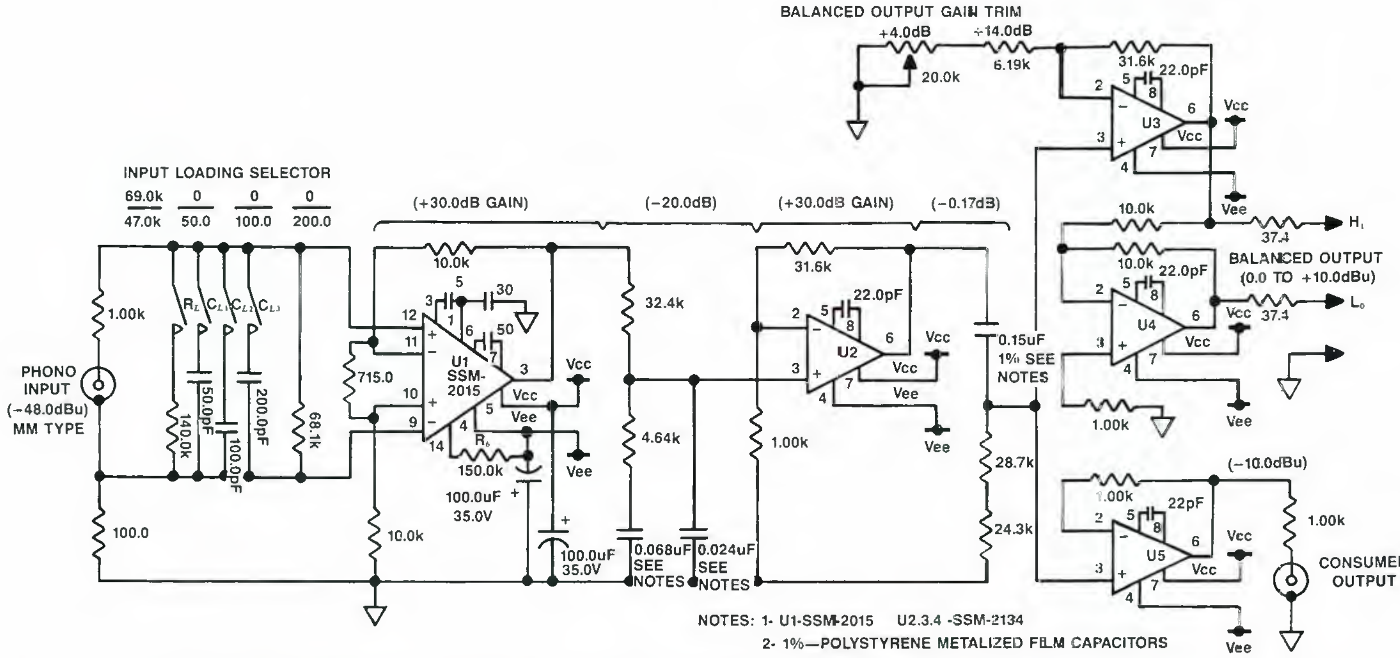
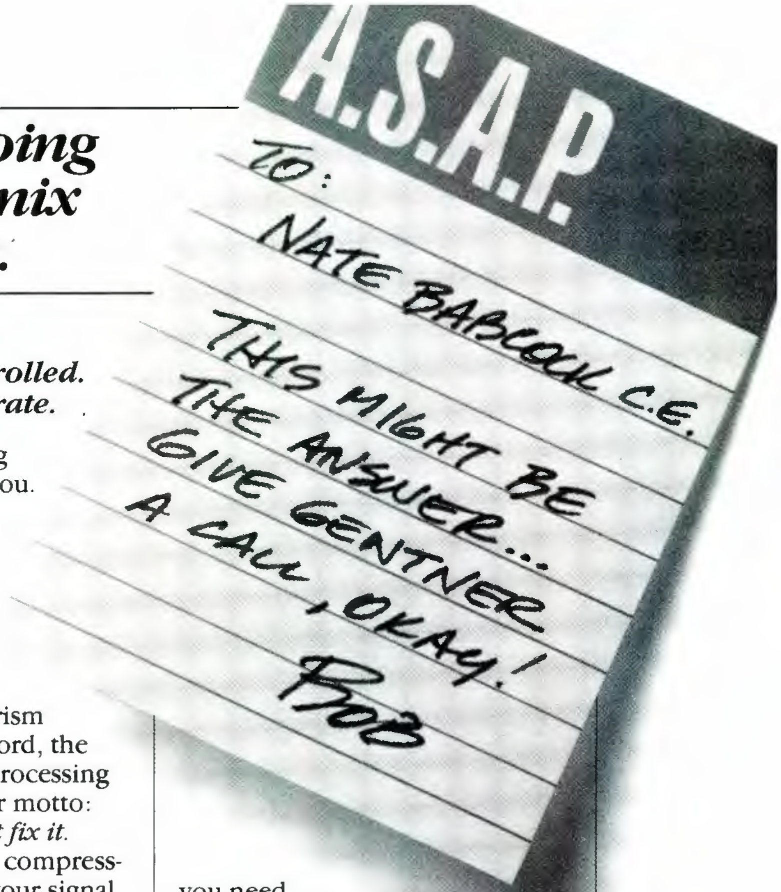



***Figure 3.*** *This RIAA/IEC-equalized phono pre-amplifier provides a low-cost, yet high-performance design.*

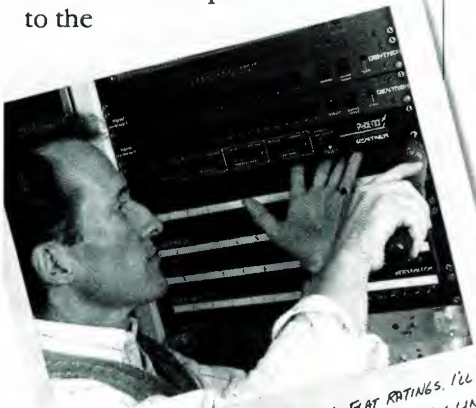
# *What the Audio Prism is doing for ratings in FM, the Phoenix can do for your AM ratings.*




It's no secret. The Audio Prism has been giving FM stations the competitive edge for years. It's a proven commodity in the top 50 markets. And it's rapidly finding its way into middle and small market FM's, providing greater clarity and a stronger, more pleasing presence on the dial.

### *The Best Kept Secret In AM Broadcast.*

With the Audio Prism setting records like it has, we're a bit surprised how little people really know about the Phoenix. It's the AM counterpart to the Audio Prism and does an equally credible job of getting your signal out there, loud and clear, right to the fringe.



RIGHT TALENT, TIGHT PROGRAMMING, FLAT RATINGS. I'LL SHOW 'EM WHAT ENGINEERING CAN DO FOR THE BOTTOM LINE!

The Phoenix delivers a smooth crisp sound that cuts through traffic noise, knocking engines and baby's screaming in the back seat. If listeners are what you're looking for, the ones that tune in and stay with you all day, you owe it to yourself to listen to the Phoenix.

### *It's Smooth It's Digitally Controlled. It's Easy To Operate.*

Don't let the flashing array of LED's throw you. They're there to keep you posted on how the Phoenix is working. And, it does work well.

With the same digital control that has made the Audio Prism almost a household word, the Phoenix makes over-processing a thing of the past. Our motto: *If it ain't broke, don't fix it.* Instead of constantly compressing and expanding your signal, the Phoenix is smart enough to leave well enough alone, relying on its digital intelligence to know when not to process. The result: your station will "hit the streets" with greater power and clarity than ever before.

### *An Added Benefit, Full NRSC-1 Compliance.*

Maybe you can afford to wait until next June to meet NRSC-1 standards, maybe not. The Phoenix complies with the new standard today and gives you the punch you need to dominate the airwaves.

Why not make your move today, then sit back and celebrate the sweet sound of success. Tell your station manager it sounds a lot like a cash register, only louder.

HERE'S TO THE PHOENIX, NRSC-1 COMPLIANCE AND BETTER RATINGS!

### *Hearing Is Believing.*

Give us a call, we'll put you in touch with your Gentner dealer. They'll give you complete product specs and arrange for you to put the Audio Prism, the Phoenix or both to the test. Hook 'em up, head for the country and listen to the difference.

**GENTNER**

*Gentner Electronics Corporation*
*1825 Research Way*
*Salt Lake City, UT 84119*
*(801) 975-7200*
*Fax: (801) 977-0087*

**Call me, I'm interested. Circle 69 on reply card.**
**Send literature. Circle 68 on reply card.**

### Construction notes

Effective grounding requires that all ground connections be returned to a single point. This minimizes ground loops that can cause excessive noise. Proper grounding also helps prevent the entry of external noise spikes, signal crosstalk and ac power-line noise. Proper grounding also is important for circuit stability.

The main ground point should be as close to input amplifier U1 as possible. All grounded components of U2, U3, U4, U5, the output jack grounds and the power-supply ground lead should be tied to the same U1 ground point.

The regulated ±18Vdc power-supply leads must be short. The supply should be adequately filtered and bypassed with polyester film capacitors at the regulators. If these procedures are followed, there is no need for individual decoupling capacitors at U2, U3, U4 and U5.

Be sure you use high-quality capacitors. Metalized, polypropylene or polystyrene film 1% tolerance capacitors are adequate. Capacitor C5 may have a 5% tolerance. Use 1% or better metal film resistors.

These three circuits can provide your station with high-quality sonic performance, and they can be constructed easily and inexpensively. Even if your station relies completely on CDs, a top-quality phone pre-amplifier may have a place in your facility.

# OFTEN IMITATED...

# ...NEVER EQUALLED.

Compatible with existing skills and equipment, AMS AudioFile is opening doors for facilities throughout the world, allowing them to offer a fuller, more comprehensive professional service to clients.

And the bottom line? The bottom line is your bottom line because dollar-for-dollar AMS AudioFile can generate a higher rate of return on investment than any other audio hardware. The increasing number of users taking second and third systems is a testament to the unique profit performance of AudioFile.

Not only do AMS have the skill to put together a hard disc system with more features and flexibility than any other manufacturer, we now have experience of facilities — some possibly very similar to yours — which are now enjoying a high level of success with AudioFile.

1985 ams 1986

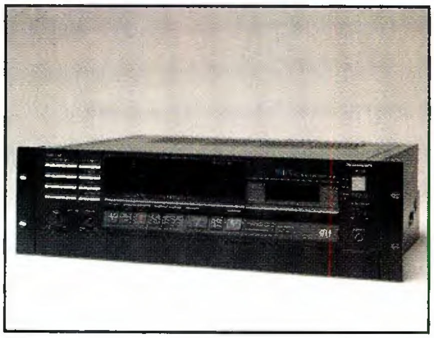
AUDIOFILE

For information and literature contact . . .

**AMS Industries plc**
Billington Road, Burnley BB11 5ES, UK
Tel: (0282) 57011 Fax: (0282) 39542

**AMS Industries Inc**
PO Box 31864, Seattle, WA 98103, USA
Tel: (206) 633 1956 Fax: (206) 547 6890

# Field report



## Panasonic SV-3500 R-DAT recorder

**By Dennis R. Ciapura**

Broadcasters who have lived through that awkward period when we pressed consumer-grade compact disc players into broadcast service will be pleased to know about the Panasonic SV-3500. The machine is easy to install and requires no awkward external interfaces or turret-top mounting.

### Technical configuration

The SV-3500 is a 16-bit recorder with 18-bit digital filtering. It has separate D/A converters for the left and right channels. Separate converters also are provided for the plus and minus sides of the waveform to eliminate zero-crossing distortion. The company calls this combination of features "4 DAC 18 Bit." This approach provides performance nearing the limits of the underlying 16-bit encoding scheme.

The machine can reproduce all of the popular encoding formats. It will switch automatically to the proper decoding mode and indicate the operative bit rate on the front-panel display. It will record from either analog or digital inputs at 48kHz, from analog inputs at 44.1kHz, or from 32kHz digital inputs. In case you were wondering, the manual states that copyrighted commercial DAT and CD digital inputs *cannot be copied.*

### Measured performance

Although the recorder is equipped with digital interface jacks, all measurements for these tests were made through the analog inputs and outputs. This allowed the D/A and A/D converters to be checked, and is the most likely mode to be used in today's stations.

As expected, the frequency response was ruler flat, varying only 0.2dB from 20Hz to 20kHz. There was no change in the response characteristic from the +4dBm operating level all the way up to the maximum output level of +22dBm. The variation was distributed broadly over the bandpass and was not peaked in the last 1/2-octave before cutoff, as seen in some CD equipment. Figure 1 shows the response at +22dBm output with a highly expanded vertical scale to reveal the response shape.

The dynamic range capability was examined by programming the Audio Precision test set to measure THD from 10dB below the recommended operating level up to well beyond the specified overload level. Figure 2 shows the results: a classic digital recording profile with virtually no distortion until the onset of clipping at +22dBm.

On the other end of the range, Figure 3 shows the noise floor vs. frequency in the quiescent state. The level is at least −80dB over most of the audible spectrum, which provides a dynamic range of 102dB. This is better than the manufacturer's specification of 90dB. The manual did not state the test conditions for the noise specification. However, virtually any bandwidth and weighting combination would certainly yield figures near 100dB.

For digital equipment, it is perhaps more relevant to look at the noise and distortion in the presence of a signal. Figure 4 is a plot of the THD vs. frequency at +4dBm operating level. The average was approximately 0.024%, or −75dB. This is close to the noise floor and quantizing performance limits for a 16-bit system. The results indicate excellent linearity in the D/A and A/D converters. Expressed in this

***Performance at a glance***

- *Two rotary heads, helical scanning system*
- *Sampling frequency*
- *Recording*
- *Digital input: 32kHz, 48kHz automatically switched*
- *Analog input: 44.1kHz, 48kHz switchable*
- *Playback: 32kHz, 44.1kHz automatically switched*
- *Decoding: 16-bit linear*
- *S/N greater than 93dB*
- *THD less than 0.05% at 1kHz, input/output, +4dBm*
- *Digital inputs and outputs: 75Ω coaxial*
- *Analog inputs and outputs: XLR, balanced*

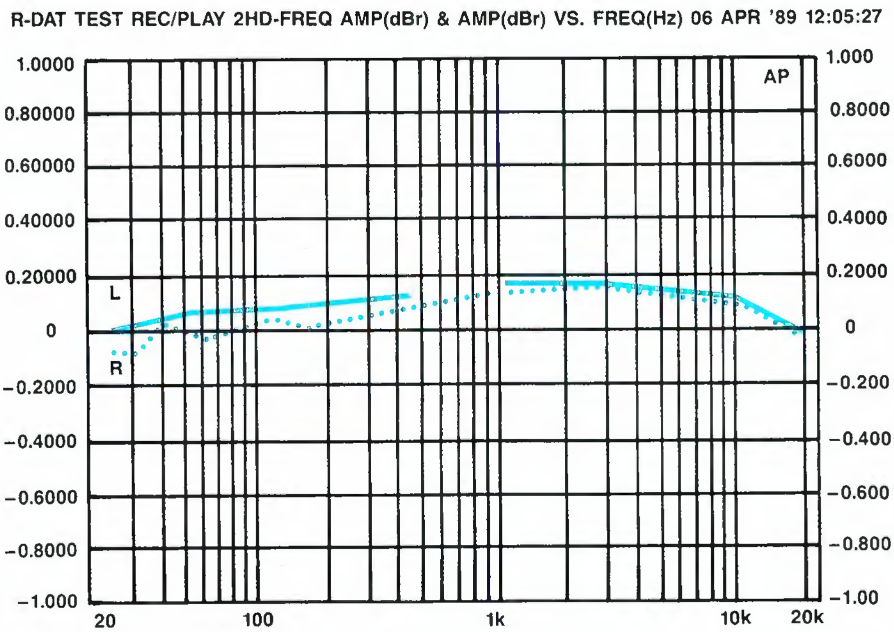



***Figure 1.** The record-playback frequency response was essentially flat. This graph is based on a +22dBm output level.*

Ciapura is vice president, technical operations, for Noble Broadcast Group, and president of TEKNIMAX Telecommunications, a San Diego-based technical management consulting company.

way, the dynamic range is 93dB, which compares to the theoretical limit of 96dB for a 16-bit system. This is excellent performance by any measure.

The record-level metering is calibrated to provide only 18dB of headroom. In my opinion, this is inadequate for digital recording systems and is one of the reasons for the fabled "digital sound" rhetoric. The hard limit of digital overload is much more audible than the classic analog-tape saturation knee. The key to superior digital recording is in avoiding overload. The SV-3500 has such a good S/N ratio that it can easily be operated at −22 on the display metering, which would give it the same headroom capability as the best consoles.

### Operational features

The programmable memory capabilities of the recorder are quite comprehensive. The front-panel display provides a tape-counter function, absolute time (from the beginning of the tape) and program time for the selected track. Program segments can be assigned cut numbers and recalled for air play in any sequence.

