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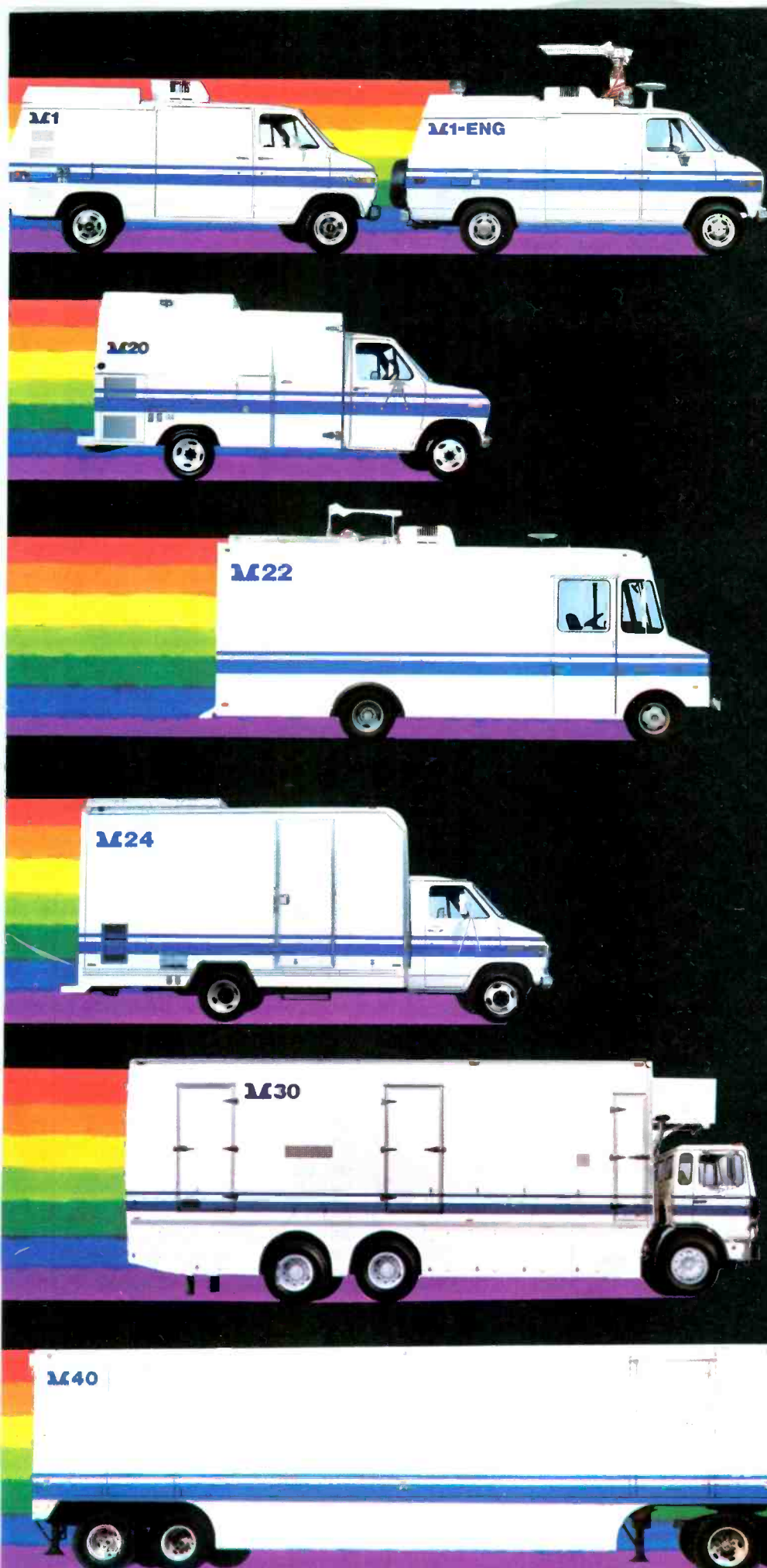
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# BROADCAST engineering

The journal of broadcast technology

September 1983 • Volume 25 • No. 9

## FEATURES

- 26 Mount Sutro: Evolution of a tower**  
By Donald E. Lincoln, director of engineering, Sutro Tower, San Francisco, CA
- 36 China TV revisited**  
By John H. Battison, director of engineering, WOSU-AM/FM/TV, Columbus, OH
- 46 Conversations**  
An interview with Warren J. O'Buch, director of marketing, Conrac Division, Conrac Corporation, Covina, CA
- 52 The film look for TV**  
By Leonard F. Coleman, director, motion picture and TV markets development, Motion Picture & Audiovisual Markets Division, Eastman Kodak, Rochester, NY
- 60 Field report: RCA Hawkeye VRC system**  
By Al Martin, director of engineering, WKBD-TV 50, Southfield, MI
- 74 Deregulation and audio proofs**  
By Donald L. Markley, facilities editor, D.L. Markley & Associates, Consulting Engineers, Peoria, IL
- 80 Montroux-'83: Reflections**  
An interview with Joe Flaherty, vice president, Engineering and Development, CBS Television, New York
- 94 Birth of a camera**  
By Fred Haines, Harris Broadcast Division, Quincy, IL
- 110 Understanding the peak program meter**  
By Larry Lamoray, international marketing manager, Auditronics, Memphis, TN
- 220 Teletext: Progress and Videotex-'83**  
By Larry Padilla, director, videotex services, Graphic Media, Fairfield, NJ

## BROADCAST ENGINEERING 1983 BUYERS' GUIDE

- 127 Introduction**
- 128 Product directory**
- 181 Broadcast product manufacturers' addresses**
- 207 Broadcast product dealers/distributors**

## DEPARTMENTS

- |   |                           |
|---|---------------------------|
| <b>6 FCC update</b>                                   | <b>216 People</b>         |
| <b>8 Editorial</b><br>Repealing the fairness doctrine | <b>226 New literature</b> |
| <b>10 Satellite update</b>                            | <b>230 Calendar</b>       |
| <b>16 Business</b>                                    | <b>238 Associations</b>   |
| <b>24 News</b>  | <b>280 New products</b>   |

## STATION-TO-STATION

- 252 Drum servo mis-phasing in BVU-200B VTRs**  
By Karl Paulsen, ENG maintenance supervisor, KGW-TV 8, Portland, OR

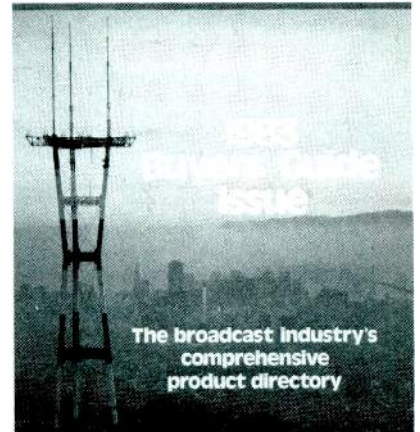
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# BROADCAST engineering

September 1983/15



**THE COVER** is an aerial view of the Mount Sutro tower facilities, which dominate the San Francisco skyline. Last July 4, as the country celebrated Independence Day, broadcasters in San Francisco also celebrated the 10th anniversary of the tower's opening. An article on page 26 titled "Mount Sutro: Evolution of a Tower," by Don Lincoln, director of engineering for the tower, reflects on the development and design of this unique facility.

The cover photo is provided by Lynda J. Stewart, director of communications, Cox Communications, 1982 annual report. Photo credit: Stephen Proehl.

## Coming events

### Sept. 25-28

Broadcast Financial Management Association (BFMA) 23rd Annual Conference, Hotel Regency, Riviera Hotel, Orlando, FL

### Oct. 2-5

NRBA Annual Convention, New Orleans, LA

### Oct. 4-6

LPTV East, Sheraton, Washington, DC

### Oct. 5-9

CIRT, Mexico City, Mexico

### Oct. 9-12

AES 74th Technical Meeting & Exhibits, New York Hilton, New York, NY

### Oct. 23-26

CCBA Convention, Toronto, Canada

### Oct. 29-Nov. 3

SMPTE 125th Annual Conference, LA Convention Center, Los Angeles, CA

## NEXT MONTH:

- Annual salary survey
- Satellites and earth stations for radio and television
- Satellite audio distribution

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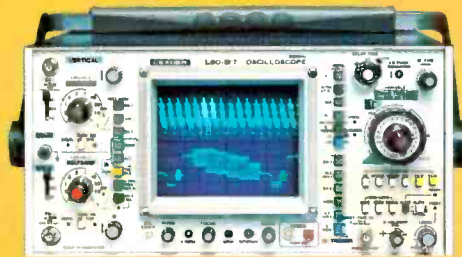


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# FCC update

Harry C. Martin, partner, Reddy, Begley & Martin, Washington, DC

September 1983



## Abbreviated radio program logs proposed

As reported in this column in July 1983, the US Court of Appeals for the District of Columbia Circuit affirmed the commission's action deregulating commercial radio, but questioned the elimination of logging requirements.

In response to the court's concern, the commission has issued a rulemaking proposal seeking comments on what types of records licensees should maintain to track their responsiveness to public needs and interests.

The commission is seeking comments on whether it should require a complete listing by time, date and duration of all non-entertainment programming or only of issue-responsive programming. Another question is whether any new type of log should be required in addition to the current issue/programs listing. The commission wants to know if logs were required, whether such logs should have to include a brief statement on the nature of the issues addressed by each public service program listed.

## TV deregulation proposed

The commission has proposed sweeping changes in its rules and policies governing commercial TV operations. The FCC plans to eliminate or liberalize regulations on programming, ascertainment of community problems, commercialization and program logs. Also, the commission is seeking comments on the nature of competition in the video marketplace, as part of an inquiry considering the elimination of all program content regulations not required by statute.

Regarding policies on programs addressing community problems, the FCC plans to stop scrutinizing specific programming proposed by new TV station applicants (or renewal applicants) except in comparative proceedings or in response to a petition to deny. Licensees instead would have a general obligation to address community problems. Determinations of how issues should be treated would be a matter of licensee discretion. An alternative to this approach would be retaining existing policies requiring

presentation of some non-entertainment, local and informational programming, but eliminating the quantitative guidelines currently in the rules.

Concerning ascertainment of community problems, the commission proposed eliminating any requirements regarding ascertainment, or retaining ascertainment obligations without specifying any particular procedures.

The commission also proposed eliminating standards on commercialization, which generally limit commercial time to 16 minutes per hour. Another option would be to retain guidelines in the rules, but to liberalize them, permitting more flexibility and experimentation by TV licensees.

The commission said that if its policies on programming and commercialization are eliminated, the present program logging policy might be unnecessary. The commission is seeking comments on the appropriate level of licensee record-keeping and reporting in a post-deregulation environment.

Finally, the commission is seeking comments on whether it should stop regulating programming. This is a far-reaching concept that eventually could end all content regulation except that necessary to ensure compliance with basic statutory obligations (for example, political broadcasting, sponsorship identification, obscenity and lotteries).

## FM quadrasonic proceeding terminated

In light of rule amendments contained in the Report and Order eliminating restrictions on broadcast-related uses of FM subcarriers (the SCA Report and Order, released June 22, 1983 [BE June 1983]), the commission has terminated its rulemaking in Docket 21310 in which it proposed standards for FM quadrasonic broadcasting.

The commission said the proceeding is now moot, because the quadrasonic FM broadcasting systems considered in Docket 21310 may be used by FM broadcasters

under the rules adopted in the SCA Report and Order.

## Promotional practices policies terminated

The commission has eliminated two of its long-standing policies governing licensee conduct: licensee misuse of ratings data and use of inaccurate or exaggerated coverage maps.