One of the more interesting and useful features for personal applications is the ability to index existing program segments

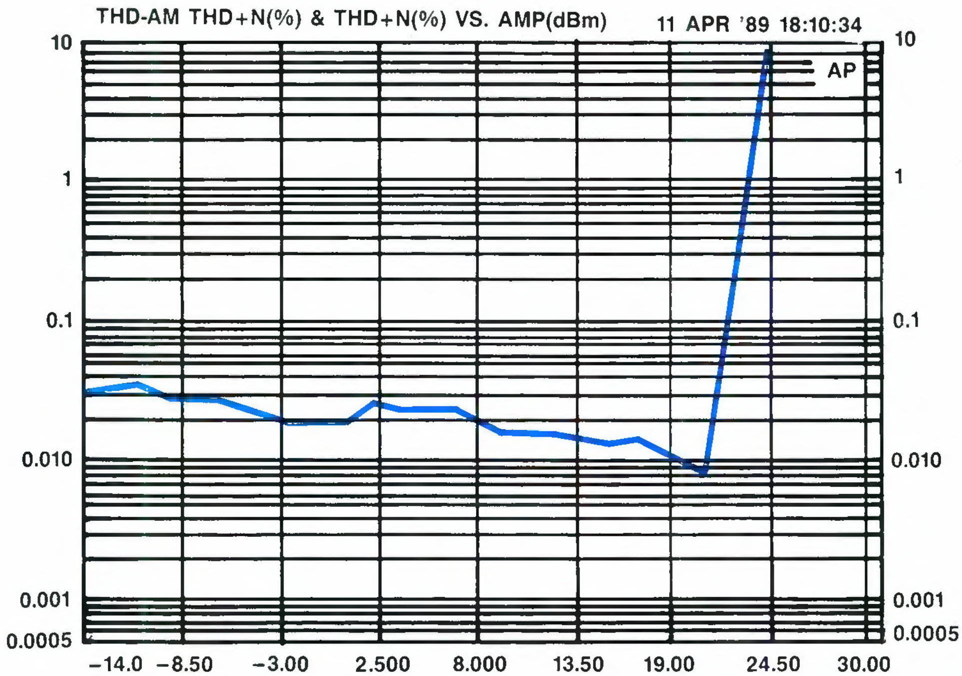



***Figure 2.*** *The recorder's THD+noise at 1kHz vs. output level is quite low until the A/D converter's maximum input is exceeded.*

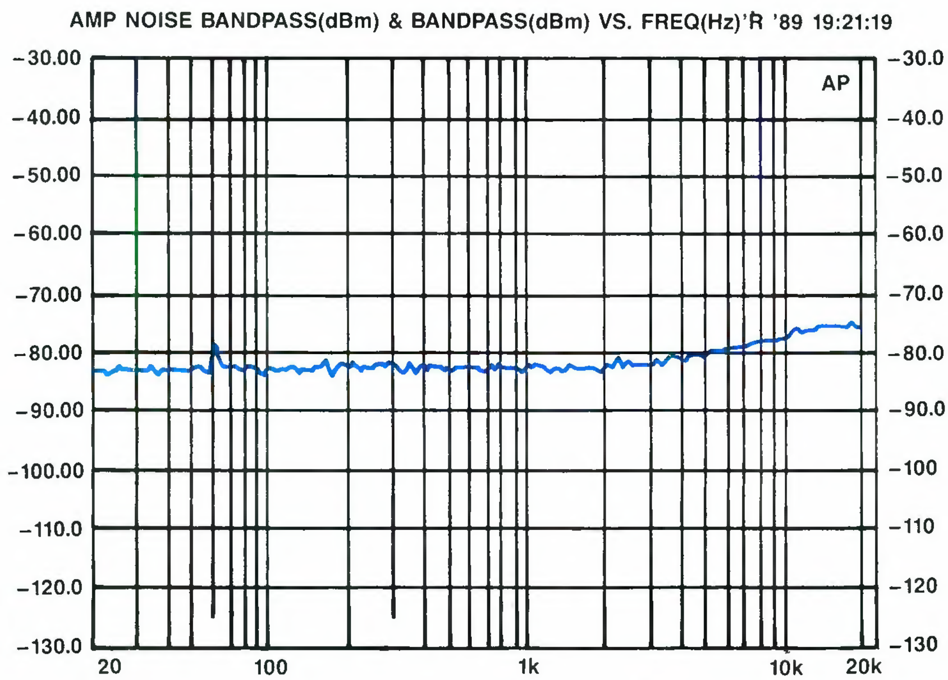
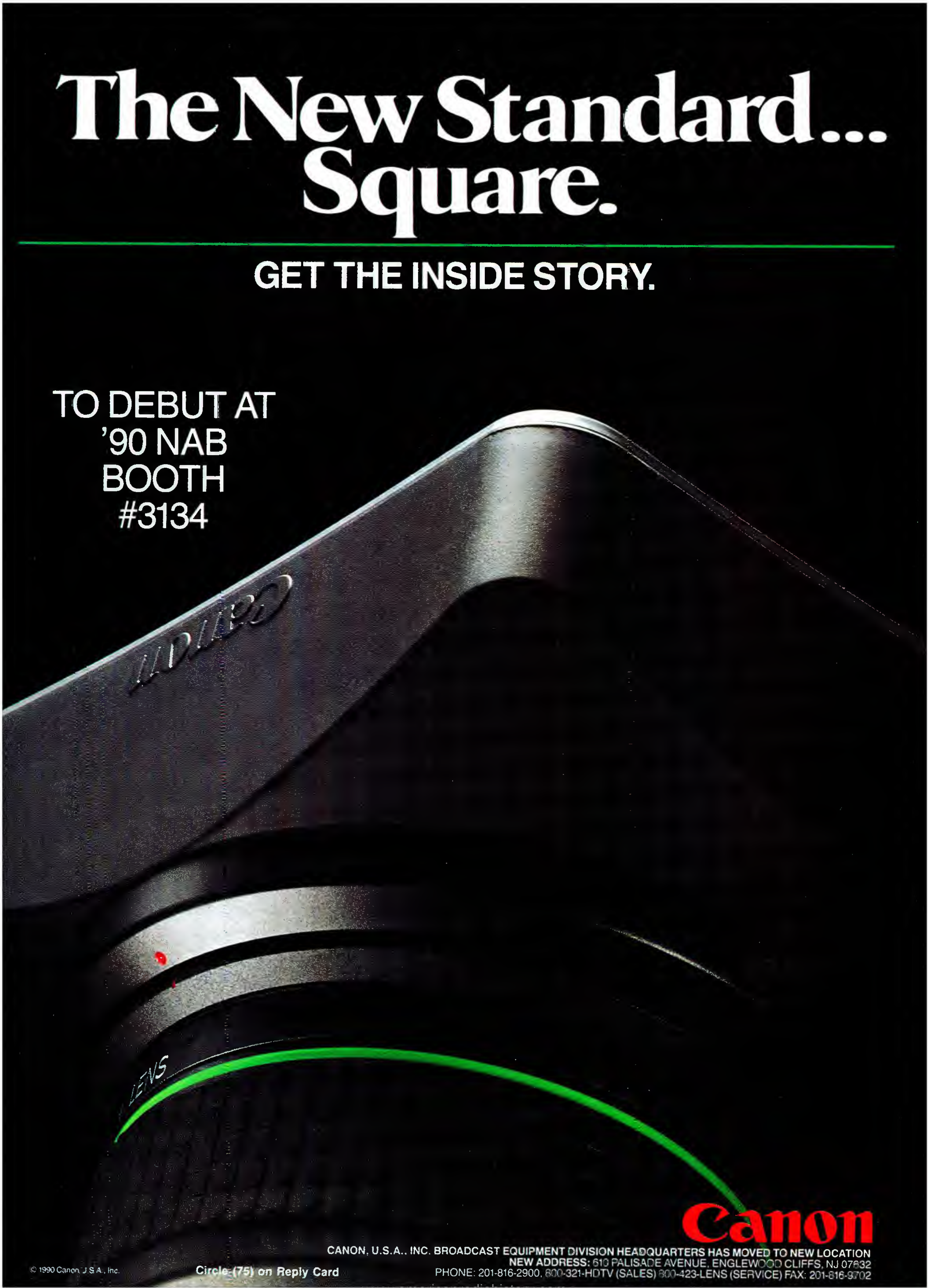



***Figure 3.*** *This noise floor vs. frequency plot shows a dynamic range of approximately 102dB.*



The New Standard...
Square.
GET THE INSIDE STORY.
TO DEBUT AT
'90 NAB
BOOTH
#3134
Canon
LENS
Canon
CANON, U.S.A., INC. BROADCAST EQUIPMENT DIVISION HEADQUARTERS HAS MOVED TO NEW LOCATION
NEW ADDRESS: 610 PALISADE AVENUE, ENGLEWOOD CLIFFS, NJ 07632
PHONE: 201-816-2900, 800-321-HDTV (SALES) 800-423-LENS (SERVICE) FAX: 201-816-9702
© 1990 Canon U.S.A., Inc.
Circle (75) on Reply Card

on a tape after they have been recorded. This means that commercial tapes can be programmed for playback with skip commands to edit around the undesired program segments, or even portions of segments.

The unit searches for sequenced cuts at 100 times normal speed and skips forward at 200 times normal speed. On-air and production cuing requirements are more practically met by calling up segments by program number. However, the indexing feature provides the same convenience that we've become accustomed to with CDs and is great for just listening.

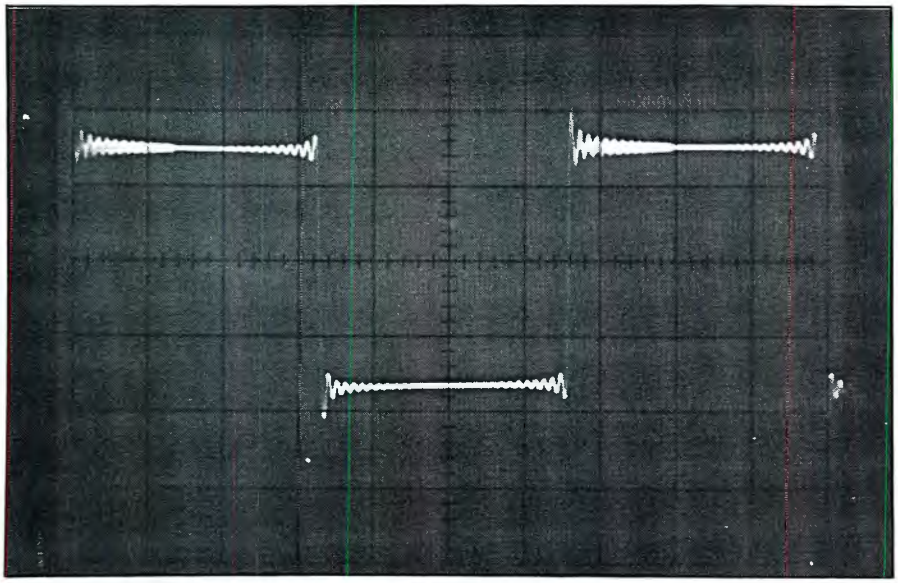
**In the studio**

The first mission of any digital recorder is perfect fidelity. Because the SV-3500 tested so impressively in the lab, I was anxious to see how it performed with program material in the production studio. Several cuts were recorded from CDs for A/B comparison with precisely matched levels. There was simply no way to tell SV-3500 recordings from the CD input sources. It's easy to see how those who have auditioned R-DATs become attached to them.

With regard to user support, I wish that Panasonic had done a better job on the manual. The instructions for using the machine are excellent, but there is very little technical information. The manual resembles one provided with a consumer product. This is unfortunate for a machine that could be so attractive to broadcasters.

Transferring programming from CDs to a bank of these machines for custom program automation would yield virtually perfect audio. The manual does provide enough coding information to allow interfacing the recorder's serial input port with a CPU. This is important because the best application for the machine outside the production studio is for airing syndicated formats with program automation systems.

Only time will tell what role R-DATs eventually will play in broadcast operations. The Panasonic SV-3500 is certainly an attractive "first-experience" option for those stations interested in trying state-of-the-art digital recording.



*The recorder's 300Hz square-wave response shows minimal ringing and excellent rise time.*

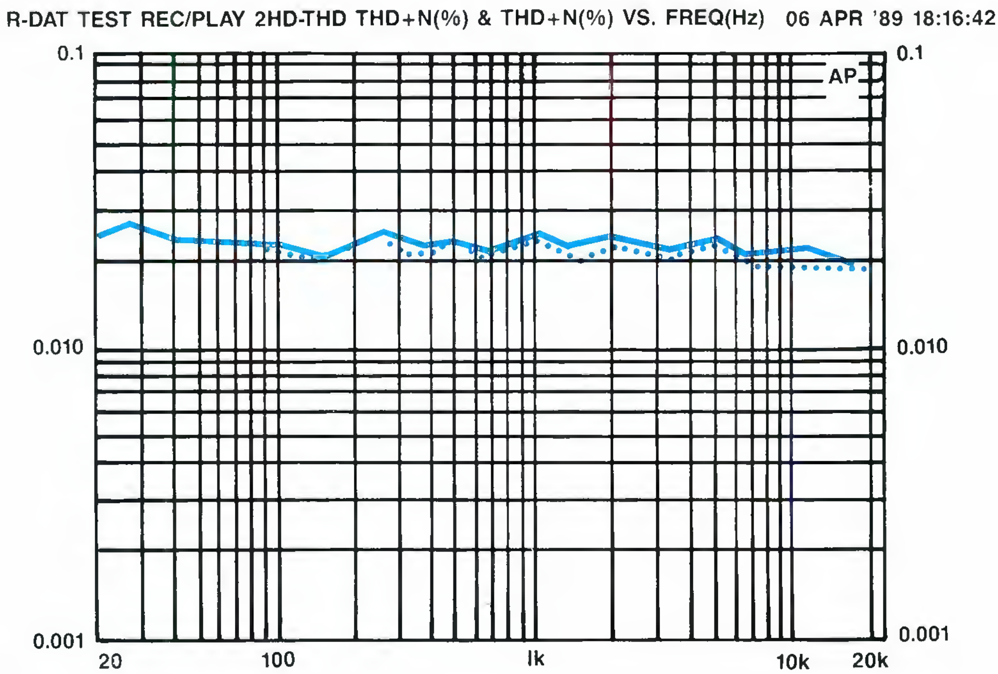



***Figure 4.*** *The THD vs. frequency is approximately 0.024%, which approaches the theoretical limit of a 16-bit system.*

# We Speak Your Language


## Automated Audio for Video

No matter what equipment you use, FOR-A's new automated Audio for Video System speaks your language. The AFV-500 is compatible with almost every popular editor and switcher in the industry. So it gives you an *open path* to expand in any direction. And that's just for openers.

The AFV-500 is remarkably easy to operate. Its internal memory lets you program up to 90 complete setups at a time. From source assignments—up to 20 with our new Audio Matrix Interface option—to levels, fades and stereo pans. With perfect transitions between key frames. With speed and simplicity that cuts your post time dramatically, allowing the freedom to be more creative as well as productive. Starting at under $8,000, the AFV-500 is also easy on your budget.

AFV-500. Audio for Video in any language.

FOR-A®

INNOVATIONS IN VIDEO and AUDIO TECHNOLOGY

FOR-A Corporation of America
Nonantum Office Park, 320 Nevada Street
Newton, MA 02160

Circle (77) on Reply Card

Any questions??? Let's talk!

Boston (617) 244-3223
Chicago (312) 250-8833
Houston (713) 894-2668
Los Angeles (714) 894-3311

*Continued from page 4*

during the annual convention in Atlanta, March 31-April 3.

Swanson joined Harris (formerly Gates Radio) in 1965, following a 5-year stint with Collins Radio and several years at Bendix Aviation. At Bendix, Swanson began his career as an engineering student and continued his work designing ultrasonic equipment after graduation from Valparaiso Technical Institute with a bachelor's degree in electrical engineering.

Swanson then turned his attention to broadcast technology. At Collins Radio, he developed 250,000W transmitters for the Voice of America.

At Harris, Swanson made significant contributions in the development of pulse-modulation techniques and, more recently, digital modulation for AM radio. Many of Swanson's patents represent the same standards and benchmarks used by transmitter designers worldwide.

Swanson's body of work has meant more than the concrete benefits of improving the audio quality and power efficiency of AM. His work has helped preserve a segment of the radio industry by strengthening the economic viability of AM music stations today.

Swanson is an honors graduate of the Army Signal Corps and holds a master's in electrical engineering from the University of Iowa, Iowa City, IA.

## ATTC announces HDTV contract with Tektronix

The Advanced Television Test Center (ATTC) has awarded Tektronix a contract to engineer and manufacture a high-definition TV device, the ATTC format converter. This invention will enable the digital videotape recording of several different forms of HDTV. The prototype is scheduled for delivery by March, with production units to follow.

The format converter will make it possible to record the official tests of advanced-television (ATV) transmission systems for use by industry analysts and government policymakers in determining the new TV standard. Without video recording, most ATV testing could be done only from live picture sources.

Tektronix has been involved in HDTV for more than six years and currently provides the TV industry with HDTV test equipment.

The ATTC format converter will be a key part of the test center's special-purpose laboratory, which is now under construction in Alexandria, VA. The 12,000-square-foot facility, together with its HDTV equipment, will be completed in the spring. It will be used to test the LTV transmission systems that are being proposed as the new standard for U.S. television. The tests, which could begin by mid-1990, are being organized by the official Advisory Committee Advanced Television Service of the Federal Communications Commission.

The format converter is designed to work in combination with the Sony high-definition digital videotape recorder, allowing the tape recorder, which was built to receive only one TV scanning format (1125 lines in a picture), to accept other formats using different numbers of lines (1050, 787.5 and 525). The test center has acquired two of the first production units of Sony's ADD-1000 recorder for this purpose.

## ITVA sets international conference for New Orleans

The International Television Association (ITVA) will hold its 22nd annual international conference and Golden Reel Awards ceremony at the New Orleans Marriott Hotel, May 30-June 2. A record 2,000 video communicators are expected to attend, many representing ITVA's international af-

# The Aphex Audiophile Air Chain


"FM radio has become a ratings war in which we are the casualties by being subjected to a poor excuse for clean, accurate music."
Thomas J. Koch, *The Audiophile-File*

KTWV-FM The Wave. WHYI Miami-Ft. Lauderdale Top 40's. KKGO America's Jazz Station. WQXR New York's Premier Classical Station. All different, but all winners, because they have an overriding demand to deliver the best in audio quality. They know quality sound is essential to attract and keep loyal listeners.

That's why these premier stations rely on The Aphex Audiophile Air Chain, a combination of the Aphex Compellor®, Aural Exciter® and Dominator™ to achieve *consistent high quality sound*. Quick and easy to set up, this combination will achieve competitive loudness while maintaining the same high quality regardless of program or who is controlling the board. By comparison, other processors need to be tuned for almost every song, and achieve loudness by homogenizing or crunching to the point of pain.

AM, FM, TV or Cable ... rock to Bach or talk, if you want to be a winner in the "no win modulation wars", contact your Aphex dealer to arrange for a demo of the Aphex Audiophile Air Chain.

**APHEX**
SYSTEMS

11068 Randall St.
Sun Valley, CA 91352
(818) 767-2929

All Aphex products are designed and manufactured in the U.S.A.



**Circle (78) on Reply Card**

filiates in 14 countries.

The theme is "Countdown to 2000 — Your Future in the Video Profession." The conference is offering more than 125 sessions targeted at all aspects of video production from entry-level basics to advanced management. Forty percent of the sessions are new and will include "Quality Service in the '90s," "American Business Culture in the Global Marketplace," "Marketing Business Television and Your Videoconference" and "Legal and Financial Aspects of Freelancing." There will be 18 sessions specifically focused for independent producers.

Full-day preconference institutes are being brought back in greater number. Topics will include: "Audio for Video: Equipment and Techniques," "Editing," "Executive Management: Transforming the System — Creating Culture Change in the Corporation," "Directing: Fighting the Boredom Battle — Directing High-Risk Corporate Video," "Computer Graphics," "Management Matters: The Business of Corporate Video," "Signal Monitoring," "Scriptwriting," "Lighting" and "Managing a Small Business."

## RF radiation hot spots project is complete

The National Association of Broadcasters, with the support of other media organizations and individuals, has completed a research project analyzing radio frequency (RF) hot spots. They were analyzed for their effect on broadcast station evaluations of compliance with the Federal Communications Commission's RF radiation regulations.

Many stations are concerned that strong RF fields measured physically near metallic objects that re-radiate low-level surrounding RF energy must be considered in assessing compliance with FCC regulations. The initial research results show that these hot spots hold no potential for adverse biological effects and, accordingly, should not influence station evaluations.

The FCC is expected to act shortly on a pending proceeding that addresses how RF hot spots should be considered by stations evaluating compliance. NAB will either supplement that decision or file a new petition with the FCC providing the research results.

In addition to the NAB, contributors to the project were Capital Cities/ABC; CBS; NBC, Greater Media; Fisher Broadcasting; Television All-Industry Committee; Association of Federal Communications Consulting Engineers; du Treil, Lundin & Rackley; Jules Cohen & Associates; LDL Communications; and Karl Lahm, of Lahm, Suffa & Cavell.

The report, "An Investigation of RF-Induced Hot Spots and Their Significance Relative to Determining Compliance with the ANSI Radio Frequency Protection Guide," was prepared for NAB by Richard Tell Associates. For a free copy, call the NAB Science and Technology Department at 202-429-5346.