The commission said that its overseeing ratings abuses no longer was warranted. It cited the commercial nature of the conduct involved and said that future complaints should be directed to the Federal Trade Commission. All pending requests for FCC action will be forwarded to the FTC.

Regarding misleading coverage claims, the commission said that such information was not normally addressed to the listening or viewing public, nor did the public in any significant way rely on it. It said that advertisers and competitors can verify coverage claims and pursue private remedies if abuses occur.

## LPTV update

The commission announced in late June that its new computer purchased for technical processing of LPTV and TV translator applications was on-line and operational.

Applications in all three tiers that have been cut off now are being processed. Also, the commission plans to publish a cut-off list of hundreds of Tier I applications in late summer. Applications conflicting with those appearing on the list will be due in the fall. Also, the commission plans to conduct its first LPTV lotteries soon—most likely this fall, according to its staff.

## Most operation and maintenance log requirements eliminated

The FCC has eliminated most of its requirements that broadcasters follow a schedule of routine equipment and other observations and record the results in operating and maintenance logs.

This deregulation does not apply to AM stations that have directional antennas but lack FCC-approved antenna sampling systems. Also, broadcasters must continue logging the results of EBS tests. Log entries will be required for antenna tower lighting only when lights go out or otherwise malfunction.

The commission may require, on a case-by-case basis, maintenance of an operating log in situations involving interference or deficient operations. Requirements will be tailored to particular circumstances in the event of technical problems. [:-?-)]]]]



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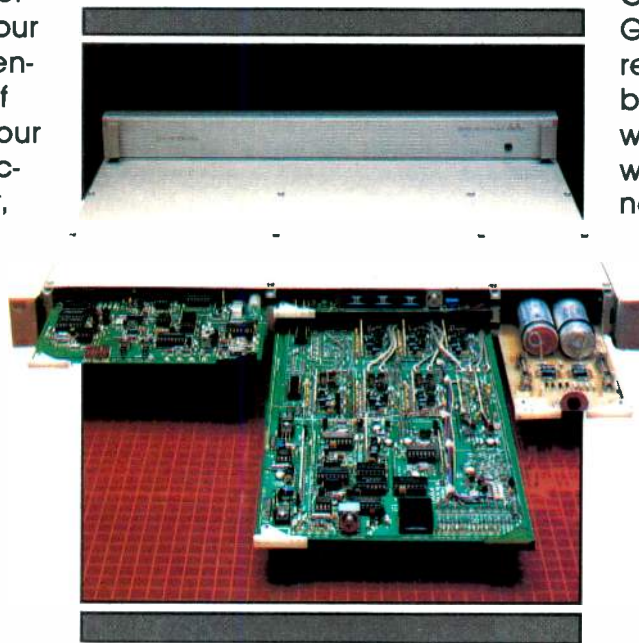
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# Repealing the fairness doctrine

**Ending government  
content regulation:  
An industry goal for 1984**

A guest editorial by Martin Rubenstein,  
president and chief executive officer,  
Mutual Broadcasting System, Arlington,  
VA



The First Amendment guarantees the rights of free speech and press. Yet, although 82% of Americans get their daily news and information primarily from the electronic media, these media are effectively denied their constitutional rights by government-imposed content regulations. I cannot believe that the founding fathers would have excluded radio and television from the rights and protections of the First Amendment had these media existed in 1791.

Content regulations such as the fairness doctrine impose an unrealistic editorial straitjacket on broadcasters. The equal time provision of Section 315 robs broadcasters of their editorial discretion, impugns their motives, undermines their professional integrity and ignores the fact that fair coverage is the cornerstone of professional journalism.

Although our reporting may not give each story on each candidate the same exact amount of airtime, as professional journalists we consistently present a balanced view of all major public issues. In fact, the regulatory environment discourages broadcasters from taking a stand and advocating responsible positions on issues of public importance.

In the upcoming election campaign, newspapers and magazines are not required by the government to grant equally prominent coverage to all candidates for office. Some candidates rate a photo and coverage on page one, others rate a small notice on page 50. In the print media, editors, not government bureaucrats, make the decision. Yet broadcasters are carefully instructed on the requirements for equal access and opportunity.

The end result is that many broadcasters do not say what they want to say and, therefore, may be given reason not to investigate, report or cover important public issues. The fairness doctrine and other noble-sounding principles have created, among broadcasters, a fear or desire to avoid controversy. The imposition of federal regulations on news content has a chilling effect on broadcasters' willingness to address difficult or controversial subjects. Although a few broadcasters are pushing these rules and regulations to the limit—and they deserve our recognition and approval—most of us are not that brave.

As a result, we worry about every commercial, every public service announcement and every news, public affairs or information program that might merit a response. We worry whenever a candidate is on the air, and we necessarily err on the side of safety. In the current environment, we cannot even air an old Ronald Reagan movie during the election without obligating ourselves under Section 315.

The fairness doctrine sounds great in theory. After all, who wants to be against fairness? However the impact of these regulations restricts broader political coverage and may retard the willingness of many broadcasters to air a full spectrum of views. It is counterproductive, and it's time to get the government out of the newsroom, away from the editing suite and off our backs.

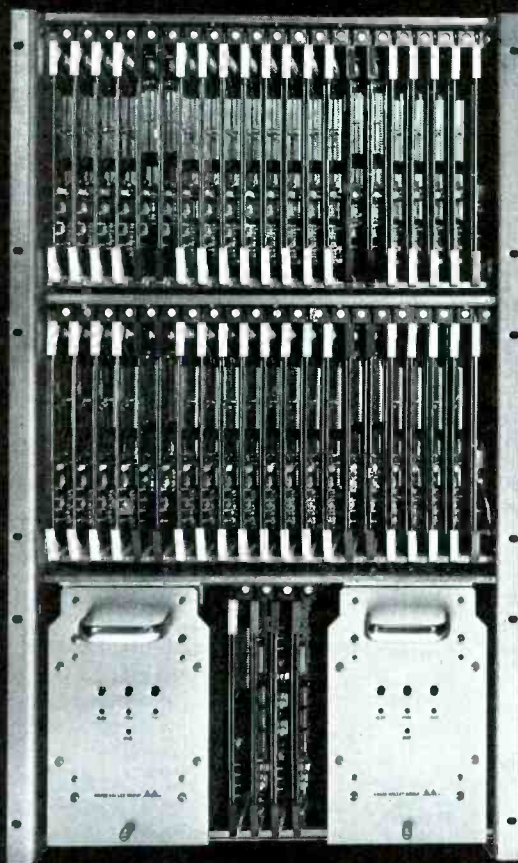
The fairness doctrine is perpetuated by the belief among legislators that publicity favors incumbents at the expense of their opponents. A corollary to this mistaken idea is the common assumption that articulate or photogenic candidates with bold PR plans can use regulations on the media to their advantage. There is no hard evidence to support these beliefs. But the conventional wisdom is that, by invoking the fairness doctrine and refusing face-to-face debates, an incumbent can capture legitimate news coverage while denying his opponent precious radio and TV attention. This mistaken perception is found at all levels of political office.

So ask yourself, could broadcasters be the victims of self-serving politicians in search of campaign advantages? Could the American people be saddled with a content-regulated media because our national leaders are too absorbed in seeking re-election? It seems to me that our political leaders ought to be willing to find a better balance between the public's rights and personal political gain.

As we begin an 18-month presidential campaign, broadcasters deserve full rights under law. The fairness doctrine and Section 315 must be repealed and the rules on editorial and personal attack removed.

*Continued on page 266*

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# Satellite update

By John Kinik, satellite correspondent

## Transborder broadcasting

When the Canadian Broadcasting Corporation (CBC) began broadcasting three TV channels via the ANIK 1 satellite in April 1973, the world's first case of satellite *transborder broadcasting* occurred. Because the downlink signals did not drop off abruptly at the border, the CBC was broadcasting to most of the United States, as well as Canada.

Although the signals were there, the situation had little significance at the time, because there was little aware-

ness of the Canadian channels and almost no interest in the programming. Also, an agreement between the two countries stipulated that there would be no transborder satellite services, except in circumstances in which one country could use a satellite operated by the other country on a temporary basis, if equivalent satellite capability was not available in the first country.

Because at the time Canada had the only satellites in orbit serving North America, the arrangement allowed US carriers to lease ANIK transponders to provide services within the United States until equivalent American satellites were launched in 1974. The availability of Canadian TV test signals in the United States was important for the future satellite TV in-

dustry, because earth terminal equipment manufacturers and potential program originators experimented with the technology to determine its commercial feasibility.

The quality and reliability of satellite-delivered television became well-established during the 1973-1975 test period. By early 1976, when RCA's Satcom I satellite was launched, the US satellite TV industry was ready to begin. By 1979, TV signals on Satcom I had reached a respectable number, and the CATV industry flourished because of the availability of high quality distant signals.

An equally important development also took place at that time. Low cost

Continued on page 14

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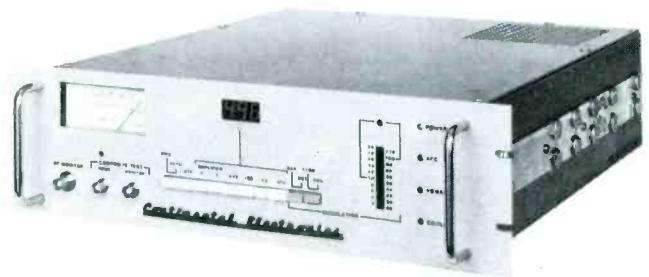
Power output is 50 watts into a 50 ohm load at all FM frequencies.

The exciter may be used as a low power transmitter.

Special circuits protect amplifier from mismatched loads. Automatic power control maintains output at preset levels from 5 watts up to the maximum level.

The Type 802A FM Exciter accepts composite baseband signal from a stereo generator, STL system or monaural and SCA programming.

A digitally-programmed, dual-speed, phase-locked frequency synthesis system generates exciter frequency.



Case design is very clean: front panel analog or digital meters and LED readouts give clear, accurate indications of system status and performance. A digital LED display shows true peak level of modulating signal in 5% increments with an accuracy of better than  $\pm 2\%$ .

Modular subassemblies may be removed from the exciter without removing the exciter from the transmitter. The exciter moves on slides for easy access from front of transmitter.

Call us for specs and prices.

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Circle (7) on Reply Card

# For those who think they've heard it all...

## Neve's full line of broadcast audio consoles

If you've heard it all, chances are you use or own a Neve. If you *think* you've heard it all, we'd like to take you beyond your sound barrier with one of Neve's full line of audio consoles and post-production systems.

We think you should hear for yourself what so many audio engineers and broadcast facility personnel already know: For superior technical performance, reliability, logic circuitry (that can interface with switchers, mic muting, loudspeaker muting, etc.), exceptional value, maintenance-ease and a pure, natural sound, there's nothing that comes close to Neve.

Of course, since many broadcasters already know about

Neve's quality, they've chosen to invest in a Neve.

Networks and independent stations invest in Neve to ensure that their audience hears the finest sound available. Post-production facilities invest in Neve to ensure that their clients receive the finest product available and to keep clients coming back, while attracting new business with the Neve name.

Neve designs a full line of audio consoles and probably has a system to fit your specific needs.

So unless you've heard it all, isn't it time to aspire to Neve?

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NEVE ELECTRONICS INTERNATIONAL, LTD: Cambridge House, Melbourn, Royston, Hertfordshire, SG8 6AU Eng. and Phone (0763) 60776  
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Circle (8) on Reply Card

# PERFECT TIMING



## 780 SERIES RAM TIME PROGRAMMERS

When programming more than eight events, the 780 Series RAM Time Programmers are the most cost-effective way of dealing with the problem. They are flexible, easy to use, and provide 32 events (expandable to 96) in 5 1/4 inches of rack space.

780 Series units operate from the power line with a backup crystal time base and 72 hour battery/charger as an integral part of the equipment.

### STANDARD UNITS EIGHT DIGITS OF PROGRAMMING CAPABILITY.

ES 780 - 10 Days, 10 Outputs, Hours, Minutes, Seconds

ES 781 - 100 Days, Hours, Minutes, Seconds

ES 782 - 16 Outputs, Hours, Minutes, Seconds

SIX DIGITS OF PROGRAMMING CAPABILITY

ES 783 - Hours, Minutes, Seconds

ES 784 - 100 Days, Hours, Minutes

ES 785 - 100 Days, Minutes, Seconds

ES 786 - 16 Outputs, Hours, Minutes

ES 787 - 16 Outputs, Minutes, Seconds

FOUR DIGITS OF PROGRAMMING CAPABILITY

ES 788 - Hours, Minutes

ES 789 - Minutes, Seconds

The size of the unit is 5 1/4" High x 19" Wide x 10" Deep - Relay Rack construction, totally enclosed, with a screen top.



## ES 790 MICROPROCESSOR-BASED PROGRAMMABLE TIMER

The size of the unit is 5 1/4" High x 19" Wide x 10" Deep - Relay Rack construction, totally enclosed, with a screen top.

The ES 790 is a 1,000 event, 32 channel, microprocessor-based programmable clock. Events occur as reed relay contact closures (single pole, normally open). These closures may be all momentary, all latching, or 16 of each, at the user's option. A simple modification allows the use of 16 double pole relays, instead of 32 single pole relays.

1,000 time events can be programmed into the memory and they can be entered randomly, as opposed to chronologically.

An internal crystal with battery and battery charger is provided for uninterrupted operation.

ES 790 is enclosed in a rack mounting chassis with a front panel measuring 5 1/4" high and 19" wide. Depth behind panel 10".



## 750L SERIES THUMBWHEEL PROGRAMMER COMPARATORS

When programming up to eight time events, the 750 Series is recommended. Thumbwheel switches are set to compare the time information from an ESE Clock or Timer.

An output (event) occurs each time the thumbwheel switch setting agrees with the time display.

One set of thumbwheels is required for each event. The standard 750 Series units are enclosed in a 3 1/4 inch high relay rack panel and chassis.

- STANDARD UNITS**
- ES 750L - ES 112 and one 8 Digit Program
  - ES 751L - ES 124 and one 6 Digit Program
  - ES 753L - ES 112 and two 4 Digit Programs (Hrs & Min)
  - ES 754L - ES 124 and two 4 Digit Programs (Hrs & Min)
  - ES 756L - ES 510 and one 4 Digit Program (Min & Sec)
  - ES 758L - ES 510 and two 4 Digit Programs (Min & Sec)



## ES 1296 PRESETTABLE TAPE TIMERS

For Off-Air taping, or operating tape recorders when nobody is there, ESE has created ES 1296.

ES 1296 is a six digit, twelve hour clock with LED displays and a programmable, 300 watt, 117V AC outlet on the rear.

A rear-mounted four position switch is used to pre-set the start time as far ahead as 96 hours.

Once the rear outlet is activated, it will remain on for 66 minutes.

The Record Duration option allows the user to select one of four time intervals for recording. These four time intervals are either 16, 33, 66 and 138 minutes or 33, 66, 138 and 250 minutes.

An additional option is Sequential Turn-on for those machines that require Power, Play, Record in sequence.

A Manual Override Switch can be provided as an option so that the user may operate his machine at any time without disconnecting from the ES 1296.



## ES 270 IRIG B TIME CODE READER

The ES 270 TIME CODE READER has been designed to be an economical solution to the problem of receiving and displaying IRIG B.

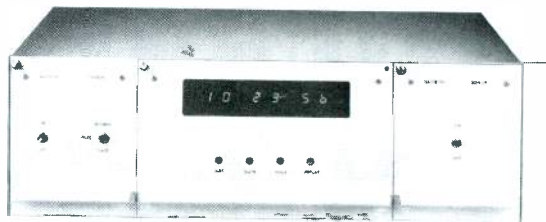
Nine digits (Days, Hrs, Min, Sec) of time are shown on bright red LED's, .4" character height. ES 270 comes in a rack mounting enclosure, 1 1/4" High, 19" Wide and 10" Deep. The power requirement is 117V AC, 50/60 HZ, 230V AC, 50 Hz is available as an option.

# MASTER CLOCKS

ESE Masters provide a means of keeping all time displays in the system in agreement, through the use of a Serial Time Code. Only one pair of wires is needed to distribute the time code to all remote serial input displays.

An ESE Master Clock System can operate digital displays, clocks with sweep second hands, printers and, in addition, tell your computer what time it is.

Twelve hours of standby battery operation is standard in ES 160 and 160/1.



ES 160 Mounted in a 5 1/4" relay rack panel and chassis, displays six digits of information on 4" LED displays, in 12 hour format.

ES 160 has three second per month accuracy. Its standard output is serial BCD, CMOS compatible and can drive 100 ES 161, 166, 171, 991 or 993 Remote Displays without buffering.

Dimensions: 5 1/4" High x 19" Wide x 15" Deep, \$1103.

ES 160/1 One second per month version of ES 160, \$1286.

ES 162L/164L

The most economical Masters, ES 192 (12 Hr) and ES 194 (24 Hr) are constructed using ES 112 or ES 124 digital clocks and adding the ES 167 Serial Time Code Generator to provide the output needed to drive Remote Serial Displays ES 161, 166, 171, 991 and 993. Displays are .55" gas discharge.

Dimensions: 2 1/4" High x 8" Wide x 6" Deep, \$341.

### ACCESSORIES

ES 161 REMOTE DIGITAL DISPLAY Decodes serial time data and displays six digits of time on .55" Gas Discharge Displays, in either 12 or 24 hour format. Dimensions: 8" Wide x 2 1/2" High x 8" Deep, \$173

ES 162 IMPULSE DRIVER Plugs into the ES 160 chassis, can drive 20 impulse Clocks. Designed so that if power fails, impulse always comes on with the same polarity when power is restored, \$210

ES 164 REMOTE DIGITAL IMPULSE DISPLAY Similar to the ES 161 except that the ES 164 derives its count command from the ES 162 Impulse Driver, or any impulse clock drive circuits already installed. Dimension: 8" Wide x 2 1/2" High x 6" Deep, \$256

ES 165 IMPULSE DRIVER The ES 165 Impulse Clock Driver was designed provide synchronized power to the ES 168 Impulse Clocks. ES 165 is capable of driving 50 ES 168 clocks and will keep them running accurately through twelve hours of power failure. The ES 165 derives its synchronizing pulse from any one pulse per second source, such as an ESE Master Clock and can also accept the once per second, alternating 12 or 24 volt impulses from an existing impulse clock system. If ES 165 is added to an existing impulse system, and if power fails, the clocks driven by the ES 165 will continue to run at the correct rate, but others will stop, unless supplied with battery power. When power is restored, the usual way to correct the other type of impulse clock is to run their driver at twice rated speed. This can be done safely, as it will not affect the operation of the clocks driven by the ES 165, \$200

ES 166 JUMBO 1" CLOCK DISPLAY Features six digits of one inch gas discharge displays in 12 or 24 hour format. Receives serial time code input from any ESE Master Clock or ES 167. Dimensions: 10 1/2" Wide x 4 1/2" High x 6 1/2" Deep, \$267

ES 167A SERIAL TIME CODE GENERATOR An integral part of ES 160, 190 and 192/194 Master Clocks, this unit can be added to many other ESE products, including ES 112, 124, 182, 184, 992, 994, 750, 751, 753, 754 and all 780 Series Time Programmers. Drives ES 161, 166, 171, 991 or 993 Remote Display, \$153

ES 168 IMPULSE CLOCK operates from the 6pps output of the ES 165 Impulse Driver. As many as 50 ES 168's can be connected to a single driver, and they will continue to run during a power outage of at least 12 hours. The clock face is 12" in diameter, with a red sweep second hand and black hour and minutes hands, \$135

ES 171 CONSOLE MOUNT REMOTE DISPLAY Receives the serial time code generated by any ESE Master Clock, or any ESE product containing the ES 167 serial time code generator, and displays it on bright red, 4" LED's. Dimensions: 2 1/4" High x 4 1/2" Wide x 4" Deep, \$166

IMPULSE CLOCK When a sweep second hand is desired, specify the 3201.003 "Extra Flat" Impulse Clock. It has a 12 inch dial protected by a glass cover and metal bezel and is approximately one inch thick. As many as twenty impulse clocks can be driven by a Master Clock which has ES 162 as an accessory, \$211

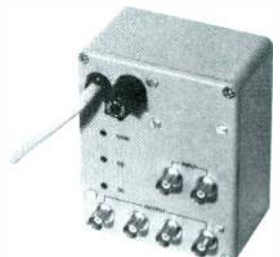
ES 991 4 DIGIT SERIAL INPUT SLAVE Decodes serial time data and displays four digits of time on large 2" gas discharge displays. Dimension: 10 1/2" Wide x 4 1/2" High x 6 1/2" Deep, Desk Top Case \$341

ES 993 6 DIGIT SERIAL INPUT SLAVE Features four digits of 2" high gas discharge displays and two digits (Seconds) of 1" gas discharge displays. Receives serial time code input from any ESE Master Clock or ES 167A. Dimensions: 5" High x 12" Wide x 3" Deep (Wall Mount) \$471



## ES 206 VIDEO TIME AND DATE GENERATOR

The ES 206 has been designed to allow the addition of Time and Date information to a video signal. Two rear-mounted video jacks permit "looping" the video information through the 206 to add the data.



## ES 207 VIDEO DISTRIBUTION AMPLIFIER

The ES 207 Video Distribution Amplifier answers the "one more unit" question with a versatile little package that can be tucked anywhere, either temporarily or permanently. Controls are available through the top plate with a miniature screwdriver for video gain, D.C. level and HF equalization. A very wide range of chroma level control can be obtained with the DA. Output video is expected to be set for 0 volts D.C. on the blanking or porch level, with video extending positive and sync negative. Nominal input and output signal level is 1 volt p-p. Typical gain control range is from 1/2 volt to 1 1/2 volts p-p

## ES 112AL/124AL DIGITAL CLOCK \$173

ES 112 (12 hr) and ES 124 (24 hr) are solid state, six digit clocks. Can drive 80 Series and 90 Series slaves. Displays are gas discharge, .55" high.  
Dimensions: 2 1/2" High x 8" Wide x 6" Deep



## ES 562/564 SIX DIGIT CLOCK/ TIMER WITH MEMORY \$329

ES 562/564 is a combination six digit clock and 24 hour timer with memory, allowing the user to set the clock to the correct time of day, switch to timer mode, then switch back to time of day by pushing one button; time of day will be correctly displayed, in hours, minutes and seconds. Six pushbutton controls are mounted on the top of the unit, near the front of the desk-top case. When panel mounting is specified, they will be mounted on the front panel, below the display. The controls may also be remoted, through two rear-mounted five pin connectors (Option R or Option D). These controls are Reset, Timer, Fast/Start, Slow/Stop, Hold and Clock.  
Display: Six digits of .55" Planar Gas Discharge Display.