---

*News From Europe*

**By John Blau, European correspondent**

## European TV by the year 2000

European advertising expenditures will exceed $20 million by the year 2000, according to the study "Television in Europe to the Year 2000," which was commissioned by Saatchi & Saatchi Advertising. Cable and satellite programs will account for almost one-fourth of these expenditures.

Apart from advertising, the study gives a current update on Europe's rapidly changing TV market, divided into two groups: cable and satellite, and terrestrial. Few similarities can be found among the 17 countries polled in this survey.

A key issue raised by the study concerns the survival chances for Europe's many new private commercial stations. The majority of the experts polled in this survey agreed that only stations with a viewer penetration of 25%-30% by the year 1995 would make the cut. Two West German commercial channels, RTL Plus and Sat 1, have increased their viewing audiences at the expense of the country's public-service networks.

The study estimates that TV advertising will grow 10% annually and total $2.86 million by the year 2000. Cable and satellite will have increased its market share to 36% by this time.

## U.S. investment in U.K. cable grows

American investment in the United Kingdom's cable market continues to grow. PacTel is now the leading partner in two franchises in East Anglia. US West is working with the U.S. Cable Corporation in a bid for the Tyneside franchise in northwestern England.

## Vidétron pulls out of France

Canadian cable operator Vidétron is withdrawing from the French market to increase its commitment in the United Kingdom. Share transactions on both sides of the channel marked the end of the relationship between Vidétron, the second largest cable operator in Canada, and the French utility company Générale des eaux. Générale has bought back from Vidétron controlling interests in the two French cable operators Région Cable and Générale des vidéocommunications.

Vidétron was disappointed by the two French cable operators' choice of U.K.-based Cabletime to upgrade their systems for interactivity, in preference to its own Videoway system.

## EC against cable quotas

The Brussels-based Commission of the European Community (EC) has sent warnings to the French, Dutch and Belgian governments over restriction on cross-frontier broadcasting in national media laws.

The EC has approached the French government about a law specifying that 50% of cable programs be French-language or French-financed productions. The same provision exists for over-the-air channels, with a 60% EC quota.

## Gorbachev makes pitch for European satellite

Soviet leader Mikhail Gorbachev called for an all-European satellite TV system in a recent political speech to the Council of Europe. In line with his "common Europe" theme, Gorbachev referred to five specific initiatives "equally important for both Eastern and Western Europe." A European TV satellite was one of them.

The Soviets' own DBS system, called Gelikon, is due to start operation in 1992. There have been few public announcements on the system in recent weeks. Apparently, some Eastern European countries have opposed allocating the necessary funds.

Gorbachev also expressed interest in HD-Mac. Observers say that his remarks could have come in response to an earlier talk with French Prime Minister Mitterrand, who is known as a firm backer of HDTV and is considered a major force behind the Eureka program.

An agreement of understanding on HD-Mac was among the 22 industrial accords signed during Gorbachev's visit to France. It has been reported that some 600,000 might be supplied to the Soviets at a future date. If the number is correct, the sets probably would be used for satellite distribution of films to theaters.

## Data broadcasting provides business service

U.K.-based Americans who want to keep

# PINNACLE SYSTEMS WORLDWIDE

We are proud to announce the installation of over 800 Pinnacle Video WorkStations™ around the world.... all in less than three years!

And it's only the beginning.

With Pinnacle's family of Video WorkStations you can start at any level and add production capabilities as your needs grow-all within a single system. How? Because Pinnacle products are software-based and completely modular.

## 2100 SERIES

Start with 2D digital effects and build your system to include still store, paint, 3D modeling and animation, and PRIZM's perspective, rotation and curvilinear effects.

## 3000 SERIES

The complete paint, 3D graphics and animation WorkStation. Upgrade to still store, 2D, 3D and curvilinear effects.

## VIDEO WORKSHOP

Professional desktop video is a reality with this Macintosh-based creative tool. Features include scripting, budgeting, storyboarding, pictorial cataloging and editing.

**PRIZM**—Powerful option available for the 2100 and 3000 Series featuring real time perspective, rotation and curvilinear video effects.

Flexible, modular, easy to upgrade and service, software-based—that is Pinnacle Systems. With offices in the USA and the United Kingdom, plus a worldwide network of distributors, we are accessible wherever you are. To learn more, contact:

PINNACLE

Pinnacle Systems, Inc.
2380 Walsh Avenue
Santa Clara, Calif. USA 95051
(408) 970-9787
Fax (408) 970-9798

United Kingdom Sales Office
(0932) 848806
Fax (0932) 847209

**Circle (79) on Reply Card**

U.S. and Canadian Distributors:

**Northeast:** HB Communications, New England; The Camera Mart, New York; Peirce-Phelps, East Pennsylvania, D.C., West Virginia, South New Jersey, Delaware, Maryland, North Virginia; Avec Electronics, Virginia; **Southeast:** Clark-Powell Associates, Carolinas; Consolidated Media Systems, Tennessee; Industrial Audio/Video, South Texas; Pro Video Systems, Alabama, Mississippi; Professional Communications Systems, Florida, Louisiana; Technical Industries, Georgia; Video Unlimited, North Texas; **Midwest:** Advanced Video Communications, Northeast Illinois; Audiovisual, Upper Midwest; Cinequipt, Minnesota; Duncan Video, Indiana; General Television Network, Michigan; Jefferson Audio Video Systems, Kentucky, South Indiana; Jimmy Rea Electronics, Ohio; Lines Video Oklahoma, Arkansas, South Missouri; Modern Communications, East Missouri, South Illinois, **West:** Ceavco Audio-Visual, Colorado, New Mexico; Hoffman Video Systems, Southern California, Proline, Pacific Northwest, R.E. Snader & Associates, Northern California. Hawaii: Visual Technology, Utah, Idaho, Arizona; **Canada:** Tresco Communications, Quebec; Videoscope, Ontario; Matrix Professional Video Systems, Western Canada. **Puerto Rico:** Video Industrial Products Corp.; **Plus over 35 international distributors throughout the world.**

abreast of what is happening back home can have daily copies of "USA Today" broadcast to them. All they need is a facsimile machine, a TV aerial and a decoder to translate the signal.

Data broadcasting is the name of a new service that takes information from one source and broadcasts it to a number of receivers, either via satellite or terrestrially by land-based broadcast systems.

Applications include transmitting weather information to disc jockeys who can read out the latest storm warnings or stories to newspapers within minutes of the events occurring. An updated look at the stock market is one of the most popular services.

Although all these kinds of transmission are available today via traditional telephone services, such as fax, telephone or telex, they all are 2-way and, therefore, more expensive. In addition, many companies are equipped only to send the messages sequentially, rather than concurrently, as a broadcast. With data on price shares, the faster service could be vital.

Sweden, France, West Germany and Spain have introduced these services, but it is in Great Britain where most of the action is taking place. Britain's BBC and IBA already have established services to transmit information about share prices to private investors and about horse races to betting shops. And the successful launch of British Satellite Broadcasting's DBS system will enable the company to launch its data broadcasting services in the spring.

## HDTV steals the show in Berlin

HDTV demonstrations were the highlights of this year's Internationale Funkaustellung (IFA) European consumer electronics event in Berlin. European broadcasting and consumer electronics industries are pressing ahead with plans for HDTV field trials at the World Soccer Championships in Italy in 1990 and full transmission at the Olympic Games in Barcelona in 1992.

At the IFA, a complete 1,250-line/50Hz studio produced live broadcasts daily, using HD-Mac, the European standard for HDTV satellite transmission. The programs were sent to three orbiting satellites: West Germany's Kopernikus and TV Sat-1 and the French TDF-1. The signals were then beamed back to earth to be displayed on receivers.

The West Berlin demonstration was the result of a collaboration between 30 European companies that joined forces under the pan-European research project, Eureka. The HDTV project, EU95, involves manufacturers and broadcasters from nine countries led by West Germany's Robert Bosch GmbH, the Netherlands' N.V. Philips and France's Thomson SA.

Initially, all European HDTV broadcasts will be via satellite.

To spur consumer interest, several European manufacturers plan to introduce HD-Mac equipment compatible with existing European systems as a series of upgrades. The first step will be IDTV, which is limited to incorporated improvements in the recorder. It will be followed by EDTV, or enhanced television, which involves better transmission standards. The final step will be HDTV, with 1,250-line/50Hz transmissions on wide-screen displays with a ratio of 16:9.

Thomson Consumer Electronics presented a 16:9, 1,250-line TV receiver at the show, which is compatible with existing 625-line transmissions. The company also demonstrated advanced-definition (ADTV) TV receivers.

Another event that made headlines at the Berlin show was the first digital radio broadcast. West Germany's Kopernikus satellite was used to beam radio signals to compact disc antennas at the show.

Digital audiotape (DAT) had a low-key presence at the Berlin event, which followed on the heels of an international agreement on digital copying. Many DAT recorders where shown to dealers only.

## HDTV shines at ITU-COM

HDTV stole the limelight at the opening of the first ITU-COM exhibition in Geneva, Switzerland.

At the symposium, European standard-makers pushed for a common data rate that would be compatible with a proposal from the United States. The Japanese, however, called for a common image format, which would mean the same number of lines independent of the broadcasting frequency.

The International Radio Consultative Committee (CCIR) is scheduled to ratify a world standard for HDTV by May 1990.

## First private Greek TV channel

Greece's first private TV channel, Mega Channel, went on the air in December, ending 20 years of strict state control of the electronic media. The channel broadcasts in the Athens metropolitan area, reaching approximately 40% of the homes. Mega Channel will compete with the country's two state-owned public-service networks, 12 foreign satellite broadcasters and three local stations that are running test programs. Mega Channel's main competitor, however, will be Antenna TV, which was launched last month.

## Thomson lands deal in Soviet Union

Thomson SA of France, has agreed to manufacture as many as 600,000 TV sets a year in a joint venture with the Soviet Union. Thomson Consumer Electronics, a member of the state-controlled electronics group, has signed an agreement with the Soviet Communications Ministry to form a 50% joint-owned company with Orbita, a Soviet state-owned company, to build sets in Moscow.

## BBC announces 5-year budget

The British Broadcasting Corporation (BBC) has announced a 5-year budget, which includes financial allocations for several projects including: introducing electronic newsrooms nationwide; completing the local radio network in England, bringing the number of local radio stations to 39; introducing RDS at every BBC VHF/FM transmitter in the country; and launching digital stereo sound on the national TV services.

## Preparing for Soccer Championship

Preparations for the World Soccer Championship in Italy are under way. The International Broadcasting Center (IBC) is being built in Saxa Rubra, the site of a famous battleground, 11km outside of Rome. Five separate buildings, each with three floors, are under construction. Approximately one-quarter of this space will be reserved for international broadcasters. Radiotelevisione Italina (RAI) will have its own studios and production areas.

## The Netherlands issues new media law

Eelco Brinkman, Dutch Minister of Culture, is making changes in the country's media law to accommodate commercial television. The law is expected to be passed early this year.

Commercial channels, however, claim that the law aims not to foster, but obstruct, the growth of commercial television. Although licenses will be issued to every applicant, they will be for cable-only national distribution only. Local or regional television, as such, will not be permitted. Other important clauses in the bill include: no single investor may hold more than one-third of the total stock; public broadcasters will remain the sole user of terrestrial frequencies; and public broadcasters who remain public will receive a 10-year license.

*Continued on page 108*


# THE PROFESSIONAL CD PLAYER FOR THE PROFESSIONAL CD PLAYER.

Like all professional CD players, the new Technics SL-P1300 is technologically advanced.

But you don't have to be a technical genius to operate it.

In fact, even if you haven't spent years in the studio, it will only take you a few minutes to figure it out.

You see, the SL-P1300 is ergonomically designed to give you greater control over playback than you've ever had before.

Perhaps that's because it's built like a recording console. Which means the disc well and all the other controls are right at your fingertips.

First, the control panel features a long stroke sliding pitch control. It's continuously variable with a range of ±8%. In addition, it lets you restore quartz lock accuracy at the touch of a button.

There's also our two-speed search dial with audible pause. Which makes finding your in point extremely easy.

Our professional CD player has other features professionals enjoy working with. Like one-touch memorization by time code, A-B repeat, and our exclusive rocker control search buttons. It's the digital equivalent of dragging your finger on the edge of a record.

A great deal of thinking also went into things like our balanced outputs (10 dBm nominal into 600 ohms). There's even a port for a wired remote. And separate power supplies for digital and analog circuits. Given this, it's not surprising that its S/N ratio is 112 dB.

If you're a professional CD player, chances are you're ready to hear what our professional CD player can do.

Call your Technics representative. You'll find that our pro CD player isn't the only thing from Technics that's a pleasure to work with.

**Technics**
The science of sound

Circle (80) on Reply Card

# Rethinking switchers

By Robert R. Ramsaur

Switchers are changing shape. Instead of sporting rows and rows of input sources or mountainous mix/effects buses, the new switchers are smaller and more compact. They feature smaller, simpler control systems and greatly expanded keying capabilities. In the future, look for more of the same, as continuing integration reduces to option boards what now occupies rack-mounted chassis.

### Looking back

Twenty years ago, the typical video production switcher had 10, 16 or 24 inputs. Manufacturer options allowed a choice of 1, 2 or 3 mix/effects (M/E) banks, which performed mixes, wipes and luminance keys. Key sources were limited. There was usually only one external key source and matte or A bus video fill. If an early switcher had a downstream keyer (DSK), it was good fortune, not the norm.

Second-generation switchers brought the user rotary wipes, border generators for the keyers and DSKs as standard features. Expanded external key and fill functions also were added to the downstream keyer, which was equipped with selectable sources.

Today's third-generation switchers have approximately the same number of primary video inputs as their predecessors: 10, 16 or 24, but the keyer features have been greatly expanded. Some modern switchers have more video sources available as key sources than as primary video inputs.

### Why keys

Part of the reason for this increase is the proliferation of key-rich, computer-based video devices. In the early days of video production, video sources included cameras, VTRs and character generators. A couple of keyers were all that were needed. Today, along with these traditional devices, we have digital effects systems, graphics boxes, still-stores and weather computers. Many of these devices not only have one or two video output channels, but they produce key signals as well. These allow a switcher to place the device's output cleanly over background video, without the need to set key levels and clips. In some cases, the key signal is linear, that is, it allows a variable degree of transparency over the background.

As producers desire more elaborate keys, some have begun to work with superblack backgrounds, in which video that will be keyed has a background that is below setup or even below the blanking level. This practice allows the key clip to be set near 7.5 IRE, which makes it easier to key in darker portions of the key video for a better-looking image. Accommodating these increasingly numerous and complex key signals has forced switcher designers to build in enhanced keying capability.

Ramsaur is a product specialist engineer for Grass Valley Group, Grass Valley, CA.

### Digital effects

When digital effects systems first came out, they were expensive. Facilities able to afford them already had the larger, fully-optioned switchers that had the keying capability needed to get the digital effects system video into the program path. In the last year or so, advances in technology have greatly reduced the price of digital effects systems. This cost reduction will put digital effects into many facilities that do not have the equipment budgets for monster switchers. This, in turn, will probably result in increased demand for small, but powerful switchers, with more emphasis on the ability to process keys than on the size of the input matrix.

How and where we get the digital effects unit's input video and how and where we put it back into the switcher's video path, are going to be two of the major factors affecting new switcher architecture. Manufacturers are now introducing systems in which video from several points along the signal path inside the switcher can be brought out to a digital effects system, transformed and re-entered.

(Editor's note: The "Applied Technology" in this issue contains a separate discussion of this subject.)

### Digital conversions

New digital technology is being used to resolve long-standing problems with video encoders and decoders. Once video is digitized, modern digital-filtering techniques can be used to remove chrominance-luminance artifacts that traditionally have caused dot crawl and rainbowing when the encoded video is decoded at the user end. Remote control of adjustable features allows the user to dynamically configure these devices. The user may define the input format and access registers that can control a myriad of functions such as filtering, level settings and timing.

Modern digital video encoders provide both encoded video and digital outputs. In future-generation switchers, integrated encoders and decoders will make multiformat video production easier to contend with. Dedicated ICs are being developed to reduce the amount of electronics necessary to implement these desirable features.

### One function per button

The future will see more system integration. Digital effects systems will become option boards in the digital switcher just as border generators are in today's analog switchers. This integration also will affect the way that these devices communicate with each other. Today, it is common for the edit controller, switchers, character generator and digital effects system to intercommunicate via serial data lines. As these devices become integrated into a common frame, they will all communicate on a common party bus. If the various manufacturers can work together, a common standard for this bus might make it possible to have a brand X switcher card exist with a brand Y character generator card, both under control of a brand Z edit controller, all in the same mainframe.

This may eventually require the adoption of standardized soft-switch control panels, in which buttons are assigned functions dynamically, similar to the function keys on a microcomputer. Another new approach would be to do away with buttons altogether; some recent digital effects systems use either a mouse or a modified joystick that simulates a mouse. Operators click on icons that demonstrate what the selected transformation will do to the picture. However, my experience in remote-truck engineering for sports events convinces me that the conventional use of one function per button or one function per shifted button is a very effective human interface for situations in which speed and instinctive reaction are critical.

### What it all means

Because the video image is placed in memory, video signals to the switcher and internal switcher signals have the ability to be timed virtually anywhere. This will greatly simplify the timing restraints surrounding current analog switchers.

It will become harder and harder to find a piece of equipment that is not controlled by a microprocessor. VLSI technology will continue to reduce the size and number of electronic components in future-generation electronic devices. Fewer repairs will be made at the component level and board exchanges will be more the norm. More equipment will have built-in diagnostics and serial ports for diagnostics via terminals or modems.


# but stations are already ordering it.

And if you order now you can receive delivery as early as first quarter 1990.

What distinguishes the new 900 from every other TV audio console is Auditronics' exclusive computer preselect system. Connect the 900 to your house router and you've got instant board access to every audio source. Including 64-scene memory with preview and total recall of previous preselect setups at the push of a button. Neve doesn't have it. SSL doesn't have it. Only Auditronics has it. And our 900 costs considerably less than either of theirs.

Auditronics' new 900 also delivers these unique advantages to the television broadcaster:

- Small footprint of 36" × 82" conserves scarce control room space.
- Advanced ergonomics places all controls within easy reach from operator's chair.
- User-defined feature selection lets you order everything you need (and leave out what you don't need).
- Auditronics' legendary 24-year record for ruggedness and reliability stands alone.

Call your nearest factory direct engineering representative today for information on Auditronics' new 900 made-for-TV audio console.

| | | |
|---|---|---|
| West | Audio Images | 415-957-9131 |
| Central | Audio Broadcast Group | 616-452-1596 |
| South | GP Enterprises | 817-572-0132 |
| Mid-Atlantic | Broadcast Services | 919-934-6869 |

auditronics, inc.
3750 Old Getwell Rd., Memphis, TN 38118, USA
(901) 362-1350

Circle (88) on Reply Card

*Continued from page 104*

## Sony turns European

Sony's worldwide ambitions extend beyond its takeover of Columbia Pictures Entertainment. That deal was one element in a strategy to transform itself into Japan's first global corporation.

In Europe, Sony's drive has increased due to the single European market and the fear of increased European protectionism. Sony intends to maintain its position in existing European markets, and also position itself to enter new markets.

Sony was among the first Japanese companies to manufacture in Europe, opening a TV plant in South Wales in 1974. Today, it has eight assembly plants and two development and engineering centers in six European countries. The European operations have a workforce of 8,000, and provided approximately 23% of its worldwide turnover last year.

Currently, only about 40% of Sony's European sales are local. The company plans to raise local content by adding European production of high-value components, including chips, heads for VCRs, optical pickup for CDs and magnetic tape coating.

The company also would like to participate in European joint industry research and development programs such as Eureka and Esprit, from which Japanese companies are currently banned.

Sony has lobbied hard for Muse to become the world standard, but faces a major obstacle. The EC consortium's rules require that all members support HD-Mac as the sole world standard, a move that would make little sense to Sony.

## Spain to regulate cable

The Spanish government is planning some form of regulation for TV cable stations. The government is assessing the impact of commercial television and will make a decision by September 1990.

According to a report by consultants Cable Consult SA, the growth of cable in Spain has been hindered by lack of regulation covering the plethora of community networks throughout the country. Unique to Spain, the systems provide tape-delivered channels while incorporating some satellite-delivered material. The 850 networks, operated by some 450 companies, serve almost a million subscribers.

Large-scale cable plans are already under way in Barcelona, Seville and Madrid to start networks in 1991. Among the U.S. companies vying for a piece of this business are: ATC, Jones Intercable, Pacific Telesis, TCI, United Cable and the Washington-based Vega group.

*Continued on page 115*


# Time delay.

The SV-255 portable Pro-DAT: It's *A Time Machine*. What goes in comes out, whether it's one minute or one year later!

To do this the SV-255 brings you the best pre-amps and A-D's in the DAT world. Our low noise pre-amps, with optimum headroom and "gapless" trim range, match the widest variety of sources and levels for the best possible sounding recordings.

MASH A-D converters significantly lower noise and distortion compared to conventional A-D systems, especially at low levels and high dynamic ranges only DAT lets you use. And the 64-times oversampling rate allows the use of gentle 18dB per octave filters for notably enhanced phase and frequency response.

This kind of engineering integrity has made Panasonic portable professional DAT's today's best selling DAT machines.

Come into your Panasonic Pro-Audio Dealer today and judge the superior sonic qualities for yourself.

**Panasonic**
Professional Audio Systems

For your nearest dealer, call 714-373-7278, or write: Panasonic DAT, 6550 Katella Avenue, Cypress, CA 90630.
For enhanced performance use Panasonic DAT tape.

Circle (83) on Reply Card

# People

**David Buckler, Lawrence Mincer** and **Ron Witko** have been appointed to three new sales executive positions with Chyron, Melville, NY. Buckler is vice president of client development. Mincer is vice president of North American sales-telesytems and video products. Witko is vice president of U.S. sales-telesystems and video products.

**Denise Gallant** has been appointed to the position of advanced systems planning for Chyron, Melville, NY. She is responsible for working with individuals and companies in professional television in order to identify industry trends and shape new products.

**Maria Curry,** vice president and general manager of the magnetic tape group of AGFA, photo division, Ridgefield Park, NJ, has been named president of the International Tape Association.

**James Owen** has been named Southeast lighting and grip sales representative for Arriflex, Blauvelt, NY. He is responsible for the company's line of lighting products.

**Garry Elliott** has been appointed national sales manager for the professional products division of Audio-Technica, Stow, OH. He is responsible for the pro division's domestic program.

**John Binsfeld** has been appointed director of sales for CCA Electronics, Fairburn, GA.

**Glenn Higgins** has been appointed president of Comtech Antenna Systems, St. Cloud, FL. He is responsible for overall management control of the company.

**Robert Berger** has been named director of software development for Digital F/X, Mountain View, CA. He is responsible for the development of software systems with advanced capabilities.

**Peter Fochi** has been appointed district manager, western region for EEV, Elmsford, NY. He is responsible for the sale of products in Alaska, Arizona, California, Colorado, Hawaii, Nevada, New Mexico, Oregon, Utah and Washington.

**William Kranzush, Eunice Davis** and **Bruce Slemmer** have been appointed to positions with HM Electronics, San Diego, CA. Kranzush is customer service manager. He is responsible for customer service for the line of wireless drive-thru systems, cable and wireless intercom systems and wireless microphone systems. Davis is marketing manager. She will coordinate all marketing programs. Slemmer is general sales manager, and will direct all commercial sales activities.

**Dennis Mallon** and **Maxwell Adams** have been appointed to positions with IDB International, Culver City, CA. Mallon has been promoted to commercial sales. Adams has joined the sales team, and will market the company's data/voice products worldwide.

**Jack Wagner** and **Sharon Krause** have been appointed to positions with Radiation Systems, Mark Antennas Division, Des Plaines, IL. Wagner is marketing manager. He is responsible for worldwide sales and marketing. Krause is advertising coordinator and is responsible for designing promotional literature, coordinating advertising and public relations.

**John Naccarato, Hazel Simpson, John McDiarmid** and **Charles Conte** have been appointed positions with Neve, Bethel, CT. Naccarato is general manager, Rubert Neve Canada. Simpson is director of sales. McDiarmid is U.K. sales manager. Conte is public relations administrator for the North American market.

**Brent Bullock** has been named national sales manager for Quanta, Salt Lake City.

**Carla Campbell** has been appointed Eastern regional sales manager for Panasonic/Ramsa Professional Audio, Los Angeles. Campbell is responsible for supervision of sales, servicing of dealers and sound contractors and the development and maintenance of Ramsa's dealer network in the East.

**John Kilcullen** has been named treasurer/controller for Solid State Logic, New York. His responsibilities include implementing and managing corporate accounting and credit policies, developing financial policies and strategic plans.

**Tom Laughlin** has been named professional audio specialist for Sony of Canada Ltd. He is responsible for the engineering and servicing of professional audio products.

**Glen Adamo** has been named president of Sony Broadcast Export Corporation, New York. He is responsible for the sale of all non-consumer products to Latin America.

**Patricia Kiernan** has been appointed general manager for the U.S. operation of Trident Audio USA, Torrance, CA.

**Rich Lunniss, Meryl Altman** and **John Dale** have been appointed positions with A.F. Associates, Northvale, NJ. Lunniss is vice president for sales, marketing and the product division. Altman is vice president, systems division. Dale is director of systems administration.

**Mark Sanders, Ajay Chopra** and **Walter E. Werdmuller** have been appointed to positions with Pinnacle Systems, Santa Clara, CA. Sanders is president and chief executive officer. Chopra, a founder and director of the company, is vice president of engineering. He is responsible for all the research, development and engineering activities. Werdmuller has been promoted to vice president of sales.

**Heitaro Nakajima,** executive technology advisor, Sony Corporation, New York, was presented with the AES Gold Medal at the Audio Engineering Society convention. The medal was presented in recognition of his contribution to the development of the compact disc.

# SHOOT FROM THE HIP

# STUDIO NEWSROOM LECTURE HALL O.R. CEILING CONFERENCE ROOM STADIUM COURTROOM

## Only Vectorcam™ by Vicon offers all these pan/tilt possibilities and more.

Vicon Vectorcam™ camera positioning systems put professional-quality camera control at your fingertips—whether the camera is in your corporate conference room or positioned out of reach on the ceiling of a sports arena.

There's a Vectorcam™ system for your application from under $4,000 for a basic system to under $40,000 for a 4-camera programmable system with memory, 99 presets per camera station and RS232 compatibility.

And you can depend on the quality of Vectorcam™ systems because they're built to last—by Vicon, a company devoted to innovative accessories that enhance television camera operation. Vectorcam's rugged construction, close-tolerance gearing and high quality components ensure accurate positioning with precise stops, pans, tilts, zooms and focus.

The Vectorcam™ remote control unit is available in desktop or rack-mount configurations and can be tailored to your application. So, when it's time to shoot from the hip—or anywhere else—contact the professionals at Vicon or at your local Vicon dealer.

Professional
Products
Division

VICON

Vicon Industries Inc.
525 Broad Hollow Road
Melville, New York 11747-3703
516-293-2200
Fax: 516-293-2627

**Circle (84) on Reply Card**

*V6035PT*

*V6033PT*

*V7000C*

*V7100C*

*V6100PT/V6000PT*

# Comments filed and participation proposed

**By Bob Van Buhler**

The SBE has filed comments opposing a petition by Cellular 21, New Jersey, to reallocate 940MHz-944MHz to a new roaming cordless telephone service. The society opposed the measure, citing the existence of large numbers of "grandfathered" studio-to-transmitter links (STLs) and intercity relays in the band, and the extensive use of 942MHz-944MHz for aural STLs in Puerto Rico.

In its petition, Cellular 21 requested the use of 940MHz-944MHz, and also suggested that broadcasters and other auxiliary users vacate the current aural STL band. The petition advised that the users be relocated to bands above 24GHz to accommodate further expansion of the proposed service. The petition did not present specifics on how this might be accomplished or how other fixed users in 941MHz-944MHz would be affected by the plan.

Noting the lack of a specific interference contour in the Cellular 21 plan, the society indicated that no technical basis exists for compatible channel sharing. The transmitters and locations (to be used by Cellular 21) are not identified. There is no provision in the petition for predicting interference criteria or plans for their resolution. The comments on rulemaking 7140 were filed by SBE attorney, Christopher Imlay of Booth, Freret & Imlay.

### Promises kept

In early December, SBE chapter chairmen received a packet of information to share with its members. The packet outlined the first step in the membership campaign, which is designed to involve the local chapters in the society's growth. The chapter chairmen also were provided with a list of local engineers who attended the SBE convention, but who are not members.

Copies of the *SBE Convention Daily* newspaper were enclosed along with the mailing, as well as a letter from Bob Goza, convention chairman. A report on the SBE membership directory, scheduled for the February mailing, also was included. The directory project is being coordinated by Paul Lentz, SBE secretary.

This mailing was followed by the *President's Newsletter* from SBE president, Brad Dick. The newsletter updated the membership on certification, the professional licensing issue, frequency coordination, membership and other organizational news.

With the newsletter, Dick fulfilled a promise made at the SBE national convention's annual membership meeting, when he told the membership that regular mailings would be made to help keep the members informed about important society news.

### Motions from the floor

A letter from three SBE national officials was circulated to board members. The letter proposed participation in a number of programs, which the officials regard as "a quantum leap for the society."

SBE treasurer, Bill Harris and directors Paul Montoya and Fred Baumgartner, proposed the hiring of a full-time SBE administrator at a salary of $50,000 per year with $50,000 per year expenses.

To finance this, they recommended increasing SBE annual membership dues to $42 by 1991 and drawing on convention revenues to whatever extent possible. Convention revenues have gone traditionally to finance the Ennes Foundation's educational projects such as scholarships, and to provide necessary funds to support the following year's convention.

In his proposal, Montoya advocated making certification mandatory for SBE membership. Likening the society to the legal profession's Bar Association, he said, "If we are to achieve many of our professional goals within the engineering profession (such as job recognition, proper salaries and advancement possibilities), we must have the proper credentials." Montoya, who recommended a non-renewable novice level for entry-level candidates, currently is SBE-certified as a broadcast technologist.

Baumgartner advocated excluding outsiders and hangers-on from SBE meetings. He said each chapter has those who show up as they please and do not help support the organization or work for the good of the group. He urged chapter chairmen not to provide these people with the same privileges and benefits. He also advised the adoption of the Society of Cable Television Engineers (SCTE) as a role model for education and certification. Baumgartner is employed in the 2-way radio industry.

The letter also advocated a serious newsletter, an awards program that combines the SBE certification program with other organizations and regional 2- or 3-day management seminars. According to the authors, "The course we have charted is not a pick-and-choose scenario as much as it is a comprehensive plan."

Interested parties may obtain a copy of the joint letter from any SBE director or officer. It should be emphasized that the letter represents its authors' opinions and has not been endorsed by the SBE officers, board of directors or membership.

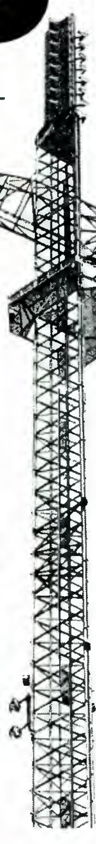
A list of SBE-elected officials is included so that you may contact your local directors with your views and questions.

*See Table 1 on page 114.*

Van Buhler is manager of engineering at KNIX-AM/FM, Phoenix.

# LDL

# THE BUCK STOPS HERE.



What makes us unique is that we take full responsibility for every broadcast transmission system we supply. Even if you specify other equipment and suppliers for parts of your LDL installation.

And it's a responsibility we can afford to take. Because LDL stands for LeBlanc & Royle towers, Alan Dick antennas and LARCAN transmitters. Leaders in their fields.

At the same time, we're members of the LeBlanc Communications Group. So LDL also stands for the vast broadcasting resources and experience of our other affiliated LeBlanc Companies.

**See us at the NAB. Booth #1634**

And that makes us one of very few companies who can handle complete turnkey systems with our own internal resources. So you get every benefit of total systems integration. On schedule, within budget.

Rely on us. As your one source for any or all your needs. From the most complex configuration to the smallest replacement part. From custom-designed or off-the-shelf products to upgrades for existing systems. We've got whatever it takes to get you on the air. And keep you there.

That's LDL. Responsive and responsible.

**LDL COMMUNICATIONS, Inc.**
A MEMBER OF THE LeBLANC COMMUNICATIONS GROUP
LeBLANC
14440 Cherry Lane Court, Laurel, MD 20707
Tel: (301) 498-2200 Fax: 3014987952 Telex: 821569

Circle (85) on Reply Card

**OFFICERS:**
President, Brad Dick
Broadcast Engineering
P.O. Box 12901
Overland Park, KS 66212
913-888-4664

Vice President, Richard Farquhar
SOS Productions
4620 Timothy Lane
Canal Winchester, OH 43223
614-221-0966

Secretary, Paul Lentz
5034 Silica Drive
Sylvania, OH 43560
419-882-5906

Treasurer, Bill Harris
KRZN/KMJI
5350 S. Roslyn St., Suite 210
Englewood, CO 80111
303-741-5654

**DIRECTORS:**
Phil Aaland
KGUN-TV
P.O. Box 5707
Tuscon, AZ 85703
602-792-9933

Jeff Baker
66 Huxley Way
Fairport, NY 14450

Fred Baumgartner
3835 S. Olathe Street
Aurora, CO 80013
303-220-0600

Steven Brown
WLTE
1111 Third Avenue
Suite 470
Minneapolis, MN 55404
612-339-1029

Dane Ericksen
Hammett & Edison
Box 280068
San Francisco, CA 94128
415-342-5200

Robert Goza
Route 1, Box 153
Baufont, MO 63013
314-484-3718

William Hineman
WTHR-TV
1000 N. Meridian
Indianapolis, IN 46204
317-636-1313

Chuck Kelly
Broadcast Electronics
4100 North 24th St.
Quincy, IL 62305
217-224-9600

Tom Weems
Tektronix
21300 Erwin St.
Woodland Hills, CA 91367
818-999-1711

Immediate past president
Jack McKain
KUBC/KKXK
Box 970
Montrose, CO 81402
303-249-4546

Joe Manning
KAET
Arizona State University
Tempe, AZ 85287-1405
602-965-3506

Paul Montoya
KOOL-FM
1560 Broadway
Suite 1100
Denver, CO 80202
303-832-5665

Edward Roos
WPTV-TV
P.O. Box 510
Palm Beach, FL 33480
305-655-5455

***Table 1.*** *A list of SBE officials and their addresses.*

*Continued from page 108*

## West German and Japanese stations cooperate

The West German public-service network ZDF has signed an agreement to cooperate with Japan's public-service network NHK and NTV, one of the country's private stations. The German and Japanese broadcasters plan to set up coproductions, exchange programs and increase cooperation in satellite broadcasting.

## Competition possible for CNN

Europe's public-service broadcasters plan to compete against Ted Turner's Cable News Network (CNN) by setting up a Europe-wide satellite news channel. Some 20 members of the European Broadcasting Union (EBU) have expressed interest in the project scheduled to go into operation at the end of this year.

## Europesat is set to happen

Board members of Eutelsat have agreed to go ahead with their plans to launch the Europesat DBS system. Europesat will comprise of at least two in-orbit platforms, each carrying up to 14 channels. Power levels would be lower than the first-generation of European DBS systems, with tubes in the 100W range.

Countries currently backing the Europesat initiative are Italy, the Netherlands, Belgium, Switzerland, Norway and Austria. The final go-ahead for the project, however, relies on the active involvement of West Germany and France.

West Germany, however, is looking at Kepler, a follow-up satellite, which would have both DBS capacity (less powerful than TV Sat-2) and lower-power telecommunications transponders to take over from those on Kopernikus. So far, TV Sat-2, which transmits in the HD-Mac standard and requires special receivers, has not been able to compete successfully against Kopernikus, beamed in PAL, which is compatible with existing TV systems.

## EC delays decision on satellite services

The European Commission (EC) has delayed, once more, its policy paper on satellite services until spring 1990. The paper will specify the extent of deregulation the EC wants in satellite communications, including broadcasting.

## U.K. commercial channel runs into problems

Channel 5, the U.K. TV channel scheduled to start in 1993, is encountering problems that could affect its commercial impact.

It is estimated that 70% of the United Kingdom can be covered using 25 transmitting stations on two UHF channels — numbers 35 and 37. Unfortunately, video recorders in the U.K. are tuned to Channel 36. This means that both recorders and TV sets will have to be retuned to avoid interference from Channel 5. Video owners will be affected whether or not they want to receive Channel 5.

For the 30% of the country unable to receive the channel terrestrially, the channel could be carried on local microwave TV systems or distributed by satellite.

# New products

## *Stereo power amplifier*

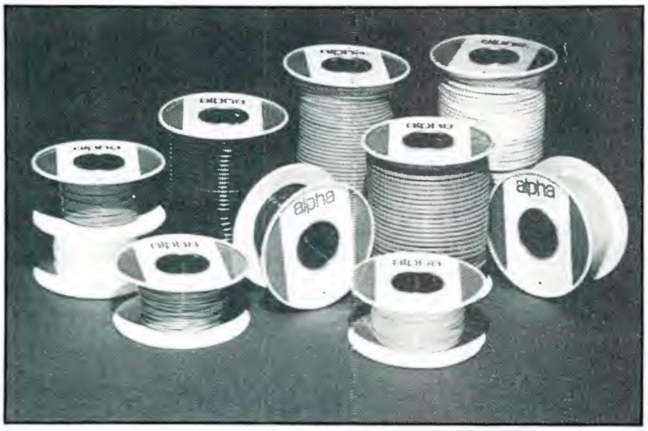
*By ADA Signal Processors*

• **T-100S amplifier:** 50W per channel stereo power amplifier; uses 6CA7, 12AX7A tubes for classic tonal texture; use with MP MIDI tube pre-amp for all-tube system; active high-voltage regulation avoids 60-cycle hum; 4Ω, 8Ω, 16Ω output impedances; forced-air cooling.

**Circle (350) on Reply Card**

## *Wire products*

*By Alpha Wire*




• **Hookup wire:** range of single-conductor products; insulations with 150V-1,000V range withstand 80°C to 200°C temperatures; UL, CSA and military specs; PVC, PVC/nylon, TPR, FEP, Teflon and irradiated PVC or polyolefin insulator materials.