## ES 214 DYNAMIC AUDIO LEVEL INDICATOR \$119

The ES 214 is a highly accurate audio level indicator which is designed to simulate the action of a conventional VU meter but with superior dynamic characteristics. The LED meter is five to one hundred times faster in responding to complex waveforms than the mechanical meter without sacrificing the familiar meter "movement".

### SPECIFICATIONS

Number of Indicators: 14 LED Lamps in 3 colors. Scale: +4, +3, +2, +1dB - Red. 0 dB-yellow, -1, -2, -3, -5, -7, -10, -15, -20, -25 dB - Green.



## ES 280 AUDIO TIME CODE GENERATOR/READER \$525

The ES 280 is a 10 Digit Audio Time Code Generator/Reader, capable of laying down a serial BCD time code on audio tape in the Generator Mode, and recovering and displaying it in digital form in the Reader Mode. The code has been designed by ESE. It is not a standard code, such as SMPTE or IRIG. The frequencies used to produce the code have been selected to be compatible with cartridge machines as well as other tape recording and playback equipment. Amplitude adjustment assures the right amount of signal for the particular machine being used.



ES 258 "SMART" SMPTE TIME CODE READER. The ES 258 is a bi-directional multi-speed, eight digit SMPTE Time Code Reader which displays Hours, Minutes, Seconds and Frames on 4" red LEDs. The ES 258 incorporates a digital error detection system; When a bad frame of time code is detected, the unit will switch to a frame-counting mode.



## 70 SERIES CONSOLE MOUNT CLOCKS AND TIMERS

ES 172 SIX DIGIT - 12 HOUR CLOCK: Three setting controls - Fast Advance, Slow Advance and Hold \$166

ES 174 SIX DIGIT, 24 HOUR CLOCK: Otherwise identical to the ES 172 \$166

ES 370 FOUR DIGIT, ONE HUNDRED MINUTE UP/DOWN TIMER: Six controls - Count Up, Count Down, Stop, Minutes Advance, Seconds Advance, Reset \$211

ES 371 UP/DOWN TIMER: Similar to the ES 370 except with Leverwheel Preset capability for faster setting of the desired time. \$335

ES 570 FOUR DIGIT, SIXTY OR 100 MINUTE TIMER: Select 60 or 100 minute mode on rear connector. Start, Stop and Reset controls. Runs continuously unless stopped. Reset will return all displays to zero. Unit will run if reset while running or will stay at zero if reset when stopped \$166

ES 572 SIX DIGIT, 12 HOUR CLOCK OR TIMER: Five controls - Start, Stop, Reset, Fast Advance, Slow Advance. Will run continuously to 12:59:59. Advances to 1:00:00 and continues as clock unless stopped or advanced. \$202

ES 574: A 24 hour version of ES 572 \$202

ES 575: Exactly like ES 570, with the addition of a "freeze" button. When the button is released, the display "catches up" with the correct elapsed time. \$202  
Dimensions: 2 1/8" High x 4 5/8" Wide x 4 1/8" Deep



## ES 301/302 100 MINUTE UP/DOWN TIMERS \$248.317

ES 301 is a four digit, one hundred minute timer (99:59) with six controls: Count Up, Count Down, Stop, Minutes Advance, Seconds Advance, Reset. Counting can be activated up or down or set back to zero. When "Stop" control is pressed, the four digit display is held. Counting direction (up or down) can be changed or time can be reset to zero without stopping the count. The ES 301 can drive 80 Series and 90 Series Slaves. Displays are gas discharge .55" high.

With the ES 302, the user can preset times much faster than with the ES 301, because lever-wheel type switches are used for the preset feature. The ES 302 can drive 80 Series and 90 Series Slaves.  
Dimensions: ES 301: 2 1/2" High x 6" Wide x 6" Deep.  
ES 302: 2 1/4" High x 10" Wide x 6" Deep.



ES 253 SMPTE TIME CODE READER: is an eight-digit SMPTE Time Code Reader displaying Hours, Minutes, Seconds and Frames \$477

ES 254 SMPTE TIME CODE READER: is a bi-directional, multi-speed eight-digit reader, displaying Hours, Minutes, Seconds and Frames on 4" red LED displays \$709

ES 255 is a bi-directional, multi-speed, eight-digit SMPTE Code Reader, that can add the information to a video stream for recording time code on the video portion of a tape, or for displaying it on a monitor. Reading speed is 1/20 to 20 times playback speed \$1045

SMPTE TIME CODE GENERATOR: ES 261 is a pre-settable, eight-digit SMPTE/Time Code Generator, capable of Drop Frame or Non-Drop Frame operation. \$788



## 80 SERIES JUMBO CLOCKS AND TIMERS

Large, bright 1" gas discharge displays provide effortless long distance viewing from 40 feet.

ES 182 - SIX DIGIT, 12 HOUR CLOCK: Three rear-mounted setting controls - Fast Advance, Slow Advance, and Hold. \$286

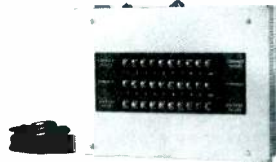
ES 184 - SIX DIGIT, 24 HOUR CLOCK: Otherwise identical to the ES 182 \$286

ES 380 FOUR DIGIT, 100 MINUTE UP/DOWN TIMER: Displays minutes and seconds, with rear-mounted connector to allow remote wiring of six momentary SPST CONTROLS - Count up, Count Down, Stop, Minutes Advance, Seconds Advance and Reset. Other features similar to ES 301. \$332

ES 381 UP/DOWN TIMER: Similar to ES 380, except that leverwheel preset is used. \$437

ES 580 - FOUR DIGIT, 60 MINUTE TIMER: Displays minutes and seconds. Rear connector allows remote wiring of three momentary SPST controls - Start, Stop and Reset. Reset returns all displays to zero, and timer will continue to run from zero if reset while running. \$239.

80 Series slaves are also compatible with other ESE clocks and timers: ES 112/124, 301, 302 and 51C.  
Dimensions: 4.45" High x 10.38" Wide x 6.58" Deep.



## ES 203/205 \$93

ES 203/205 is a 20 input Timer/Source Interface. It was designed to provide a simple means of connecting a variety of sources such as carts and turntables to the remote input of ESE Timers. The most common application for this product is resetting an ES 510L Timer each time a source is started.

The 20 inputs are divided into ten DC voltage inputs and ten contact closure inputs. Activation of any one of these inputs will cause an output which will momentarily reset an ESE timer.

Mechanical: Aluminum Case 8" x 6" x 2".



## ES 510L FOUR DIGIT 60 MINUTE TIMER \$198

ES 510 is a four digit, sixty minute timer (59:59) with Start, Stop and Reset controls. If stopped, display will hold time reading and when restarted will continue with next count from last displayed figure. If reset while running, timer will continue to run. ES 510 can drive 80 Series and 90 Series Slaves.  
Dimensions: 2 1/4" High x 6" Wide x 6" Deep.



## 90 SERIES 2 INCH DISPLAYS VIEWABLE AT 60 FEET

ES 391 - Presettable Up/Down Timer: 100 Minute Range - Displays Minutes and Seconds, uses Leverwheel Preset Controls are Count Up, Count Down, Stop, Reset and Preset. \$511  
Dimensions: 4.45" High x 10.38" Wide x 6.58" Deep

ES 590 - Sixty Minute Timer: Displays Minutes and Seconds. Rear-mounted connector provides for wiring to user's single pole, momentary, push-button controls. Start, Stop and Reset. Reset returns all displays to zero, and timer will continue to run from zero if reset while counting. \$358  
Dimensions: 4.45" High x 10.38" Wide x 6.58" Deep.

ES 992/994 - 6 Digit Clocks: ES 992 (12 Hr) and ES 994 (24 Hr) - Hours and Minutes on Two Inch Gas Discharge Displays. Seconds on One Inch Gas Discharge Displays. Three top-mounted setting controls - Fast Advance, Slow Advance and Hold. \$471

Dimensions: 5" High x 12" Wide x 3 1/2" Deep



## ES 232 TIME CALCULATOR

ES 232 is an eight digit, 24 hour, Up/Down Timer/Time Calculator displaying Hours, Minutes, Seconds and Frames (30 frames per second) on bright red 4" LEDs. In the Calculator mode, data may be added or subtracted, or stored in memory, or recalled from memory. There are 10 memory locations available. Data may be added to or subtracted from the timer value, while the timer is counting either up or down, but not while the timer is stopped. When stopped, data moved from calculator to time serves to preset the timer. In the timer mode, ES 232 counts up or down, and can be reset while running or stopped. It can be preset to any number in the 24 hour range. While timer is running or stopped, it is possible to enter the value into memory without disturbing the operation. It is also possible to recall a value from memory and add or subtract while timer is counting up or down. ES 232 uses 24 keys, mounted on a desktop case, measuring 5" wide X 6" deep X 2" high.



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Continued from page 10

earth terminals started to appear when entrepreneurs realized the available business opportunity in bringing high quality television to rural and remote areas.

Suddenly, the satellite border situation changed. There were desirable American TV signals in the air over most of Canada. Receive earth terminal costs had become low enough to justify private or small community purchases. For the first time, satellite broadcasting across an international border created a problem, as satellite antennas popped up like mushrooms

over Western Canada to receive American signals. At first, the Canadian government resorted to use of legal action in some instances and threats of legal action in others, trying to stem the tide of installations.

When it became obvious that the policy was doing more harm than good, the Canadians worked to improve the quantity and variety of programming transmitted via the Anik satellites to keep Canadians watching Canadian television. In February 1983, the first Canadian pay TV channels were initiated via satellite, nearly 10 years after the CBC channels went on the air via ANIK 1. A change in

policy has been announced by the Canadian government this year, removing restrictions on the use of private receive earth terminals, except for apartments and condominiums, in which a minimum amount of Canadian programming must be provided to subscribers.

In effect, the Canadian government quit trying to preserve its satellite sovereignty when it realized that the battle had been lost because of the overwhelming number of US signals available and the rapidly decreasing costs of receive earth terminals. In the first case in which foreign satellite signals crossing a border became a major issue, policy had to defer to reality.

### The longest satellite border

The nature of the satellite border between the United States and Canada is similar to the situation that has existed for years in terrestrial broadcasting. Broadcasters on either side of the border have been relatively free to transmit their signals into the other country. There are TV and radio stations along this border that direct their programming (and advertising) at the foreign market.

Canada's cable TV industry has been well-established for more than 10 years because of easy access to US signals at the border. These signals can be used locally or transmitted on terrestrial microwave links to more distant cities north of the border. A major border conflict occurred when the Canadian government authorized cable companies to delete advertising from US signals and insert Canadian advertising. US broadcasters and advertisers complained about the resulting loss of revenue. The conflict has simmered since then, with the United States forced to accept the Canadian policy, designed to protect against the increasing outflow of advertising dollars from Canada.

Recently, the Canadian government has had to accept the reality of American satellite signals in the air over Canada. Agreements have been made between the two countries to open up the border to allow satellite broadcasting to be treated similar to terrestrial broadcasting, with the previously established cable advertising precedent maintained. Thus the path has been cleared for satellite program originators to sell their channels to Canadian cable systems and other users on a commercial basis. Several satellite carriers that transmit "superstation" signals to cable systems have obtained preliminary FCC approval to transmit their signals to Canada on an official basis.

The new open border policy

Continued on page 256

## SONEX users tell it like they hear it.



Presentation control room at Multi-Image Resources, Dallas TX; works "above reproach."



Control room and studio at Eastern Sound Studios, Methuen, MA.



Audio production facility, Larry Blakeney & Associates, Jackson, MS.



KLOR FM, Ponca City, OK; used to "reduce ambient noise and smooth our frequency response" in news studio.

Audio Visual Center, Hays, KS; "Great! Stopped reverberating sounds" in audio taping room.



Here are just five applications and comments from among our almost 2,000 SONEX users. Eastern Sound: "Our studio never sounded better and our control room is very accurate. . .". Blakeney: "SONEX controls acoustics beautifully, better than carpet, acoustic tile, or any other product. . .don't have to worry about outside noise. . .or disturbing our neighbors when we turn the volume up. . .". Klor also says that it is "critical in master tape work, and far superior to any other system we've tried."

Get the facts today. SONEX is manufactured by Illbruck/usa and distributed exclusively to the pro sound and A/V industries by Alpha Audio.

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**Six-digit readout:** Automatically tracks every CRT test. We call it digital autotracking. It's patent pending.

**Bright dual-trace CRT:** 60 MHz (-3 dB); 100 MHz (-12 dB).

**Delta PPV, Time, Freq:** Measure any part of a waveform for PPV, time or frequency using Delta measurements. Just dial in the waveform section you want to measure and push.

**Simplify Freq ratio tests:** Automatically compare input/output ratio of multiply/divide stages from 1:1 to 1:999,999 with the push of a button.



**Autotracking DCV, PPV, Freq:** Measure DCV to .5%; PPV to 2%; freq. to .001%. Just push a button for either Channel A or B.

**One probe input:** One probe input per channel for all measurements - digital and scope - with 5 mV to 2000 V measuring range. (2 lo-cap probes provided.)

**Super sync:** ECL provides rock-solid sync trigger circuits with only 4 controls; includes TV sync separators for video work.

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**The first scope with push button digital readout.** If you use general purpose oscilloscopes for troubleshooting or testing, we can double your present productivity with the SC61 Waveform Analyzer, the first instrument to turn every conventional scope measurement into an automatic digital readout.

**No more graticule counting.** Connect only one probe to view any waveform to 100 MHz. Then, just push a button to read DCV, PPV, frequency and time — automatically!

There are no graticules to count or calculations to make, which speeds every measurement.

The digital readout is from 10 to 10,000 times more accurate as well.

Plus you have everything you want to know about a test point, at the push of a button, which speeds troubleshooting tremendously.

A special Delta function even lets you intensify parts of a waveform and digitally measure the PPV, time or frequency for just that waveform section.

And it's neat. No more tangled leads, piles of probes or dangling cords. The SC61 is an entire test station in one unit.

**The one and only.** There are other scopes with digital readout, but none of them completely automate every conventional scope measurement so you can automatically analyze any waveform without counting one single graticule. Totally automatic waveform analyzing at the push of a button. It will make all the difference in your productivity.

**Double your productivity.** When we say the SC61 will double your productivity, we're being conservative. We've seen cases of

three, four, even ten time increases in productivity with this first-of-its-kind, automated oscilloscope. Every situation is different, however, so try the SC61 and judge for yourself. Here's our offer.

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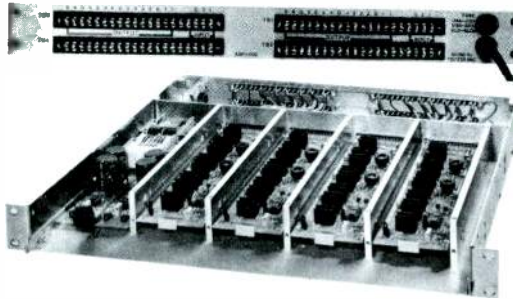
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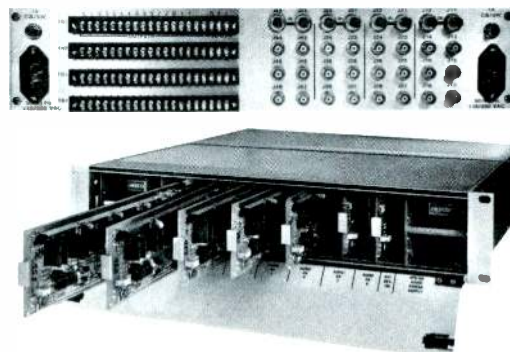
# OU Can Trust HEDCO's Audio & Video DA's

2 AUDIO  
PLUS  
2 VIDEO  
OR  
4 AUDIO  
OR  
4 VIDEO  
DA's



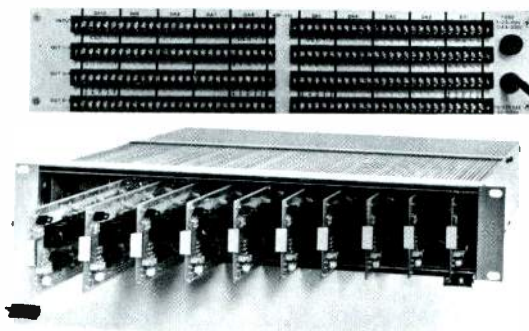
1 R.U. Distribution Frame

4 AUDIO  
PLUS  
4 VIDEO  
OR  
8 AUDIO  
OR  
8 VIDEO  
DA's



2 R.U. Distribution Frame

5 AUDIO  
PLUS  
5 VIDEO  
OR  
10 AUDIO  
OR  
10 VIDEO  
DA's



2 R.U. Distribution Frame

For complete information on HEDCO's full line of broadcast equipment, call or write:

**HEDCO**™

Hughes Electronic Devices Corporation  
P.O. Box 1985, Grass Valley, CA 95945  
916/273-9524 Telex: 364412

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## business

### EQUIPMENT SALES

**McMartin Industries**, Omaha, NE, has reported several sales of transmitting equipment. AM systems have been sold in Maryland, Texas and Florida. FM equipment has been placed in several states as well as in Iceland, Ecuador and Colombia (South America). A second order from the People's Republic of China has been received for transmission and monitoring equipment, with Sri Lanka and Australian sales pending.

**Rupert Neve**, Bethel, CT, is providing distribution equipment for the new HBO satellite complex at Smithtown, Long Island. The latest order, surpassing \$120,000, is in addition to six previous contracts for production and post-production audio consoles.

**Larcam Communications Equipment**, Ontario, Canada, has received major orders for VHF TV transmitters from the Canadian Broadcasting Corporation for its Gaspe and Baie des Chaleurs project and for Quebec City. Another order is a 60kW replacement system for WBIQ-TV, Birmingham, AL.

**Samsung Electronics Company Ltd.**, part of a Korean conglomerate, has signed a patent license agreement to produce receivers for the Kahn/Hazeltine ISB AM stereo system.

**Colorgraphics Systems**, a member of the **Dynatech Broadcast Group**, has contracted to install integrated Technology NewStar computerized newsroom systems at WGN TV and radio in Chicago. A second agreement will place the equipment in the CBS radio news operation in New York.

**Otari Corporation** and **Martin Audio/Video Corporation** have completed agreements with ABC Radio Network for the sale of one MTR-90 and 74 Otari MTR-10 recorders, a contract totaling more than \$500,000.

**Lyon Lamb Video Animation Systems** has made a formal agreement with **Sony Broadcast** to provide Sony products as part of its VAS IV video animation system.

**Ampex** has installed equipment valued at \$1 million at Rustad/Wickhem/Video in Madison, WI.

Shooting Star Video has purchased an **Ikegami HL-79EAL** broadcast camera.

Channel 18, an LPTV station serving Sulphur Springs, Greenville and Commerce, TX, has purchased a **Shook Electronic Enterprises/Magnetic Media** 22-foot mobile TV production system. It will be used as a studio production unit and mobile production facility.

**Logitek Electronic Systems** has delivered six Auditorack audio consoles to Host Communications for use in Host's Southwest Conference Network control facility in Dallas.

The Pan American Olympics Organization (COPAN) has ordered 39 **Angenieux** video broadcast zoom lenses. The order includes more than 20 42X zoom lenses especially suitable for sports events and remote telecasts.

Broadway Video in New York has installed an **MCI-**  
Continued on page 20

# FIXED, MOBILE & REMOTE BROADCAST AUDIO MIXERS.

\$12,000 is too much! Yet, you need high quality and reliability in your small broadcast audio mixers. Take a serious look at a SAM-82 high-quality broadcast mixer, at less than half of that price. Built by a \$40 million company, this flexible 8 in/2 out professional mixer is suitable for demanding applications within TV, video and mobile studios. Over 800 SAMs are in use by quality-conscious European broadcasting and recording facilities.

Need both studio and remote mixer? We designed the attractive "quick-install" desktop console mount for the SAM-82. Disconnect XLRs and remove SAM-82 from console mount, and in 2 minutes you have a compact full facility remote mixer designed for "on-the-road" punishment. When you return from the field, just reconnect in 2 minutes, and you have an attractive console mixer again. Battery pack is available. Direct output option makes SAM-82 ideally suited for CMX type post-production facilities. Please call or write.



SAM-82 shown in attractive "quick-install" desk top console



## SAM-42

6 inputs, 4 balanced and floating Mic/Line channels with 48V phantom supply. 2 Tape/Monitor inputs. 3 outputs, balanced and floating. 2 Main and 1 Aux. outputs. 2 monitor channels. Talkback channel and test oscillator. Powered by internal battery pack. Size is approx. 11 x 11 x 3 inches. Introductory price \$2,995.



## SEEM PLUTO

Compact "personal" broadcast audio mixer. 3 inputs. Mono output Headset monitoring. Return talkback. Commentator's feed. All ports balanced. Built-in limiter with warning tone in operator's headset. 48V phantom power available. Size is approx. 8 x 8 x 3 inches. Price \$1,475.



## SAM-82

12 inputs, 8 are balanced and floating Mic/Line channels with 48V phantom supply. 2 Echo/Line return channels. 2 Tape/Monitor returns. 6 outputs, all balanced and floating, 2 are main outputs. 2 aux. outputs. 2 monitor channels. Talkback output and test oscillator. Rear multipin connector enables two SAM-82s to be used as 16 in/2 out mixer. Size is approx. 18 x 13 x 3 inches. Introductory price \$4,975.

In Canada: (416) 868-0528  
GERR Electro Acoustics Ltd.