**Circle (351) on Reply Card**

## *Fiber-optic transmissions*

*By American Lightwave Systems*

• **LC series links:** Lightwave, compact fiber-optic transmission system; 67dB S/N ratio with audio meets RS-250B short haul specs for distances exceeding 15.5 miles; NTSC, PAL, SECAM versions available; four audio subcarrier channels, dependent upon video channel format; universal module, mainframe design for interchangeability; 70MHz interface for microwave; supports bidirectional A-V transmission.

**Circle (352) on Reply Card**

## *Video signal comparison*

*By Colorado Video*

• **Model 292 freeze-frame:** slow-scan video receiver compares a received image with a reference image and shows differences; reference or new images also can be viewed on conventional monitor; designed for surveillance or monitoring of operations at a remote location; requires only voice-grade telco line.

**Circle (353) on Reply Card**

## *LAN products*

*By CaSaT Technology*

• **ENT-4305:** LANCAST 802.3 thin ethernet transceiver; for office, engineering environments needing lower-cost equipment with interchangeable cable taps; fixed BNC cable tap; LED indicators show power, status in companion ERT-4308 diagnostic module.

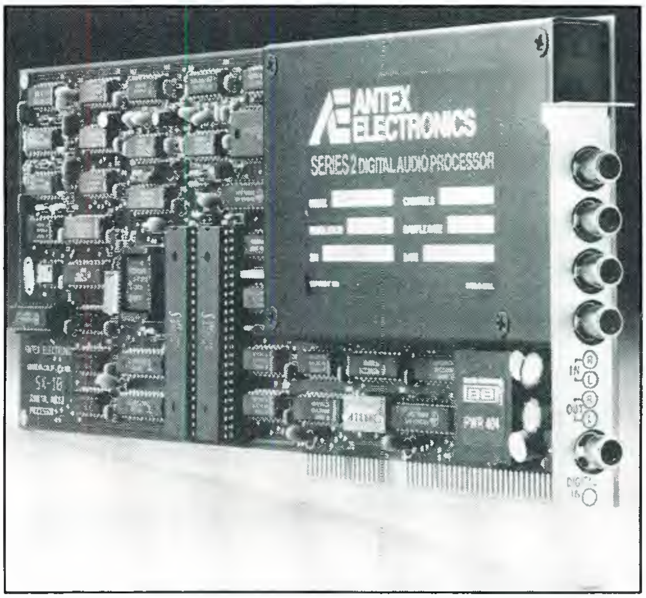
• **CBT-320:** carrierband tap for IEEE 802.4 networking; isolated, low-insertion loss; 2-, 4-port device for attaching workstations or other network devices; 75Ω F connector; EMI, RFI shielding.

• **APS-2220 family:** LAN protection switches; connects alternate redundant circuits if primary LAN fails; auto diagnostics, alarm threshold.

**Circle (354) on Reply Card**

## *Audio digitizer*

*By Antex Electronics*




• **Series 2/Mod SX-10:** digital processing board for 286/386 PCs; receives analog or digital audio signals; digitizes signals on two channels for storage on hard disk or CD-ROM; after storage, signals can be recalled for editing, mixing.

**Circle (355) on Reply Card**

## *Environmental seals*

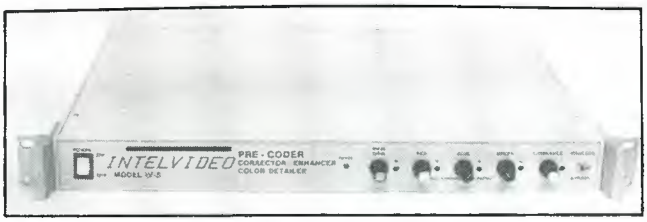
*By Equipto Electronics*

• **Rubber gaskets:** helps seal equipment racks against dust, moisture in Equipto heavy-duty vertical racks and sloped-front consoles.

**Circle (356) on Reply Card**

## *Video precoder*

*By Intelvideo*




• **Model IV-5:** video precoder; for use ahead of NTSC encoder; provides luminance correction, enhancement and color detail improvement; 16dB dynamic enhancement of color detail, as a function of saturation and color; operates in RGB mode.

**Circle (357) on Reply Card**


The future is D2 . . . and Ampex has it now. Our 319 D2 videocassettes are available in all three sizes and in a variety of play lengths, from 3 minutes to over 3 hours. Each offers you our high-coercivity metal-particle formulation for sharp images and highly saturated colors. And each offers you our advanced-technology precision cassette design, with high-impact ABS antistat plastic shells and low-friction Teflon-impregnated spool bearings to reduce debris during fast forward and rewind cycles. All built to the most exacting standards to deliver the most outstanding reliability. And all backed by the industry's most acclaimed service and support organization. It's a future whose time has come. From Ampex.

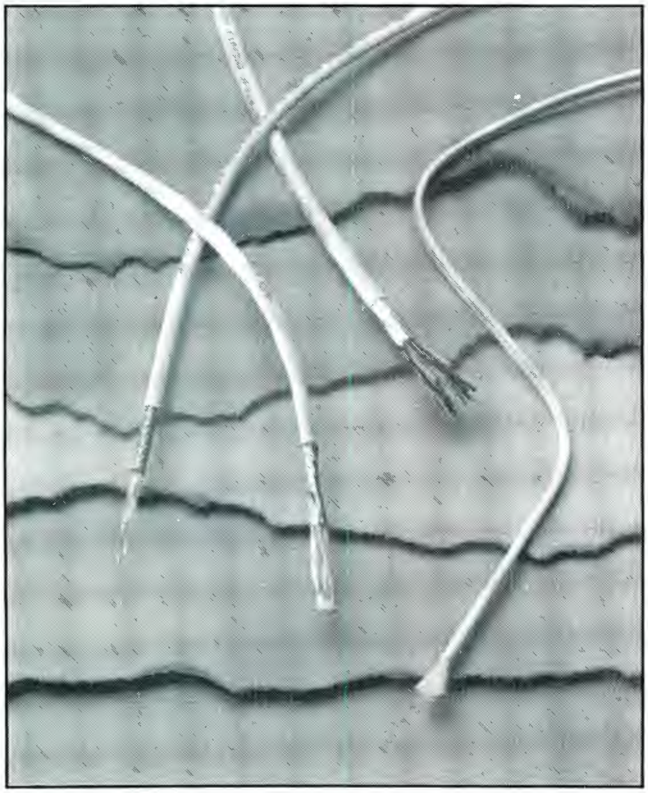
THE PROFESSIONAL CHOICE

*Ampex Recording Media Corporation*
*401 Broadway, Redwood City, CA 94063, (415) 367-3809*

**Circle (87) on Reply Card**

## *Flame retardant cabling*

*By Belden Wire & Cable*

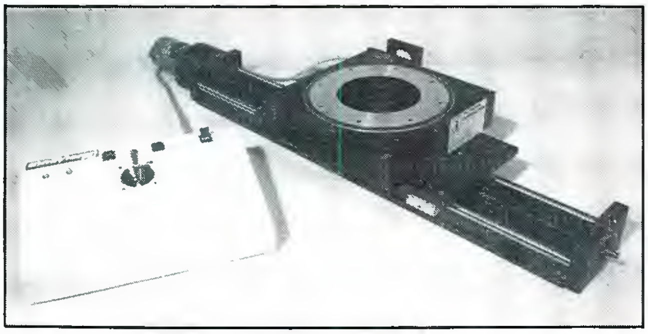


• **Flamarrest:** low-smoke, flame retardant jacket for metallic, fiber-optic plenum cables; more flexible than traditional fluorocopolymer jacketing material; available on various coaxial, multiple pair, multiple conductor and fiber-optic products.

**Circle (358) on Reply Card**

## *Animation tables*

*By Innovision*



• **Motion control tables:** three portable models; precision position, velocity control from joystick or computer controller; single-, dual-axis motion; 20-inch X-/6-inch Y-axis travel or 360° rotation; 24-inch length and stackable for dual axis control.

**Circle (359) on Reply Card**

## *Camera stabilizers*

*By Istec*

• **32DB1710:** stabilized airborne surveillance system; includes CCD color camera with 700TVL resolution; 180× magnification optical system, continuous zoom from 19mm to 1,710mm; 0-60 degrees/second slew rate; 3-axis stabilizer offers less than 5 microradians rms jitter in all three axes; custom mounts, as required for installation on aircraft or vehicle types.

**Circle (360) on Reply Card**

## *Audio level meter*

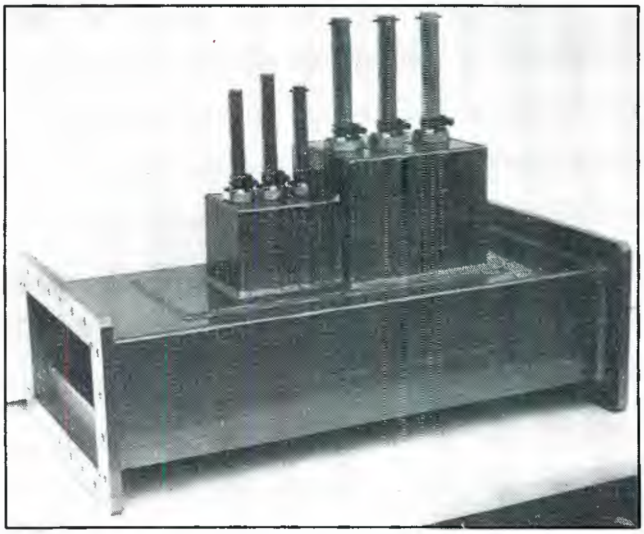
*By FM Systems*


• **AVM meter:** digital, hand-held audio level meter; measures true rms with calibration in dBm; −50, +20dBm range with 0.1dBm steps; LCD display shows only highest signal occurring in measurement interval; balanced or unbalanced high-impedance bridging input.

**Circle (361) on Reply Card**

## *High-power filters*

*By Micro Communications*



• **Waveguide harmonic filters:** in-line waveguide filters; factory-tuned for maximum rejection of second, third harmonics; restricts higher-order waveguide modes; in-the-field tuning optimizes filter reactance to the installation.

**Circle (362) on Reply Card**

# The DR-2™ Digital Hard Disk Recorder


Lots of companies build digital workstations these days and they all have three problems in common. They aren't cheap, they aren't simple and they don't connect to the rest of the world.

The DR-2, from Alpha Audio Automation Systems is an uncommon digital disk-based recorder. The DR-2 is inexpensive, works like a two track and interfaces like a video deck. A very practical solution to some very common problems.

The DR-2 works just like your typical center track timecode audio tape recorder. In fact, it may be helpful to think of the DR-2's memory as CD quality timecoded audio tape. With one BIG difference. You can locate to any point on the "tape" in less than 1/10 of a second.

'unch in and punch out on the subframe, cue and review. The DR-2 has no learning curve. No training cost. This is high technology with no lost time. If you're fast on a two track, you'll fly with The )R-2.

'he friendly nature of the DR-2 extends beyond its "tape recorder" controls. Because the DR-2 has wo serial ports that speak Sony P2 protocol, the most widely used serial protocol in the video world. ;o the DR-2 fits into any editing system just the way a video deck would. And in some ways that a 'ideo deck never could.

'ut your sound effects library on line with random access. Do edits with instant recue. Stack DR-2's ınder editor control to create digital mag machines and multitracks. Use the DR-2 as a stand alone ecorder with the optional remote control. The DR-2 has applications in music production, audio for 'ideo, and television and radio broadcast.

'or about the cost of a two track mastering deck, you can have the DR-2 ready to record 30 minutes ıf 44.1kHz 16-bit stereo audio with time code. Or 60 minutes of mono. Double the storage to 60 ninutes stereo with the optional 720 megabyte hard disk. Add optional digital I/O in all the major ormats.

For further information contact:

**Alpha Audio®**
**Automation Systems**

2049 W. Broad Street
Richmond, Virginia 23220 U.S.A.
Phone: (804) 358-3852
FAX: (804) 358-9496

The DR-2 is the logical evolution of the common two track studio workhorse. A sensible step into the realm of digital fidelity, speed and control. The DR-2 is high technology in a practical package that works right out of the box. What an uncommon idea!



Circle (109) on Reply Card

### *Special-purpose vidicon*

*By Burle Industries/Tube Products*


• **S81027:** ruggedized 1-inch silicon vidicon; Ultricon III silicon target, electron gun for 25% improvement in amplitude response at 400 TVL; response extends into near infrared; eliminates after image, burn in, comet tailing; for severe environments, withstands shock to 100gs and 24gs rms in any axis in 5Hz-2kHz frequency range; meets military specs.

**Circle (363) on Reply Card**

### *Audio consoles, automation*

*By Otari/Console Products Group*

• **Series 54:** audio mixers 4-band EQ, 10 aux send buses, 24- to 46-input systems; dual signal paths; high-resolution metering; available with DISKMIX 3 VCA or Moving Fader automation option.

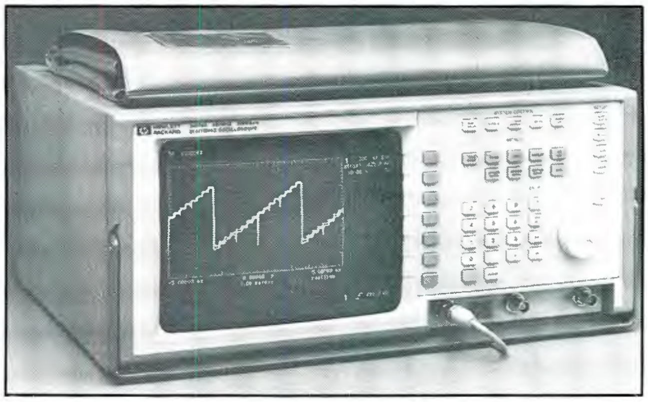
• **TC-100:** transfer console; designed for transfer or dubbing in film, video production; consists of rack-mounted card frames for audio signal control and metering panel; input capacity of 9-18 combines for larger systems; 4-bus output, solo functions; fader bypass, headphone output.

• **DISKMIX 3:** moving fader automation systems for audio consoles; menu-driven with SMPTE time-code reference

**Circle (364) on Reply Card**

### *Digitizing oscilloscope*

*By Hewlett Packard*



• **HP 54504A:** 2-channel, digital oscilloscope; dual 8-bit A/D converters with 200 megasample/second digitizing rate; 400-MHz repetitive bandwidth offers 50$\mu$second timing resolution on repetitive signals; glitch trigger feature; autoscale, HP-IB interface.

**Circle (365) on Reply Card**

### *Wireless pen, graphics systems*

*By Quantel*

• **Cordless stylus:** wireless graphics pen for Harry Suite, V-series paintbox, HarrySound, Encore HUD; serves all control operations from graphics and painting to audio editing, effects functions and machine control.

• **VE model paintbox:** effects processor option to V-series graphics equipment; flexi-curves, instant shaping, modifying, corner pinning and interactive 3-D axes.

**Circle (366) on Reply Card**

### *Miniature wire stripper*

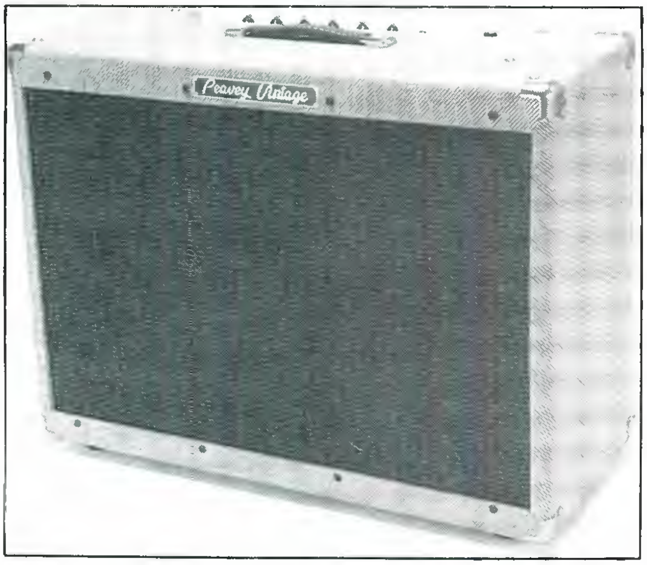
*By Paladin*

• **PA 1115 Mini-Stripax:** compact wire/cable preparation tool for 30-16 gauge solid or stranded wires; single motion removes insulation from multiple conductors without nicking metal; integral wire cutter; insulated to 600V in case of accidental work with live wires.

**Circle (367) on Reply Card**

### *Audio monitor*

*By Peavey Electronics*

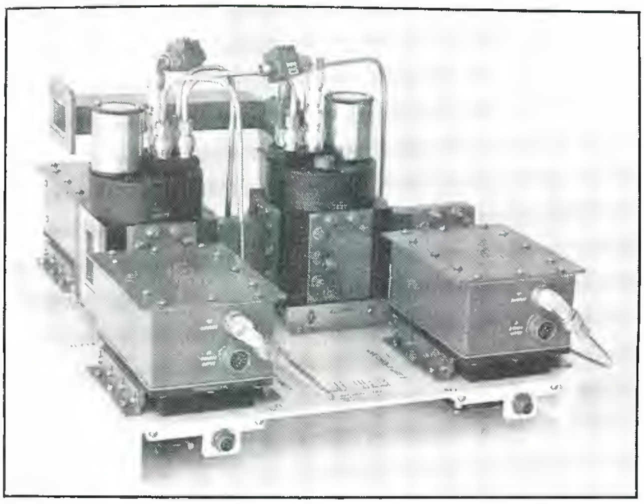



• **Classic 50 series:** audio amplifier; three dual triodes and 4-tube power amplifier design; integral equalization and spring reverb; two 12-inch or four 10-inch speakers; forced-air cooling.

**Circle (368) on Reply Card**

### *Satellite receiving equipment*

*By LNR Communications*



• **CF4-35 LNA:** low-noise amplifier for C-band frequencies; GaAs FET rated for 35°K noise; compact construction; hermetically sealed for use without dehydrators; optional 70dB gain, high intercept point output of 37dBm.

**Circle (369) on Reply Card**



Circle (90) on Reply Card



Circle (89) on Reply Card

### *Contact treatment*

*By Tayo Industries*

• **Physonic solution:** electrical contact enhancement liquid; synthetic polymer material creates molecular bond with metallic surface for improved interconnection between contacts and enhanced signal transfer; leaves no harmful residue; 2ml, 8ml, 10ml bottles with applicator.

**Circle (370) on Reply Card**

### *CRT, equipment cleaning*

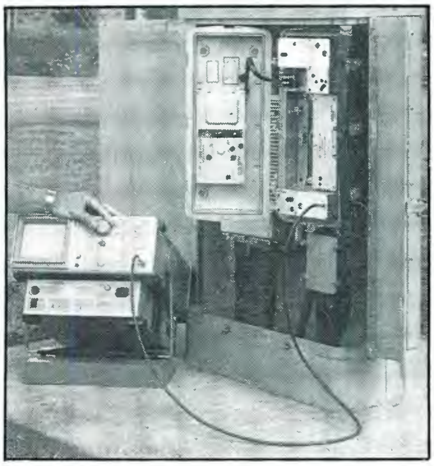
*By Tech-Sa-Port*

• **Flight Deck:** cleaning kits; keeps CRT displays of video monitoring equipment clean and static free; presaturated, anti-static cleaning wipes and polishing cloths included; original formulated for use in aircraft cockpits.