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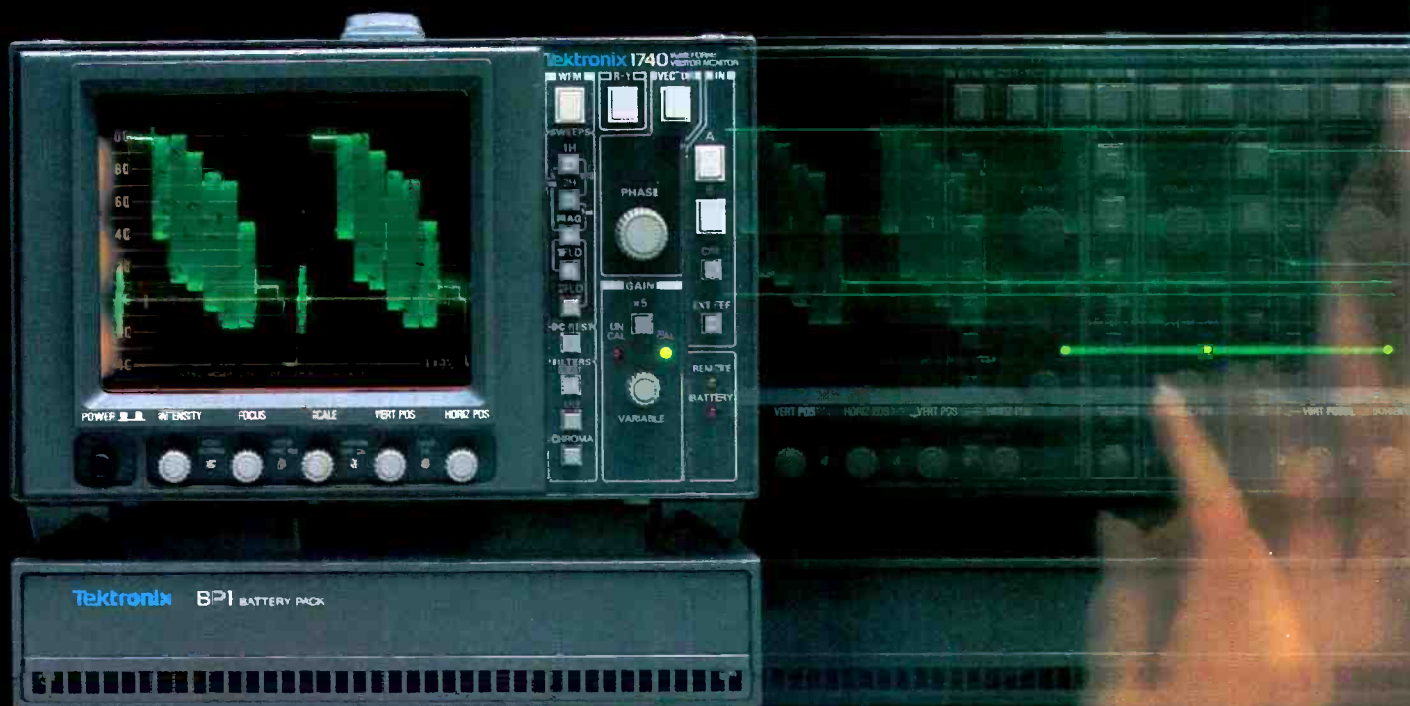
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TEK 1740 SERIES  
WAVEFORM/VECTOR MONITORS

**TWO MONITORS IN ONE  
PORTABLE PACKAGE...**

**THAT'S A NICE SWITCH.**



The model above is pictured with the optional battery pack.

Tektronix introduces a new product to help improve your signal quality: The 1740 series portable waveform/vector monitor.

We know that in-studio or out on remote, space is critical. And the smaller the equipment is, the better. So we've combined our waveform and vector monitoring functions, and integrated them into one compact, go-anywhere package.

#### **HALF THE RACK SPACE.**

At 8½ inches wide and 18 inches long, the 1740 series uses only half the normal rack width. That means you gain more usable space and more flexibility than ever.

To change from waveform mode to vectorscope mode and back just press a button. Couldn't be simpler.

There's a brighter CRT display on the 1740 series, too. Viewing is easy even in high ambient light.

And, because it operates on either AC or DC, the 1740 can go wherever you go.



**TWO-IN-ONE ECONOMY.**

Using one monitor where two were needed before lowers your equipment costs. And because the 1740 series is completely portable, it makes a sensible purchase for either studio or field use.

And there's more. The 1740 series operates on only 50 watts of power. And that means less heat build-up (which is important in crowded equipment racks).

And in addition, there's a single line display preset for monitoring VHS

**SEE FOR YOURSELF.**

Now that you've heard about our new two-in-one fact, you should see one. Call or write us for a demonstration. We have field offices in most cities. Or you can call Toll Free 300-547-1522 (in Oregon 300-452-1877), or contact your authorized Tektronix professional video dealer.

And remember You can depend on Tektronix for video-monitoring equipment that works, and for technical support and service worldwide.

**WORKING HARD FOR YOUR SIGNAL QUALITY.**

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depend on.  
Net 30 credit terms.**

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or



**TRANSMITTER TUBES**

3CV30000H3	\$2540 00	4CX10000D	\$1250 00	6076	\$685 00
3CX1000A7	540 00	4CX15000A	1585 00	6076A	625 00
3CX1500A7	500 00	4CX20000A	1585 00	6146A B	7 00
3CX2500A3	426 00	4CX35000C	6250 00	7007/6166A	3100 00
3CX2500F3	446 00	4X150A	58 00	7527A	159 00
3CX3000A1	445 00	4-65A	59 00	8008	35 00
3CX3000A7	575 00	4-125A	69 00	8122	110 00
3CX3000F1	495 00	4-250A	80 00	ML8773	4660 00
3CX3000F7	690 00	4-400A/8438	89 00	8791	460 00
3CX10000A3	1375 00	4-400AX/8438A	159 00	8791VI	460 00
3CX10000A7	1550 00	4-400B/7527	99 00	8792	822 00
3CX15000A3	1420 00	4-400C/6775	89 00	8792VI	793 00
3CX15000A7	1520 00	4-500A	240 00	8794	3144 00
3CX20000A3	1895 00	4-1000A	452 00	8806	3145 00
3CX20000A7	1895 00	5CX1500A	685 00	8807	2954 00
3-500Z	88 00	5-500A	285 00	8874	194 00
4CX250B	65 00	575A	35 00	8890	3053 00
4CX250BC	73 00	807	6 50	8891	3456 00
4CX300A	200 00	810	100 00	8816	3570 00
4CX350A	110 00	811A	11 00	8976	3064 00
4CX1000A	400 00	813	35 00	8977	2776 00
4CX1000K	485 00	828	80 00	8985	1550 00
4CX1500A	660 00	833A	80 00	8986	1630 00
4CX1500B	500 00	866A	6 50	8988	3200 00
4CX3000A	895 00	872A	30 00	8990	1460 00
4CX5000A	1060 00	5762	670 00	9007	4250 00

**RCA SATICONS, VIDICONS, ULTRICONS**

BC4380 series	2225 00	BC4398 series	1700 00	BC4909	2145 00
BC4386 series	2500 00	BC4399 Series	2100 00	BC8134 Series	850 00
BC4390 series	1850 00	BC4532U	1235 00	BC8480	2105 00
BC4391 series	2160 00	BC4809 series	815 00	H8399/4389	420 00
BC4396 series	2500 00	BC4908 series	1850 00	H9311/4911	850 00

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To call CA office: **800-421-7549** (except from CA)

**800-824-6232** (from CA only)

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Long Beach, CA 90804  
213-498-3504

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Continued from page 16

Quantel Mirage in its teleproduction facility.

Soundcraft Electronics has delivered 13 consoles to TV Manchete in Brazil. The consoles—six series 2400 28/24 with bar-graph meter displays and seven series 800B 24/8—will be installed in studios in five major cities.

AFA Systems, a division of AF Associates, has completed installation and testing of an Empire Video 1-inch computerized editing facility in New York. The system was designed and built by AFA.

**NEW ADDRESSES, DIVISIONS**

Lyon Lamb Video Animation has moved to 4531 Empire Ave., Burbank, CA 91505; 1-213-843-4831.

Telemation's administrative offices are now located at 143 S. Main, Suite 900, Salt Lake City, UT 84111; 1-801-364-4477.

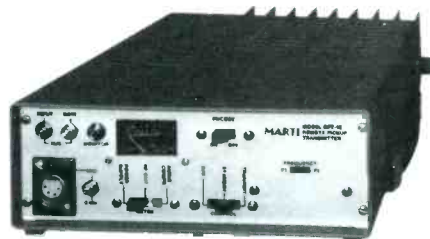
Math Associates, supplier of fiber-optic components, has relocated to 2200 Shames Drive, Westbury, NY 11590; 1-516-334-6800.

Ford Aerospace Satellite Services Corporation (FASSC) has opened its new headquarters in Washington, DC, at 1140 Connecticut Ave.

Acquis Corporation has announced the formation of Acquis Ltd., which will act as the exclusive export sales and marketing company for Convergence Corporation TV post-production equipment. Its address is 18952 MacArthur Blvd., Suite 100, Irvine, CA 92715; 1-714-752-6003.

**Live Remotes**

Marti's RPT15 Transmitter has the power to bring difficult remotes back LIVE.



VHF-UHF  
Model RPT15  
Transmitter

Delivering the maximum allowable (15 watts) power for aircraft ENG, the RPT15 produces outstanding results with traffic reports, mobile units and fixed remotes — and with clean broadcast-quality audio and continuous-duty operation. Built-in encoding permits operation with Marti Mobile Repeaters and Automatic Repeaters in wide coverage systems.

**RPT15 FEATURES:**

- ★ Type accepted on all VHF-UHF RPU channels
- ★ 15 watts continuous output
- ★ Dual frequency capability
- ★ Sub audible encoder
- ★ Built-in metering
- ★ Built-in AC supply
- ★ FM Compressor-Limiter
- ★ Mixing mic and line inputs

**MARTI** **MARTI Electronics, Inc.**  
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Cleburne, Texas 76031  
(817) 645-9163 • Telex 794 835

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# MOBILE TELEVISION UNITS



**32' VEHICLE WITH 22' BOX BODY**  
 3 Hitachi SK91 SD3 with 14:1 lens and all the equipment required for studio and ENG use.

**\$327,000**



**22' VEHICLE WITH 14' CUBE BODY**  
 3 Hitachi FP22 S/3 with 10:1 lens, microprocessor for automatic set-up and all the equipment required for studio and ENG use.

**\$203,000**

## Both Vehicles Include:

- 3 O'Conner Fluid Heads, tripods, spreaders and dollies
- 3 Christie Reflex 20 batteries and 1 charger for speedy 20 minute charge
- 1 Grass Valley Production Switcher 1600-AN
- 1 Lerro Character Generator System with Chyron VP1 and Sony SMC 70 Microcomputer
- 2 Sony 3/4" VTRs 5850/5800
- 1 Adda TBC
- 1 Yamaha 12 Input Audio Board
- Fully monitored—B&W and color, audio and video patching, on board power and air conditioning
- Prices include engineering, turnkey installation, manufacturers' warranty, delivery and training.

**DESIGNED TO ACCOMMODATE 1" HITACHI VTRs - TRIAX ADAPTORS ALSO AVAILABLE**



## LERRO

ELECTRICAL CORPORATION  
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For more information, call Bob McTamney at (215) 223-8200

## CORPORATE DATA

**Itam Corporation**, an English manufacturer of audio mixing consoles and multi-track recording equipment, will be represented in the United States by JC Audio Distributors, 280 Mill St. Ext., Lancaster, MA 01523, 1-617-365-2130, and Studiobuilders, 919 North Victory Blvd., Burbank, CA 91502; 1-213-842-9526.

**BGW Systems**, Hawthorne, CA, has appointed a Pacific Northwest organization to represent its pro audio line. The new sales group is Roger Ponto Associates, 8611 NE 26th Place, Bellevue, WA 98009; 1-206-453-8487.

**Sound Technology**, Campbell, CA, announced that Evans Sales and Marketing Group, Nashville, TN, will represent the company in Alabama, Tennessee, Mississippi and the Carolinas.

**Cinema Products Corporation** has announced that it has been undergoing a major reorganization. Its board of directors now includes Ed DiGiulio, chairman of the board and president; Peter Waldeck, senior vice president in charge of international marketing; Ed Clare, vice president and general manager; Guy Gessel, chief engineer; Charles Lipow, advertising and public relations; Leonard Berman, financial consultant (outside board member); and Donald Peterson, investment counselor (outside board member).

**Bardwell & McAlister**, Hollywood, CA, has appointed five additional distributors and several dozen new dealers throughout the United States and Canada. New distributors include Gordon Enterprises, Los Angeles;

Victor Duncan, Detroit, Chicago and Dallas; Filmtrucks/Cinemobile, New York; Brojo Lighting, Quebec; and Stage Equipment and Lighting, Miami.