**Circle (371) on Reply Card**

### *Spectrum analyzers*

*By Tektronix*



• **TEK 2710:** VHF/UHF spectrum analyzer, 5MHz resolution bandwidth filter; 4-trace digital storage; time domain measurement; full marker/delta marker control; tracking generator covers to 1.8GHz with 100dB dynamic range; optional battery pack with inverter; optional GPIB interface

• **TSG-1000 HD series:** an optional zone plate signal for multidimensional frequency response tests in 1050, 1125 and 1250 HDTV system.

• **TEK 1780R series:** may be upgraded with firmware and electronic graticules to display K-factor, short time distortion and ICPM measurements; two field-installable EPROMS.

• **CCS-3B Betacam, CCS-3M M-II:** component/composite test systems combine the TSG-370 generator, WFM-300A waveform monitor and 1720 vectorscope packaged for easier signal monitoring and testing.

• **751 modulation monitor, Opt 1:** a 4.5MHz demod board.

**Circle (372) on Reply Card**

### *HD Oscilloscope*

*By Tektronix*

• **TEK 2467BHD oscilloscope:** for use with HDTV signals; triggers for 1050/60, 1125/60 and 1250/50 systems; autoselection permits immediate switching from one signal to another without resetting instrument controls; microchannel plate CRT technology makes high sweep-rate traces visible in normal room lighting; instrument based on 2400 series oscilloscope, ±1% flatness to 30MHz.

**Circle (373) on Reply Card**

## *S-VHS test equipment*

*By John Fluke Manufacturing Company*

• **PM 9553 Y/C option:** for PM 5514V, PM5515, PM 5518 color pattern generators; separate luminance, chrominance outputs for S-VHS VCRs, monitors; standard RGB outputs; retrofits to existing units.

**Circle (374) on Reply Card**

## *Post-production audio software*

*By New England Digital*

• **Release 2.2:** PostPro, direct-to-disk digital audio recorder control via Macintosh PC with graphics environment operating system; EditView provides point-and-click marking for changes in timing, durations, programmed volume envelopes; CMX Autoconform creates EDL sequence from CMX format file; Optical for direct-to-disk accesses effects or recorded material from 2Gbyte optical disk.

**Circle (375) on Reply Card**

## *Audio workstation, enhancements*

*By New England Digital*


• **Synclavier 6400:** mid-range digital audio workstation; 32 stereo voices, 100kHz stereo inputs; 64Mbyte RAM, 320Mbyte hard disk; SMPTE, VITC, Macintosh IIx graphics interface; expansion options include optical disk storage, digital signal processing card, direct-to-disk recording, MIDInet module, additional hard disk storage.
• **Velocity/pressure keyboard:** improved velocity and pressure sensors produce more pressure resolution, doubled dynamic range and responsiveness for Synclavier workstations.
• **MIDInet module:** MIDI processor module provides patching capability among 128 MIDI devices.

**Circle (376) on Reply Card**

## *Microphone, power supply*

*By Crown International*


• **SASS-P, US-1:** stereo ambient sampling system; condenser PZM-type microphone; for ENG, stereo sampling and sound effects recording; 73.5dB S/N at 94dB SPL; with frequency response more than 20Hz-18kHz; reduces phase cancellations caused by acoustic crosstalk; 12Vdc-48Vdc phantom power or internal 9V alkaline batteries.

• **US-1 power supply:** converts any wireless lavalier mic to hard-wired operation; 12Vdc-48Vdc phantom power transformed to 2.225V-9V unipolar, bipolar power or 1.5V AA cell; input Z 13kΩ, output 1kΩ.

**Circle (377) on Reply Card**

## *Newsroom software*

*By Porter Communications & Publishing*

• **PADCOM PC Wire Capture:** software package receives wire service data from satellite or modem; sorts material to 16 DOS directories; modules include: View for quick scrolling and file manipulation utilities; Setup selects story categories; translation table for export of data to various desktop publishing applications; foreground or background versions.

**Circle (378) on Reply Card**

## *Videographics equipment*

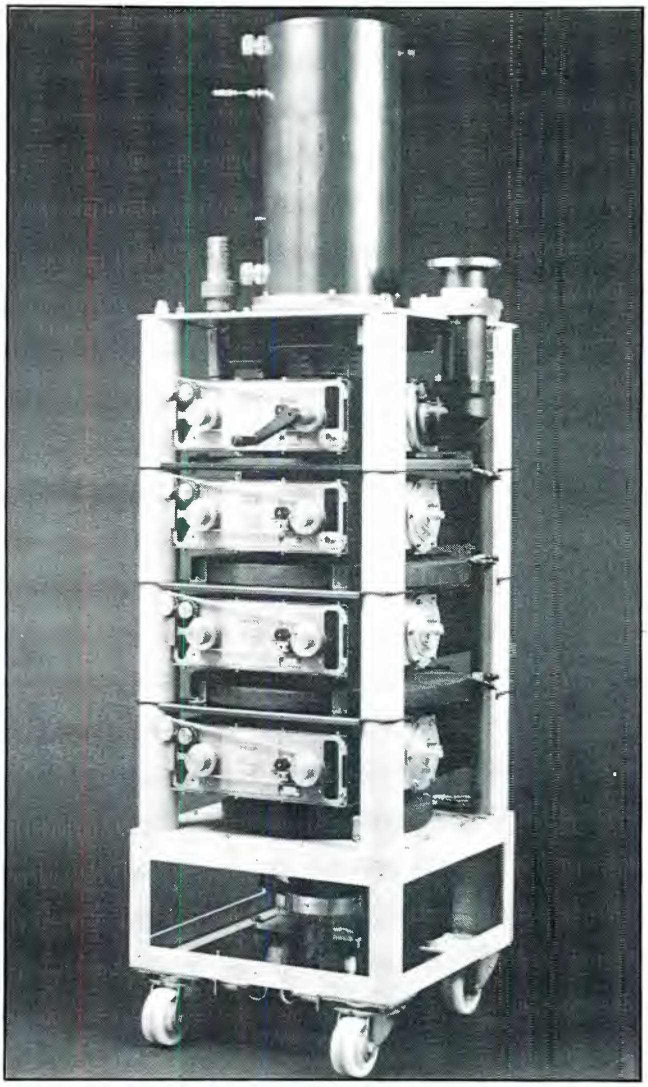
*By RGB Spectrum*

• **RGB/View 1000:** windowing display controller; integrates video with text and graphics on workstation monitor; NTSC or PAL standards; window can be positioned, scaled, clipped; overlay graphics onto video; RS-232 port control access by workstation; host-independent frame buffer supports SUN, HP-Apollo, Silicon Graphics, DEC, IBM, Tektronix workstations; software switching control of one RGB, two composite signals.

**Circle (379) on Reply Card**

## *ABC klystrons*

*By Philips Components*



• **YK1267, YK1235:** 70kW, 30kW ratings for 470MHz-860MHz band; efficiency to 65%; air-cooled devices using annular beam control design; for visual PA operation with KY1221 standard klystron in aural cavity.

**Circle (380) on Reply Card**

## *Surge control*

*By Sine Control International*

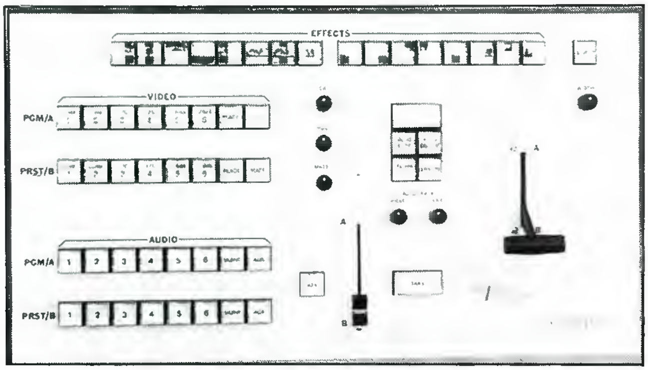
• **4L series suppressors:** accommodates surges of 40,000-45,000 surge amps; installs at main power panel or subpanel distribution points; for any high, fast risetime surge from lightning or weather-related inconsistencies; response times within 2ns.

• **6T suppressors:** filters erratic impulses in lower voltages and protects against 60,000 surge amps from lightning.

**Circle (381) on Reply Card**

### *Production switching*

*By Prime Image*



• **S-Switch 600:** true video component production switcher; inputs from Y/C (S-VHS), Y/688 (U-matic) and composite formats with transcoding to outputs in any of the three formats; six video inputs, seven stereo audio AFV inputs; 16 transition effects.

**Circle (382) on Reply Card**

### *Microphone power*

*By Professional Sound*

• **Universal power supply:** combines the capabilities of the MP-12T and MP-48PH supplies into a portable unit; one 9V battery offers 22 hours of operation; 3-way pad, high-pass switching; T power phase switch; LED battery condition indicator.

**Circle (383) on Reply Card**

### *Spatial audio ambience*

*By Shure Brothers/Home Theater Division*

• **Stereosurround system:** multichannel audio-encoding process; primary components include the HTS100SE encoder, HTS200SD decoder and HTS300SDC interchannel delay corrector; produces an effect of reality by creating a spatial ambience characteristic in the listening environment.

**Circle (384) on Reply Card**

### *Surge reducer*

*By Northern Technologies*

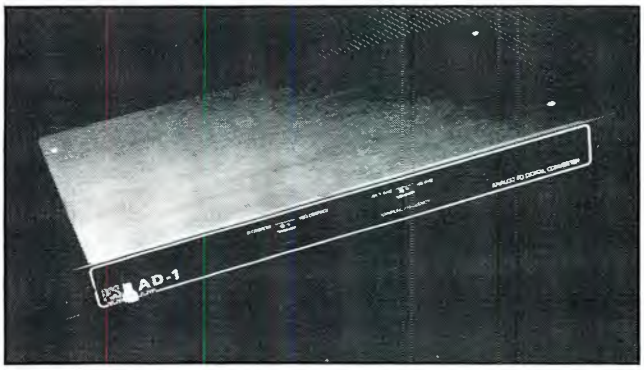
• **PLS-II:** computer power conditioner; rated at 120V, 15a, dissipates 250kW/ms peak pulse power; MOV modules with silicon avalanche diodes; withstands multiple hits; response time of 5ns to transients; 3-year warranty.

**Circle (385) on Reply Card**



### *Digital audio accessory*

*By Pygmy Computer Systems*




• **AD-1 converter:** audio A/D converter; sigma-delta, single-bit conversion, FIR filtering with linear phase response; dynamic range to 96dB; THD+N less than −88dB; supports recorders with AES/EBU, SDIF-2 formats; 32kHz, 44.1kHz and 48kHz sampling rates.

**Circle (386) on Reply Card**

### *Specialty transformers*

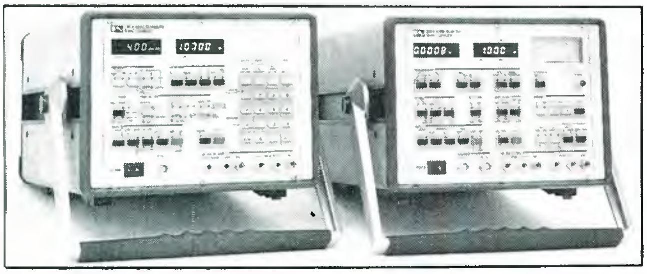
*By Norlake Manufacturing Company*

• **Special purpose:** transformers of various requirements, 1-, 3-phase, 25Hz-800Hz; 50Va through 400kVa; custom designs; UL, CSA, military specs.

**Circle (387) on Reply Card**

### *Audio analyzer system*

*By Sound Technology*



• **3100B, 3200B:** manual, programmable test system permits automated operation without a computer; RS-232 and parallel ports standard; wow-flutter per U.S., Japanese, EBU standards; level, frequency, IMD vs. level, THD vs. level or frequency, channel separation vs. frequency, phase vs. frequency; 54 different graph formats; generator stores 200 frequencies for automated sweep, level offset for auto sequences.

**Circle (388) on Reply Card**

### *Commercial automation*

*By Schafer Digital*

• **DigiSat II:** automation system tracks schedule of commercials and other local insertion events into satellite network feed without operator; dual-redundant digital audio hard disks, a switcher, system computer and two VCRs for commercial storage.

• **DAPS 800:** 44.1kHz digital audio with Sony Beta VCRs, SMPTE time-code for random access to music library; dual processors cross-fade, overlap selections; NEC AT computer controller; music stored as digital and FM tracks on tape, while commercials and spot announcements are on hard disk; maximum 240 hours of music and 20 hours of short.

**Circle (389) on Reply Card**

### *Sync correction*

*By QSI Systems*


• **Model 5400:** sync processor, recreates correct sync, burst and blanking information and proper levels; for noisy off-air signals or other RS-170/A video sources; switch-selected VBI line bypassing; locking system enables unit to replace missing sync common with some decoders.

**Circle (390) on Reply Card**

### *CD music series*

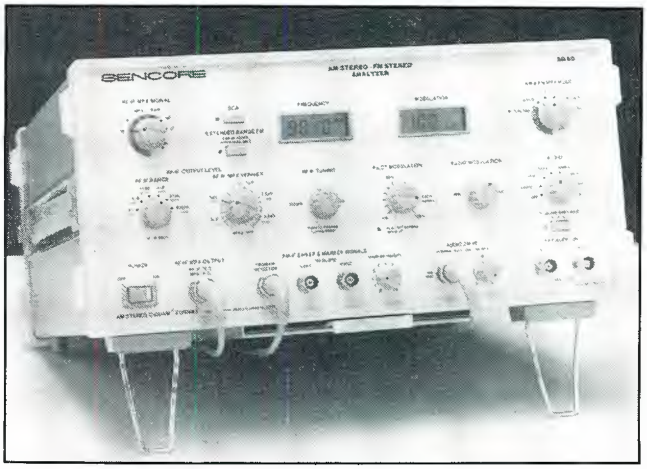
*By Signature Music Library*

• **Music Library:** two CDs contains 76 30-second and 76 60-second segments; tight edits, no fade-outs for clean endings and high impact; additional CDs with full-length themes.

**Circle (391) on Reply Card**

### *FM stereo analyzer*

*By Sencore*



• **AM stereo/FM stereo analyzer:** microprocessor-based analyzer for servicing AM/FM stereo receivers; troubleshoot sensitivity, selectivity, separation, pilot threshold with RF, IF, C-QUAM, MPX, SCA audio and tunable sweep and marker generators.

**Circle (392) on Reply Card**

### *Playback sequencer*

*By Odetics*

• **SCS800 sequencing cart system:** VTR cart-loading management system; CRT display indicates the correct sequence for loading of carts with a videocartridge serial number and designation of which of six players the cart should be loaded; database for 65,000 carts; record/play dependent upon decks; multicut software for multiple segments on one cartridge.

**Circle (393) on Reply Card**

### *Satellite receiver*

*By Standard Communications*

• **Agile Omni MT830:** TV satellite receiver meeting RS-250B spec; PLL RF center, audio subcarrier tuning; display shows satellite format, channel, AF subcarrier frequency, six IF bandwidths, upper/center/lower transponder indication; operator selects transponder number and satellite format to initiate automatic tuning and adjustment of all parameters.

**Circle (394) on Reply Card**

### *Stereo amplifier*

*By Target Technology*

• **TTD-200 amplifier:** two separate 40W circuits with remote VCG facilities; the two sections may be bridged for 90W mono applications.

**Circle (395) on Reply Card**

## *Solder station*

*By Royel Soldering Systems*


• **T-115V series:** maintenance shop solder stations; T3000-115V with 40W, 3mm tip or 60W, 5mm tip; digital stations T3050115V, T5050-115V; iron-placed tips in six styles include surface-mount types.

**Circle (396) on Reply Card**

## *Zoom enhancement*

*By Stanton Video Services*

• **Creeper:** zoom rate controller; connects between zoom port and standard zoom controller; increases sensitivity of zoom adjustment to allow very slow zoom motion.

**Circle (397) on Reply Card**

## *Studio cabinetry*

*By Stantron/Unit of Zero*

• **Stantron Designer:** cabinets and consoles for various electronic, broadcast and security systems; modular series of preassembled units provide 17 standard colors, prethreaded mounting rails, welded frames and light or dark oak woodgrain trim.

**Circle (398) on Reply Card**

## *In-line mixer*

*By TASCAM/Teac Professional*

• **M-3500 series:** 24-, 36-channel audio mixers; 28dB headroom with −130dB mic pre-amps (DIN rated); 4-band EQ, two mid-range frequency sweep and high-pass filter per channel; six aux sends, four effects returns; linear faders; stereo in-place solo.

**Circle (399) on Reply Card**

## *Acoustics control*

*By Systems Development Group*

• **A′′** diffuser: broadcast-band acoustic diffuser material; in 15″ square or 1,530″ rectangles, interlocking for easier complete wall coverage; material includes cedar, oak, walnut, cherry, fir, poplar in various pattern layouts.

**Circle (400) on Reply Card**

## *Newsroom software*

*By Wynford Technologies*

• **NewsVision:** IBM/compatible newsroom computer software; single-, multi-user versions; multiple wire services; split-screen editing; floppy, hard disk archiving.

**Circle (401) on Reply Card**

Circle (100) on Reply Card



Circle (101) on Reply Card

### *Digital audio production*

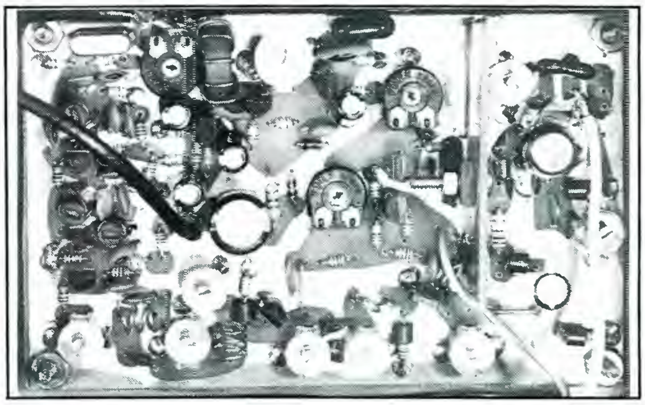
*By Studer Editech*

- **Dyaxis 2+2:** multichannel hard disk recording, playback system; playback and overdub on four channels simultaneously with dual audio processors; synchronizer and master clock module syncs to house clock, film tach, SMPTE LTC/MTC/VITC.
- **DAT backup:** software allows backup of Dyaxis system on DAT tape with edit information stored on a floppy disk.
- **Excellerator DSP:** module based on Motorola 56000 processing device for direct interconnection between a Mac II PC and the Dyaxis processor; includes play-length modification without pitch change.

Circle (402) on Reply Card

### *Construction plans*

*By Supercircuits*



- **Supermini TV transmitter:** 2¼"×4" circuit contains 2W UHF color TV transmitter; operates from 12Vdc on Channels 14-20; includes audio subcarrier; will tune to 430MHz ham TV frequency (Note: FCC regulations require that units radiating greater than 100MW be licensed.)

Circle (403) on Reply Card

### *Satellite receiver controller*

*By Standard Communications/Satcom Division*

- **CRC-810:** advanced remote-control interface for Agile Omni PRO satellite receivers; RS-232C operation, IBM-PC software control functions of transponder center frequency in 100kHz steps, multiple antenna, A-V polarity, audio subcarrier frequency in 5kHz steps, IF bandwidth and C-/Ku-band switching.