**Audio + Design Recording** has announced that it will distribute the **C.N. Rood** line of digital stereo generators in the United States.

The **Dubner CBG-2** videographics generator has been used in commercials for Eastern Airlines. It has also been used to produce station IDs for KCTV in Kansas City, KS, and WTX in Columbus, GA. Also, North Carolina-based SAS Institute has developed an animated halo effect with the CBG-2—an effect previously believed to be too difficult for the system.

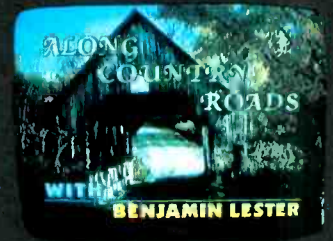
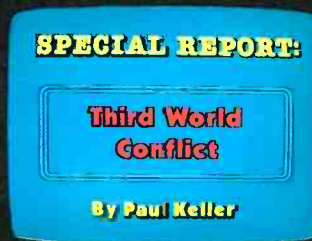
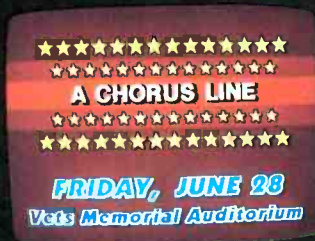
**Beston Electronics**, Olathe, KS, has signed a letter of intent to acquire **McInnis-Skinner & Associates**, Oklahoma City. Newscan and Weathergraphics are two major McInnis-Skinner products.

**Studer** has appointed a network of independent audio dealers, including Audio Engineering Associates, Pasadena, CA; Bridgewater Custom Sound, Harvey, IL; Doug Brown Enterprises, Tulsa, OK; Cramer Video, Needham, MA; Midcom, Arlington, TX; Emco, Rockville, MD; Pro Audio General Store, Atlanta, Coral Springs, FL, and Carol Stream, IL; and Studio Sonics Corporation, Schaumburg, IL.

**Compucon** now offers a variety of SCA services to FM broadcasters. For more information, contact Scott Goldman, Compucon, P.O. Box 401229, Dallas, TX 75240; 1-214-680-1000.

[:{=)]]]]

# 7200 COMMUNICATOR



Certainly our 7200 Communicator produces high-resolution, proportionally spaced characters from a multitude of undistorted standard and special fonts. Instant italics, font intermix, animated graphics, and auto sequence are also included. These are all features you would expect to find in any Broadcast-class Graphic Generator.

What wouldn't you expect? How about a choice of 32,768 background and character colors, a 100-line resident text memory, four 128-character resident fonts. How about a full-screen status/preview display and a basic PROM alternative to RAM/disk memories.

What you will come to appreciate the most, however, is that our imagineering has made the operation and maintenance of the 7200 simplified.

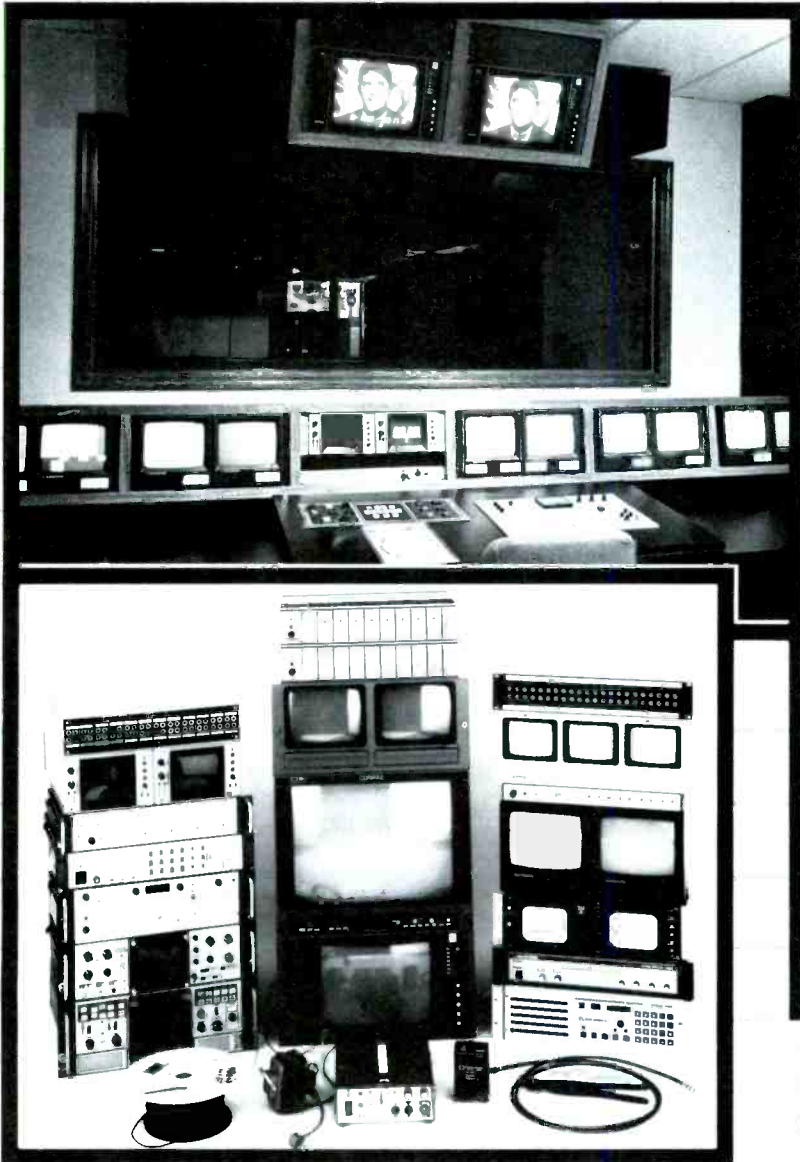
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# 300 YEARS EXPERIENCE, AND AVAILABLE

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More than 100 top broadcast product lines to choose from ... many from our warehouse stock. Next day shipment of monitors, racks, vectorscopes, waveform monitors, coax connectors, TBC'S, DA'S, bridging switchers, sync generators, test generators, demodulators, audio wire, microphones, jack panels, patch cords, audio amps ... everything you need to make changes in your plant, at low prices.



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## DESIGN/ CONSTRUCTION

We will design, equip and construct your TV facility ... from studio cameras to antenna: a small studio, a complete television station, or a mobile unit. We charge reasonable prices and we finish on time.



## PREWIRED/PREPACKAGED SYSTEMS

TM-100	Transmitter Input Monitoring (shown)
VTM-1000	VTR Input Monitoring (Bridge)
VTC-1	Mobile Video Test System
BJ SERIES	Prewired Audio Jack Panels
CUSTOM	Modular Systems (such as Video/Audio Distribution & Routing)

We can build and test them at our place for easy installation at your place.

## FINANCING

We can provide LEASE FINANCING of our products and services for as little as \$10,000. Up to ten years to pay. Low rates. Fast service.

For more information, contact us.  
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# Comtech's satellite feed uses less than 1% of a transponder's capacity.



Our sophisticated satellite radio network system can reduce your monthly operating costs substantially compared to land lines. We design and deliver complete networks that provide the highest level of performance and reliability at a very attractive cost of ownership.

**Less than 1% of a transponder's** bandwidth and EIRP is required to achieve the same performance provided by other systems requiring considerably more capacity.

**Network expandability** is achieved via Comtech's unique mechanical package which allows a combination of SCPC, MCPC, digital data or composite video/audio demodulators. Dual and triple feeds are available for simultaneous reception from satellites spaced up to 8°, such as Westar III and Westar IV.

**High quality audio** is the result of Comtech's advanced audio processing system.

Up-link Terminal includes audio processor, SCPC modulator, up-converter, high power amplifier, antenna feed system, 5 meter antenna with mount, and receive-only components for system monitoring.

Receive-Only Terminals include SCPC demodulator, audio processor, 7-slot housing, down converter, low noise amplifier, antenna feed, and 3.8 meter antenna with mount.

**For your complete regional or state radio network, designed, built and delivered by Comtech, call or write:**



**COMTECH Data Corporation**

A SUBSIDIARY OF COMTECH TELECOMMUNICATIONS CORP

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(602) 949-1155, TWX 910-950-0085

## 3M plans recording research center

3M has announced that its Memory Technologies Group will help develop an academic center for magnetic recording research at the University of California, San Diego. The \$12 million facility will be the first such center for basic recording research in the United States.

UCSD will contribute \$1 million, land for the center and four new faculty members specializing in magnetic recording research. Additional funding will be provided over a 5-year period by 3M, IBM, Control Data Corporation, Eastman Kodak, Data Electronics, Pfizer and Verbatim Corporation.

Industry contributions will provide the center with a 23,500-square-foot building, four endowed chairs, laboratory equipment and other support. Executives from participating companies will serve as advisers. The center will operate from rented facilities until construction is completed.

## Stereo on cable launched in Canada

The Canadian Cable Television Association (CCTA) and the Canadian Association of Broadcasters (CAB) will combine forces to launch, on an experimental basis, Canada's first AM radio services available on cable in stereo sound.

Normally available only on an AM radio receiver in monaural sound, CKPG and CJCI, Prince George, British Columbia, will be carried in stereo on the audio cable service provided by Central Interior Cablevision of Prince George.

## CATEL introduces AM stereo at NCTA

CATEL demonstrated AM stereo as an optional service for CAFM (Cable FM) at the NCTA show in June, held in Houston.

The primary audience for AM stereo is expected to be automobile radio listeners. AM's greater transmission range offers improved stereo service to areas with limited FM coverage. The CATEL concept uses an AM stereo receiver to drive left and right channels for modulation of a cable FM channel.

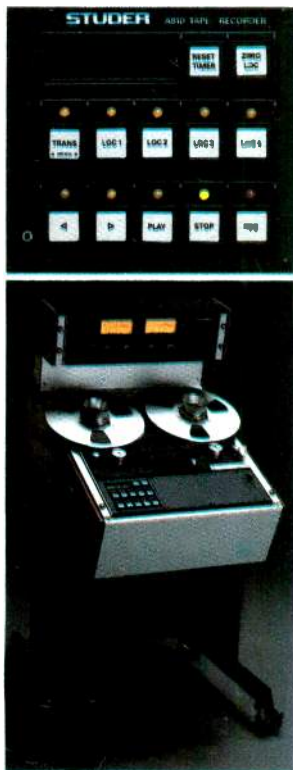
## WVAB receives NRBA Merit Award

WVAB Radio in Virginia Beach, VA, received the NRBA Certificate of

Continued on page 120

Circle (20) on Reply Card

# Studer Re-States the Art



With the new A810, Studer makes a quantum leap forward in audio recorder technology. Quite simply, it re-states the art of analog audio recording.

By combining traditional Swiss craftsmanship with the latest microprocessor control systems, Studer has engineered an audio recorder with unprecedented capabilities. All transport functions are totally microprocessor controlled, and all four tape speeds (3.75 to 30 ips) are front-panel selectable. The digital readout gives real time indication (+ or - in hrs, min, and sec) at all speeds, including vari-speed. A zero locate and one autolocate position are always at hand.

That's only the beginning. The A810 also provides three "soft keys" which may be user programmed for a variety of operating features. It's your choice. Three more locate positions. Start locate. Pause. Fader start. Tape dump. Remote ready. Time code enable. You can program your A810 for one specialized application, then re-program it later for another use.

There's more. Electronic alignment of audio parameters (bias, level, EQ) is accomplished via digital pad networks. (Trim pots have been eliminated.) After programming alignments into the A810's memory, you simply push a button to re-align when switching tape formulations.