Circle (404) on Reply Card

### *ISDN accessory*

*By Telecommunications Techniques*

• **ISDN S/T TE interface:** for FIREBERD 6000 communications analyzer; adaptor allows tests at S and T reference points of an ISDN line with TE emulation, full B-channel measurement capability and D-channel performance statistics; tests databit error rates of simultaneous voice and circuit-switched data calls being received and transmitted.

• **T-BERD 107, 209A, 211 T-Carrier:** analyzers with a repeater extender accessory; test sets measure bit errors on QRSS, 1:7 and 3-in-24 test patterns in T1 transmissions; check bipolar data error and measure signal levels; extender makes test points in the analyzers more accessible with loopback capability to assist in finding faulty cable sections.

**Circle (405) on Reply Card**

### *Special-purpose camera*

*By Television Equipment Associates*

• **$I^3$CAM 125-B Chest-Cam:** body-worn camera; monochrome or color; attaches to adjustable harness worn under or over clothing; CCD system operates from 12Vdc rechargeable battery; output signal on coax or connects to video transmitter for remote pickup; sensitivity to 0.7 lux; news, sports, investigative applications.

• **Z130-P Viper:** video periscope; infrared laser camera system; auto-iris C-mount lenses; 3-way power operation; interfaces to video transmitter for RF or fiber-optic transmissions.

**Circle (406) on Reply Card**

### *Belt pack headset stations*

*By Telex Communications*

• **BP-1, BP-2:** for AUDIOCOM intercom systems; compatible with balanced or unbalanced operation; light-signaling capability with 20kHz or Clearcom dc systems; male, female XLR connectors for daisy-chain line connections through standard mic cable.

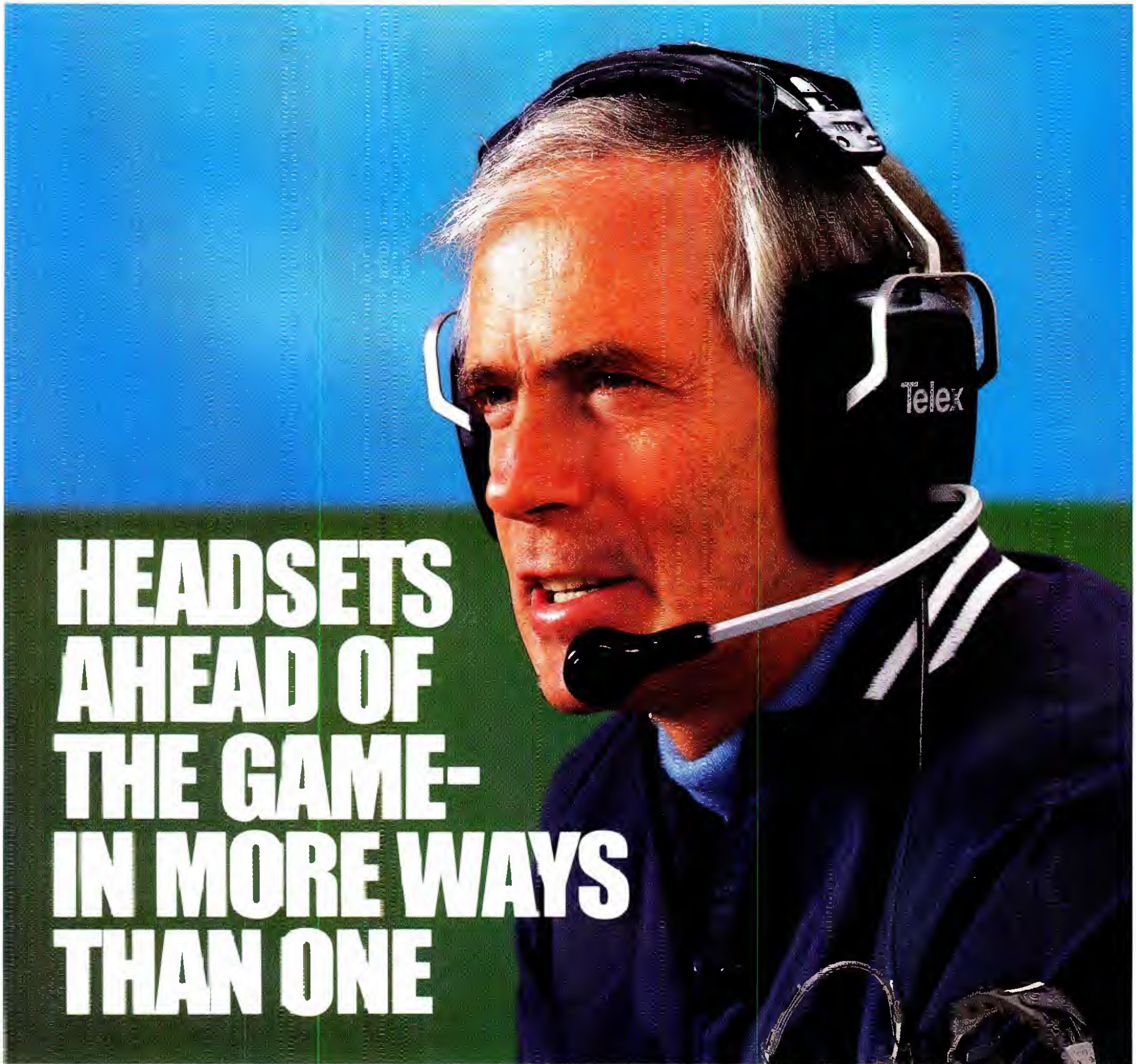
**Circle (407) on Reply Card**

### *Multitrack audio*

*By Thompson*

• **Model T24:** 2-inch multitrack audio recorder; track-ball, soft-key interface for operator and control computer; channel status, transport control, counter or SMPTE time-code and metering displayed on a standard computer monitor; data stored with the master tape; quartz-locked drive operates with a closed-loop tension servo; low-frequency response at 30ips reaches 15Hz.

**Circle (408) on Reply Card**




## For coaches and broadcasters alike—the pros pick Telex.

On the football field and in the broadcast booth high atop the stadium you'll find Telex Headsets are the choice of the pros. National Football league stadiums and major television networks use a variety of Telex Professional Headset models day-in and day-out.

Furthermore, thousands of colleges, high schools and local radio/television stations who have recognized the value of clean, clear, dependable communications are also using Telex. If you're not already using a Telex, we urge you to take a closer look next time you have a requirement.

**A model for every purpose.** Whether your need is communication, camera, sportscaster, studio announcing or inconspicuous on-camera listening, Telex has a model that will fit your requirements perfectly. No other headset manufacturer has the tremendous model variation Telex offers.

Lightweight, full cushion, single sided or dual, boom mic or monitor headsets are all fully described in the latest Telex Headset Catalog. Full specifications are included and the catalog is free. Call or write today: Telex Communications, Inc., 9600 Aldrich Avenue South, Minneapolis, Minnesota 55420.



TELEX®

Circle (112) on Reply Card

# Professional services

**VIR JAMES P.C.**
CONSULTING ENGINEERS
Applications and Field Engineering
Computerized Frequency Surveys
3137 W. Kentucky Ave. — 80219
(303) 937-1900
**DENVER, COLORADO**
*Member AFCCE & NAB*

USED EQUIPMENT
*THE LARGEST DEALER IN THE WORLD*
PRO VIDEO & FILM EQUIPMENT GROUP
PHONE 214-869-0011 FAX 214-869-0145

**EVANS ASSOCIATES**
CONSULTING TELECOMMUNICATIONS ENGINEERS
AM-FM-TV-CATV-ITFS-LPTV SATELLITE
216 N. Green Bay Road
Thiensville, Wisconsin 53092
Phone: (414) 242-6000 Member AFCCE

**dataworld MAPS**
- TERRAIN SHADOWING
- POPULATION DENSITY
- CONTOUR COVERAGE
- SPECIALS

(301) 652-8822 (800) 368-5754

**D. L. MARKLEY**
**& Associates, Inc.**
**CONSULTING ENGINEERS**
2401 West Moss Ave.
Peoria, Illinois 61604
(309) 673-7511
*Member AFCCE*

**K. BLAIR BENSON**
**Consultant**
**Television Technology**
23 Park Lane
Norwalk, CT 06854
203-838-9049

***TEKNIMAX***
*TELECOMMUNICATIONS*
DENNIS R. CIAPURA
PRESIDENT
11385 FORESTVIEW LN.
SAN DIEGO CA 92131 (619) 695-2429

**SMITH and POWSTENKO**
Broadcasting and Telecommunications
Consultants
2033 M Street N.W., Suite 600
Washington, D. C. 20036
(202) 293-7742

Robert J. Nissen
**THE NISSEN GROUP, INC.**
**Communications Technology Consultants**
32 Ridge Drive • Port Washington, New York 11050
(516) 944-5477

**Consulting Communications Engineers**
- FCC Data Bases
- FCC Applications and Field Engineering
- Frequency Searches and Coordination
- AM-FM-CATV-ITFS-LPTV

**OWL ENGINEERING, INC.**
Consulting Communications Engineers
1306 W. County Road F, St. Paul, MN 55112
(612) 631-1338 "Member AFCCE"

CHUCK JONES
ANTENNA SYSTEMS SPECIALIST
618-564-2481
**SOUTHERN ILLINOIS ANTENNAS**
ROUTE 3, BOX 114
METROPOLIS, IL 62960

**ERIC NEIL ANGEVINE, P.E.**
**consultant in acoustics**
specializing in broadcast studio acoustics
910 Lakeridge Drive Stillwater, OK 74075
405-744-6444 405-372-3949

**Why not run your business card here?**
**Only $125 per insertion.**
**Frequency discounts available.**
**Call 913/888-4664**

**UNUSED CALL LETTERS**
**MAILING LABELS**
AM • FM • TV
**dataworld®**
301-652-8822 800-368-5754

**PATCHPRINTS®** VIDEO TIE LINES In 1 2 3 4 Aux
***Custom Patch Bay Labeling***
By
**PATCH BAY DESIGNATION COMPANY**
*Div. of Glendale Rubber Stamp & Printing Co., Inc.*
P.O. Box 6278, Glendale, CA 91205
4742 San Fernando Road
Glendale, CA 91204
Telephone (818) 241-5585
FAX (818) 507-5050

**East Coast Video Systems**
ON-LINE IN-TIME
*A full service company providing...*
- Consultation
- Engineering & Design
- Installations
- Training

*Serving...*
- Cable Systems
- Corporate Facilities
- Broadcast Facilities
- Teleproduction Facilities

52 Ralph Street, Belleville, NJ 07109 (201) 751-5655

**CALL US** For New and Rebuilt Radio Broadcast Equipment
**HALL Electronics**
**(804) 974-6466**
1305-F Seminole Trail • Charlottesville, Va. 22901

**Franklyn R. Beemish & Co.**
**Engineering for the Video, Motion Picture & Recording Industries**
VIDEO POST, BROADCASTING, CONFERENCE CTRS, THEATERS, RECORDING
FACILITIES AND SYSTEMS DESIGN & IMPLEMENTATION
ANALOG & DIGITAL VIDEO, AUDIO, HDTV
ARCHITECTURAL ENGINEERING
ELECTRICAL, HVAC, ACOUSTICAL
**574 Sunrise Highway, Baldwin, NY 11510 516/867-8510**

**JOHN H. BATTISON PE.**
**CONSULTING BROADCAST ENGINEER,**
FCC APPLICATIONS AM, FM, TV, LPTV
Antenna Design, Proofs, Fieldwork
2684 State Route 60 RD#1
Londonville, OH 44842
419-994-3849

**Stainless, inc.**
New Towers, Antenna Structures
Engineering Studies, Modifications
Inspections, Erection, Appraisals
North Wales, PA 19454
215-699-4871 FAX 699-9597

BROADCAST DATABASE
**dataworld®**
**MAPS**
Coverage/Terrain Shadowing
Allocation Studies • Directories
P.O. Box 30730 301-652-8822
Bethesda, MD 20814 800-368-5754

**MAILING LISTS**
**AM FM TV**
Labels or Diskette
***StationBase***
**(800) 359-2818**

PROMOTE YOUR SERVICES
and increase business
for as low as $110 per insertion.
Call 913/888-4664.

**NETCOM** (201)837-8424
NETWORK COMMUNICATIONS CONSULTANTS
931 TEANECK RD. TEANECK, N.J. 07666
STATE-OF-THE-ART ENGINEERING FOR AUDIO & VIDEO
- FACILITY PLANNING
- SYSTEM DESIGN
- CAD SERVICES

JAMES TRONOLONE
ENGINEER

# Classified

Classified advertising now available as Classified Display or By-the-word.

**Classified Display:** $100 per column inch, per insertion, with frequency discounts available. 1 inch minimum, 10 inches maximum per ad. Blind ads $40 additional. Reader Service number $50 additional. Spot color available for $150 (color determined by publisher).

**By-The-Word:** $1.75 per word, per insertion. Initials and abbreviations count as full words. Blind ads $40 additional. Minimum charge $40 per insertion.

Contact Renée Hambleton, at (913) 888-4664, for information on frequency and pre-payment discounts. To place your classified ad send your order and materials to Broadcast Engineering, Classified Ad Mgr., P.O. Box 12901, Overland Park, KS 66212.

## BUSINESS OPPORTUNITIES

**PRIME SCA SPACE AVAILABLE** 900,000 + Population coverage over six counties. For information call Gary Minker (407) 965-9211 in southeast Florida Prime Metropolitan SCA Demographic Coverage. 1-90-2t

## HELP WANTED

**MAINTENANCE ENGINEERS** needed for Christian teleproduction facility. Experience in maintenance and component level repair required. Ampex AVC, ADO, VPR-3, Beta, Scientific Atlanta/MCL satellite. Resume to Chief Engineer, P.O. Box 819099-9099, Dallas, TX 75381. 8-89-6t

**WANTED: FULL-TIME BROADCAST MAINTENANCE ENGINEER** for VHF-TV station. RF experience required. Full benefits. Send resume to: Richard Hiett, WHSV, P.O. Box TV-3, Harrisonburg, VA 22801. Minority applicants encouraged. 12-89-3t

**TV MAINTENANCE ENGINEER** needed for a national Christian studio post production satellite uplink facility. Three years component level maintenance experience. Ampex, AVC, ADO, VPR-3, Beta, Scientific Atlanta Uplink. Positions available in San Diego and Dallas. Competitive salary and benefits (paid vacations, holidays, incentive programs, medical and dental insurance) with an exciting organization. Send resume to: Personnel Dept., Word of Faith, P.O. Box 819099, Dallas, TX 75381-9099. 2-90-1t

## HELP WANTED

**VIDEO SERVICE MANAGER/TECHNICIAN** Major video company looking for ambitious industrial and broadcast video technician to manage in-house service department. Must be a factory authorized technician of Sony, Panasonic, Hitachi, JVC, etc. Minimum three years experience required. Benefits, good salary. Send resume to Broadcast Engineering, P.O. Box 12901, Dept 711, Overland Park, KS 66212. 2-90-1t

**ATTENTION - HIRING!** Government jobs - your area. Many immediate openings without waiting list or test. $17,840 - $69,485. Call 1-602-838-8885. EXT R13464. 02-90-1t

**TV BROADCAST ENGINEER** needed with FCC First Phone license or TV SBE certification. TV transmitter maintenance experience required. Contact Mervin Ainsworth CE, WKTV, Box 2, Utica, NY 13503. EOE 02-90-1t

### BROADCAST ENGINEERING
### Audio Expert

**Broadcast Engineering**, the number one technical publication in the broadcast field, has an excellent opportunity for a radio/audio expert. This person will write articles on technical aspects of radio, edit materials from outside contributors and offer technical assistance and expertise to other publications within the Intertec electronics group.

Candidates must have extensive experience and knowledge of audio engineering. A technical degree is preferred. We offer a competitive salary and continuing growth potential. Send a complete resume with cover letter and salary requirements to: Personnel Manager, Intertec Publishing Corporation, P.O. Box 12901, Overland Park, KS 66212.

## HELP WANTED

**MAINTENANCE TECHNICIAN SOUGHT FOR** growing Los Angeles post-production facility. We are looking for qualified technicians for an anticipated expansion of the Engineering department. If you are a craftsman, not a repairman; if television maintenance is a career, not a job; if your hours are flexible, not restrained; then we want your resume! Experience with multiple formats of tape, production switchers, effects units, graphics units, editing systems, and/or digital processing desired. Send your resume and references to: Chief Engineer, Varitel Video, Suite 675, 3575 Cahuenga Boulevard West, Los Angeles., CA 90068. Varitel is an Equal Opportunity Employer. 1-90-2t

**CHIEF ENGINEER.** Excellent administrator. Hands-on experience with all transmitter and studio equipment. Communicator. Computer experience helpful. Good salary and benefits. Send resume to Personnel Director, WTOK-TV, P.O. Box 2988, Meridian, MS 39301. Equal Opportunity Employer. 2-90-1t

**TRANSLATOR TECHNICIAN**-Previous experience in maintenance of translators.Working knowledge of microwave and associated RF equipment. Familiar with IBM PC. FCC license desirable. Contact: Sam Tikannen, Chief Engineer, KOB-TV, 4 Broadcast Plaza, SW, Albuquerque, NM 87103. EOE/M/F. 2-90-1t

**MAINTENANCE ENGINEER** needed for UHF NBC affiliate in Charlotte, NC. Minimum of five years maintaining broadcast and other equipment in TV station. ENG equipment knowledge a plus. FCC license/SBE certification and degree preferred. Send resume to Hope Brown, WCNC-TV, P.O. Box 18665, Charlotte, NC 28218-0665. EOE. 02-90-1t

**MAINTENANCE ENGINEER** needed for intermountain region network affiliate. FCC general or SBE certified. Studio and ENG experience necessary. RF desirable. Send resume to Andrew Suk, KIVI-TV, 1866 E. Chisolm Dr., Nampa, Idaho 83687. EOE 02-90-1t

**ASSISTANT ENGINEER** needed for the WMC stations. 300 KW FM 5KW directional AM. A.S./electronics or equivalent experience. Strong interpersonal, maintenance and troubleshooting skills. Broadcast experience a plus. Tom Nichols, CE WMC AM/FM, 1960 Union Ave., Memphis, TN 38104. EOE. 2-90-1t

### BROADCAST ENGINEER

An outstanding opportunity to work with an innovative 7-member team in a new state-of-the-art $8.1 million facility designed to current broadcast standards. Immediate opening to provide technical support for Ball State media facilities and assistance to higher level engineers, Attractive benefit package, generous paid vacation and sick leave. Salary commensurate with experience. Reimbursement provided for school and opportunity for advancement. Requirements include Associate Degree or equivalent in broadcast electronics or related area and 1-3 years broadcast electronics or related experience. Experience is preferred on Dubner 5k, 10k; Abekas A-42, GVG 200, GVG IPS 100, Cubicomp, Ampex Vista and GVG-VPE 141 equipment. Ability to diagnose and repair this equipment at the component level. Familiarity with MII, three quarter inch, VHS and S-VHS tape formats. Application deadline 2/28/90. To apply send copy of college transcripts, resume and letter of application to:

**Human Resources Department**
**BALL STATE UNIVERSITY**
**Muncie, IN 47603**

*An Equal Opportunity/Affirmative Action Employer* 02-90-1t

**SAVE TIME**

*For fast, accurate service, please remove the peel off label used to address your magazine, and attach it to the Reader Service Card, the Address Change Card or to any correspondence you send us regarding your subscription.*

# Classified

## Use BE classified ads

## Advertising sales offices

**NEW YORK, NEW YORK**
*Diane Gottlieb-Klusner*
Telephone: (212) 702-3404
Telefax: (212) 702-7802
*Mike Trerotoli*
Telephone: (212) 702-3405
Telefax: (212) 702-7802
866 Third Ave.
New York, NY 10022

**CHICAGO, ILLINOIS**
*Vytas Urbonas*
Telephone: (312) 435-2361
Telefax: (312) 922-1408
55 East Jackson
Suite 1100
Chicago, IL 60604

**SANTA MONICA, CALIFORNIA**
*Herbert A. Schiff*
Telephone: (213) 393-9285
Telefax: (213) 393-2381
*Jason Perlman*
Telephone: (213) 458-9987
Telefax: (213) 393-2381
*Schiff & Associates*
501 Santa Monica Blvd, Ste. 504.
Santa Monica, CA 90401

**OXFORD, ENGLAND**
*Nicholas McGeachin*
Intertec Publishing Corp.
Roseleigh House
New Street
Deddington
Oxford OX5 4SP
England
Telephone: (0869) 38794
Telefax: (0869) 38040
Telex: 837469 BES G

**TOKYO, JAPAN**
*Mashy Yoshikawa*
Orient Echo, Inc.
1101 Grand Maison
Shimomiyabi-Cho 2-18
Shinjuku-ku, Tokyo 162, Japan
Telephone: (03) 235-5961
Telex: J-33376 MYORIENT

**FREWVILLE, SOUTH AUSTRALIA**
*John Williamson*
*Hastwell, Williamson, Rep. Pty. Ltd.*
109 Conyngham Street
Frewville 5063
South Australia
Phone: 799-522
FAX: 08 79 9522
Telex: AA87113 HANDM

**CLASSIFIED ADVERTISING**
**OVERLAND PARK, KANSAS**
*Renée Hambleton*
P.O. Box 12901
Overland Park, KS 66212
913-888-4664

## FOR SALE

**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 Thorncliffe Park Dr., Unit 28, Toronto, Canada M4H 1H2, 416-421-5631. 6-89-tfn

**FOR SALE:** Tubes 3CX1500A7, 4CX250B, 4CX5000A, 4CX3000A, and more. We carry lg. inventory, all major brands (EIMAC, AMPEREX, RCA) Call Stew 1-800-842-1489. 01-90-12t

**ELECTRONIC TEST EQUIPMENT BOUGHT AND SOLD.** Tektronix o'scopes, vectorscopes, NTSC generators, monitors, etc. Also HP, Fluke, Wavetek and other quality test equipment. Money back guarantee on all items. Special: Tektronix 335 portable 35 MHz dual trace o'scope $750. Fluke 8020A 31/2 digit handheld multimeter $75. Call now while supply lasts. Cal-Scope (408) 730-4573 or FAX want list to (408) 730-9537. 12-89-3t

**Immediate Delivery** - 2, almost new, Texar audio prisms with phase rotators installed; Gentner telephone interface, brand new. 219-282-3505. 2-90-1t

**TWO AMPEX** ACR-25 cart machines. $3,000 ea. or both for $5,000. Buyer to handle shipping. Also available AVR-1 and VR-1200. Call Bill Strube, KPHO-TV, (602) 264-1000. 2-90-1t

**CAPACITORS OVERNIGHT:** CAPACITORS for transmitters. CAPACITORS for power supplies. CAPACITORS overnight from stock. Sprague Mallory Cornell-Dubilier and others. The CAPACITOR PEOPLE: KELLNER ELECTRONICS, INC. FAX 1-802-425-3664. Charlotte, Vermont. Call 1-800-323-0460 for CAPACITORS. 2-90-1t

**DEMO & USED VIDEO EQUIPMENT BROKER** Hundreds of items listed - Let us shop for you!! 45' Fully outfitted sports truck - $625,000. 22' Fully outfitted U-Matic truck, 3 yrs. old - $175,000. 38' Chapparel & truck, racks,air, lights, 3.5 yrs. old - $60,000. 2 Complete SP U-Matic A/B roll suites with DVE's - $130,000. 3 Complete 1" A/B roll suites with DVE's - SOFFER. ¾" A/B roll system - 3) Sony VCR's, controller, switcher - $17,800. Chyron RGU-2 titlers - $10,000, Abekas a-52 DVE-$17,500, DSC Illusion DVE - $15,000. NEW Broadcast Video Patch Panels - $699. Grass Valley 1600-7K Switcher - $20,000. 1600-3H-$16,500. PROVID SUPPLY CORP. - ANDY TURNER - (708) 215-9010 02-90-1t

**1,000' UTILITY TOWER,** 4 years old, excellent condition/ Shivley FM antenna 6810, on 94.5 MHz. Call Andy Pickard for info. 214-580-9400. 2-90-1t

## SERVICES

**TRANSMITTER TUBE REBUILDING SINCE 1941:** 3CX2500, 4CX5000, 4CX15000 and many others. Write for details. FREELAND PRODUCTS INC., 75412 Hwy. 25, Covington, LA 70433. (504) 893-1243 or (800) 624-7626. 6-79-tfn



***Effective with March, 1990 Issue***

Classified advertising is available by-the-word or per column inch. **By-the-word:** $1.75 per word, per insertion. Initials and abbreviations count as full words. Blind ads $40 additional. Minimum charge: $40 per insertion. **Per Column Inch (Classified Display):** $100 per inch, per insertion, with frequency discounts available. 1" minimum, billed at ¼" increments thereafter. 10" maximum per ad. Blind ads $40 additional. Reader Service Number $50 additional. Spot color (determined by magazine) $150 additional.

5% prepayment discount available for 6X or larger frequency. No agency discounts allowed for classified ads. Classified display advertising in Video Systems counts toward BE Classified display frequency, and vice versa.

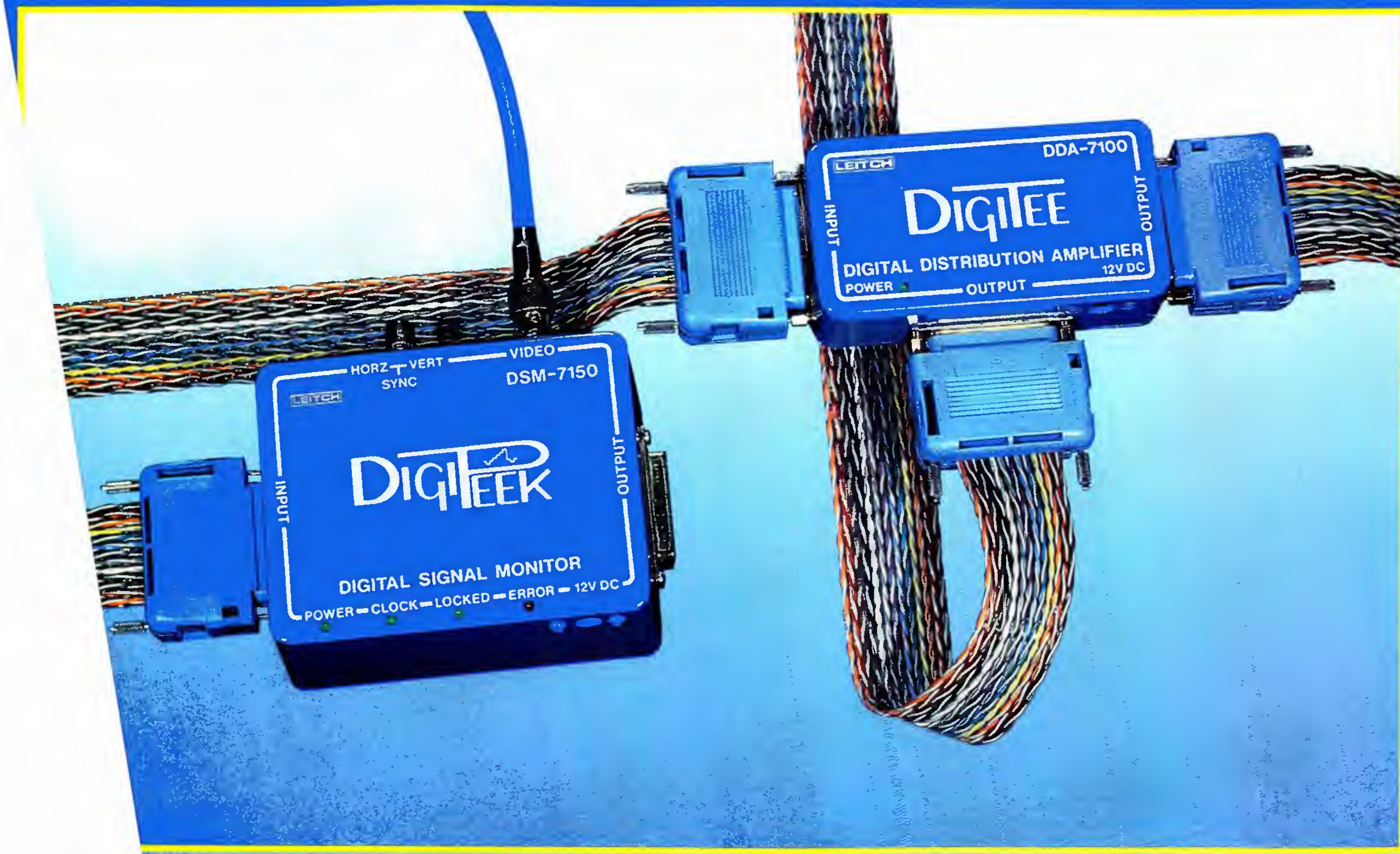
Contact Renée Hambleton at (913) 888-4664 to place your classified ad, or send your classified advertising materials and order to:

Broadcast Engineering
Classified Ad Manager
P.O. Box 12901
Overland Park, KS 66212

# Ad index

| | Page Number | Reader Service Number | Advertiser Hotline |
|---|---|---|---|
| Abekas Video System | 33 | 17 | 415/369-5111 |
| ADX Systems USA | 100 | 73 | 800/444-4ADX |
| AKG Acoustics, Inc. | 45 | | 203/348-2121 |
| Allied Broadcast Equipment | 63 | 42 | 800/622-0022 |
| Alpha Audio | 119 | 109 | 804/358-3852 |
| Alta Group, Inc. | 77 | 57 | 408/297-2582 |
| Ampex Recording Media | 117 | 87 | 415/367-2911 |
| AMS Industries, Inc. | 55,93 | 31,71 | 206/633-1956 |
| American Broadcasting System | 122 | 81 | 800/950-2223 |
| Aphex Systems Ltd. | 101 | 78 | 818/765-2212 |
| Arrakis Systems, Inc. | 21 | 13 | 303/224-2248 |
| Audio Precision | 13 | 8 | 800/231-7350 |
| Auditronics, Inc. | 107 | 88 | 901/362-1350 |
| Broadcast Store, Inc. | 60 | 39 | 818/845-7000 |
| Belar Electronics Laboratory, Inc | 122 | 91 | 215/687-5550 |
| Benchmark Media Systems | 121 | 90 | 315/452-0400 |
| Broadcast Electronics, Inc. | 11 | 7 | 217/224-9600 |
| Broadcast Supply West | 131 | 102 | 800/426-8434 |
| Broadcast Video Systems, Ltd. | 126 | 108 | 416/764-1584 |
| BTS Broadcast Television Systems | 59,83 | 34,63 | 800/562-1136 |
| Cablewave Systems | 47 | 25 | 203/239-3311 |
| Camera Mart, Inc. | 78 | 58 | 212/757-6977 |
| Canon USA, Inc., Braodcast Lens | 97 | 75 | 516/488-7700 |
| CEL | 61 | 40 | 913/831-0188 |
| Clear-Com Intercom Systems | 125 | 95 | 415/527-6666 |
| Control Concepts Corp. | 92 | 66 | 607/724-2484 |
| Cortana Corporation | 135 | 106 | 505/325-5336 |
| Datatek, Inc. | 79 | 59 | 800/882-9100 |
| Delta Electronics | 44 | 24 | 703/354-3350 |
| Di-Tech, Inc. | 62 | 41 | 516/667-6300 |
| Dolby Labs, Inc. | 39 | 22 | 415/558-0200 |
| Dorrough Electronics | 54 | 30 | 818/999-1132 |
| Dynair Electronics Inc. | 43 | 23 | 619/263-7711 |
| Electro-Voice, Inc. | 87 | 65 | 616/695-6831 |
| Electrohome | 72-73 | 53 | 579/744-7111 |
| Ergo 90 | 135 | 103 | 714/632-7045 |
| Fast Forward Video | 123 | 61 | 714/852-8404 |
| For-A Corp. of America | 99 | 77 | 213/402-5391 |
| Fujinon Inc. | 52-53 | 29 | 201/633-5600 |
| Full Compass Systems | 128 | 97 | 800/356-5844 |
| Gentner Electronics Corp. | 65 | 46,47 | 801/975-7200 |
| Gentner Electronics Corp. | 91 | 68,69 | 801/975-7200 |
| Graham-Patten Systems, Inc. | 48 | 16 | 800/547-2489 |
| Grass Valley Group, Inc. | 9 | 6 | 916/478-3000 |
| Gray Engineering Laboratories | 108 | 82 | 714/997-4151 |
| Harris Corp. | 27 | 12 | 800/4HA-RRIS |
| Hitachi Denshi America Ltd. | 3 | | 800/645-7510 |
| Hybrid Cases | 135 | 104 | 800/343-1433 |
| International Tapetronics Corp. | 29 | 43 | 800/328-1684 |
| Illbruck | 60 | 35 | 804/358-3852 |
| Jampro Antennas Inc. | 30 | 14 | 916/383-1177 |
| JemFab Group | 122 | 92 | 516/867-8510 |
| JVC Professional Products Co. | 19 | 11 | 800/582-5825 |
| LDL Communications | 113 | 85 | 301/498-2200 |
| Leader Instruments Corp. | 71 | 51,52 | 800/645-5104 |
| Leitch Video of America, Inc. | IBC | 2 | 804/424-7290 |
| 3M Magnetic Media Div. | 57 | 33 | 800/328-1684 |
| Markertek Video Supply | 60 | 36 | 800/522-2025 |
| Midwest Communications Corp. | 1 | 3 | 800/543-1584 |
| MYAT | 50 | 27 | 201/767-5380 |
| NCA | 80 | 50 | 716/852-4521 |
| NEC, Professional Systems Div. | 51,84-85 | 28,64 | 214/907-4710 |
| Newton Istruments | 121 | 89 | 919/575-6426 |
| Nikon Corporation | 5 | 4 | 516/222-0200 |
| Opamp Labs Inc. | 60 | 38 | 213/934-3566 |
| Orban, Div. of AKG Acoustics, Inc. | 7,17 | 5,10 | 800/227-4498 |
| Otari Corp. | 15 | 9 | 415/592-8311 |
| Panasonic Pro Industrial Video | 34-35,37 | 18,21 | 800/553-7222 |
| Philips Compnents | 66-67 | 48 | 800/447-3762 |
| Pinnacle Systems, Inc. | 103 | 79 | 408/970-9787 |
| Polyline Corp. | 125 | 94 | 708/298-5300 |
| Polyphaser Corp. | 130 | 101 | 800/325-7170 |
| Pro-Audio Asia | 100 | 72 | |
| QEI | 31 | 15 | 800/334-9154 |
| Queue Systems | 135 | 107 | 213/656-0258 |
| Ramsa/Panasonic | 109 | 83 | 714/895-7277 |
| Richardson Electronics Ltd. | 90 | 70 | 800/348-5580 |
| Roscor | 56 | 32 | 708/539-7700 |
| Sachtler Corp. of America | 81 | 60 | 516/867-4900 |
| Shintron Electronics | 126 | 76 | 508/486-3900 |
| Shure Brothers Inc. | IFC | 1 | 708/866-2553 |
| Sierra Video Systems | 123 | 62 | 916/273-9331 |
| Sony Communications Prod./ Broadcast Div. | 24-25 | | 800/635-SONY |
| Sony Communications Prod./ Broadcast Div. | 40-41 | | 800/635-SONY |
| Sony Magnetic Tape Div. | 69 | 49 | 201/930-7669 |
| Sound Technology | 108 | 98 | 800/359-5080 |
| Standard Tape Laboratory, Inc. | 60 | 37 | 415/786-3546 |
| Tascam, Div. TEAC Corp. of America | 127,129 | 96,99 | 213/726-0303 |
| Technics | 105 | 80 | |
| Tektronix, Inc. | 75 | 54 | 800/452-1877 |
| Telex Communications, Inc. | 132 | 112 | 612/887-5550 |
| Thomson Tubes Electroniques | 89 | 67 | 201/812-9000 |
| Utah Scientific Inc. | 49 | 26 | 800/453-8782 |
| Vicon Industries | 111 | 84 | 516/293-2200 |
| Videotek, Inc. | 115 | 86 | 215/327-2292 |
| Ward-Beck Systems, Ltd. | BC | | 416/438-6550 |
| Winsted Corp. | 130 | 100 | 800/447-2257 |
| 360 Sytems | 95 | 74 | 818/342-3127 |

# For Your 601 and D2 Tool Box




Installation and maintenance of digital equipment is one of the most exciting challenges of this decade. Leitch has developed two new tools specifically designed to simplify your digital installations.

The DigiTee provides compact signal distribution. Since, according to CCIR 601 and D2 specifications, equipment must have terminating inputs, the DigiTee provides a practical equivalent to looping inputs. The DigiTee doubles as a line amplifier for long cable runs by re-synchronizing the full 10 bit data path, yet is small enough for cable troughs.

The DigiPeek's 1 volt composite output and LEDs provides monitoring and status of the digital signal. A re-synchronized digital output permits in-circuit monitoring. The compact DigiPeek is ideally suited for trouble-shooting complex digital systems.

To keep your digital tool box up-to-date, contact your Leitch dealer.

LEITCH

Circle (2) on Reply Card

Leitch Video of America, Inc., 825K Greenbrier Circle, Chesapeake VA 23320
Tel: (800) 231-9673 or (804) 424-7920 Fax: (804) 424-0639

Leitch Video International Inc., 10 Dyas Rd., Don Mills, Ont., Canada M3B 1V5
Tel: (800) 387-0233 Fax: (416) 445-0595 Telex: 06 986 241


# Ward-Beck's Beltpack ... the mobile link for your professional intercom system!

Now total communications has become a reality with the new high-performance WBS Interphone Beltpack.

This superbly designed two-channel, single pair wired, compact unit interfaces with Ward-Beck's advanced four-wire, programmable MicroCOM system. It assures studio quality voice communications to your outermost mobile location.

Beltpack moves quality communications yet another step ahead of the rest of the pack ... and at a very attractive price!

WBS
WARD-BECK SYSTEMS

Ward-Beck Systems Ltd., 841 Progress Avenue, Scarborough, Ontario, Canada M1H 2X4.
Tel: (416) 438-6550. Fax: (416) 438-3865.