The A810 also introduces a new generation of audio electronics, with your choice of either transformerless or transformer-balanced in/out cards. Both offer advanced phase compensation circuits for unprecedented phase linearity. The new transport control servo system responds quickly, runs cool, and offers four spooling speeds.

Everything so far is standard. As an option, the A810 offers time-coincident SMPTE code on a center track between stereo audio channels. Separate time code heads ensure audio/code crosstalk rejection of better than 90 dB, while an internal digital delay automatically compensates for the time offset at all speeds. Code and audio always come out together, just like on your 4-track. Except you only pay for 1/4" tape.

If you'd like computer control of all these functions, simply order the optional serial interface. It's compatible with RS232, RS422, and RS422-modified busses.

More features, standard and optional, are available. We suggest you contact your Studer representative for details. Granted, we've packed a lot into one small package, but ultimately you'll find that the Studer A810 is the most versatile, most practical, most useable audio recorder you can buy.

The Swiss wouldn't have it any other way.



**STUDER REVOX**  
PRECISION FROM SWITZERLAND

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Offices: Los Angeles (213) 780-4234 • New York (212) 255-4462 • Dallas (214) 760-8647 • Canada: Studer Revox Canada, Ltd.

Circle (21) on Reply Card

# Mount Sutro: Evolution of a tower

By Donald E. Lincoln, director of engineering, Sutro Tower, San Francisco, CA

Independence Day was celebrated as usual in most of the United States this year, but for broadcasters in San Francisco, it was special: the 10th anniversary of the Mount Sutro Tower. The author reviews design and construction highlights of the facility, a project that taxed the engineering and construction talents of the era.

The planning for Sutro Tower (which appears on our cover this month), first began in 1956, when ABC first applied to the FCC for approval of a tall tower for San Francisco. It was Feb. 21, 1971, however, before construction actually began on the first of the super towers.

## The early days

Before the erection of Sutro Tower, TV broadcasting in San Francisco originated in three locations.\* During the formative days in the late 1940s, as licenses were issued, stations opted for different transmitting sites. KPIX/Channel 5 broadcasted from the top of the Mark Hopkins Hotel on San Francisco's Nob Hill; KGO-TV/Channel 7 chose Mount Sutro; and KRON-TV/Channel 4 selected Mount San Bruno, 3½ miles south of San Francisco. KSAN-TV, a UHF pioneer, joined KGO-TV on Mount Sutro and, after three years at the hotel, KPIX also moved there. Later, KQED/Channel 9, and KBHK-TV/Channel 44 were located at San Bruno. KOVR/Channel 13 erected a tower and antenna on Mount Diablo, east of San Francisco, that covered the Sacramento Valley and the bay area.

It was apparent from the beginning that a common tower would offer advantages to all area broadcasters. The problems were location and owner-

ship. Because ABC (KGO-TV) was already in place at Mount Sutro, it filed for that location. Channel 13 could not join in any San Francisco-based tower location because it was



Workmen lay reinforcing steel for footing. Vertical bars will tie into foundation when it is poured. (March 2, 1971)



Forms and reinforcing steel for grade-beams and tower foundations are set after footings have hardened. Fourteen-foot-square foundations are poured on top of 56-foot-square footings. Grade beams are poured last. Grading and backfilling will bring ground level to top of foundation when finished. (April 2, 1971)

licensed to the city of Stockton. On the other hand, the Channel 4 group was fully committed to Mount San Bruno.

In 1952, when KPIX moved from its hotel location to join KGO-TV and KSAN-TV at Mount Sutro, the lines were firmly drawn. There were then only two major broadcast centers: Mount Sutro and Mount San Bruno. When KTVU/Channel 2 went on the air in the mid-'50s, it was located at Mount San Bruno.

At about the time that KGO-TV filed for a tall tower at Mount Sutro, KRON-TV filed for one at Mount San Bruno. Both applications resulted in reams of paper and many meetings with government agencies and commissions. The two factions competing for the two locations spent many hours and dollars presenting their respective positions. After 10 years of negotiations, the Federal Aviation Agency approved the Mount Sutro location. (The proximity of the San Francisco International Airport to Mount San Bruno had disqualified that location as a site for the tall tower.) After final litigation, the opposing factions formed a consortium to build the big tower.

## Design

Before this final decision, little had been done to formally design either tower. Preliminary sketches used for presentations showed the proposed Mount San Bruno tower as a guyed-construction design and the Mount Sutro tower as a self-supporting design. Authorization for construction came in February 1966, when the San Francisco Planning Commission approved a conditional use permit for the site. Designers, architects, builders and other interested parties then went to work.

A massive amount of preliminary work was done by ABC before the incorporation of Sutro Tower in 1968. When the corporation was originated by the four principals (American Broadcasting Company, Westing-

\*See "TV in the Bay Area as Viewed From KPIX," BE May 1979.



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house Broadcasting Company, Cox Broadcasting Company and Chronicle Broadcasting Company), there was a good foundation of engineering data already available. Experts from the four parent companies joined consultants, engineers and designers from many disciplines in all phases of the project. Committees on antennas, finance and engineering were formed to handle specific areas, but service on these committees was in addition to the regular work loads of participants.

RCA did the antenna array design work. This project took more than 18 months and involved constructing scaled 1/10th-wavelength model antenna stacks to determine if the computer studies were correct in the predicted patterns and electrical interaction of the whole array.

The original tower design, prepared by Albert C. Martin & Associates in Los Angeles, proposed an orthotropic tower, a system whereby steel plates are welded to supporting members to make a homogenous structure. At the 11th hour, substantial increases were made to the proposed bid and the tower committee decided to seek alternative proposals. As a result, Bernie Kline of Kline Iron and Steel, Columbia, SC, attended a meeting in New

York and agreed to build a tower for the tower committee's original estimate. Kline and Martin & Associates completed a new tower design that became the basis of Sutro Tower.

Martin and RCA worked closely on the mounting and structure of the antenna system based on the Martin calculations.

The RCA antenna group then began



Pattern-plate supports giant "J" bolts that will attach to base leg of tower. Bolts are as thick as a man's wrist (April 6, 1971)

work with Kline to find a method for hanging transmission line within the tower legs. Special fittings and hard-



First section of north tower leg is in place. Note crane in foreground. Transit is used to check angle; men in background show scale of leg. (Aug. 30, 1971)

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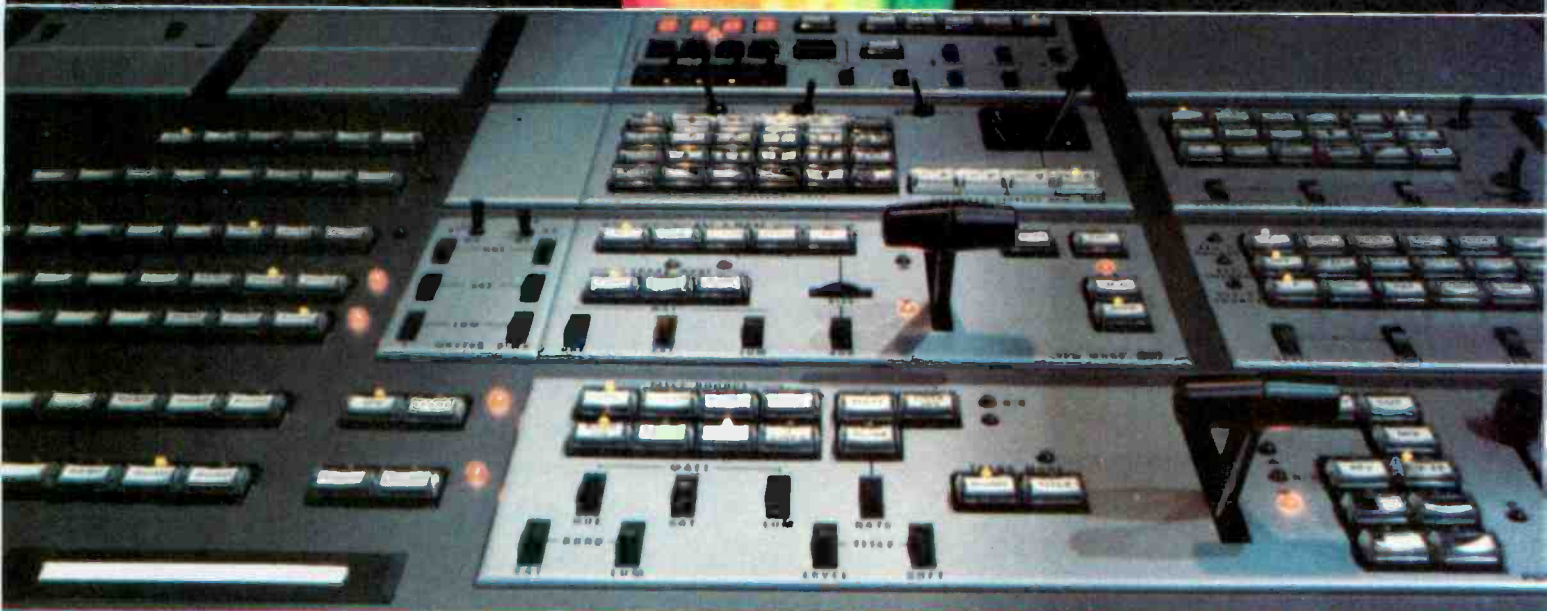
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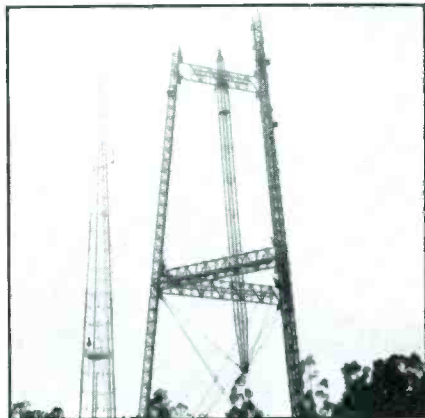
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ware were required because the designs called for a tower tapering inward at about a 5° angle to the 550-foot point and then reversing to an outward angle of about 5°.

Final plans for the tower, after hearings, were approved for construction.

#### Earthquake concerns

One of the specifications for the tower and antenna was that they be capable of withstanding an earth-



Basket boom shown in place against fog background. Old 517-foot tower, at left, is dwarfed by new structure. (March 24, 1972)

quake of 8.3 on the Richter scale. In early 1971, southern California experienced the Selma earthquake, which resulted in significant damage, including the complete destruction of a hospital. As a result, the Sutro design was re-evaluated and determined to be satisfactory. However, because of the similarity of the vibration period of the tower and antenna structures, there was concern about failure of the antenna system during the sway produced by a moderate earthquake. To prevent these distortions, a system of outriggers was added to the sixth level as supports for a guy arrangement on the three antenna stacks. As a result of these changes, the tower base members had to be increased in size to tolerate the additional weight.

#### Construction

Construction began in late February 1971, with footings cut into the undisturbed rock of the mountain. Grade beams were channeled to connect the three legs to prevent seismic shifting. After the footings were dug, 56 feet square and 10 feet thick, the concrete pouring presented a logistic problem. Ten yard trucks, pouring every few minutes for 24 hours, contributed 1100 cubic yards of concrete for each footing. The foundations, each a

14-foot cube, were then poured on top of the footings. The grade beams were poured last, connecting the entire system.



Building construction is concurrent with tower erection. Crane is used for building work, not for tower. Forms at right will enclose south leg of tower after transmission lines are installed. Whole tower will receive "skin" of baked enamel panels when completed, for protection and visibility. Panels will never need painting. (March 24, 1972)

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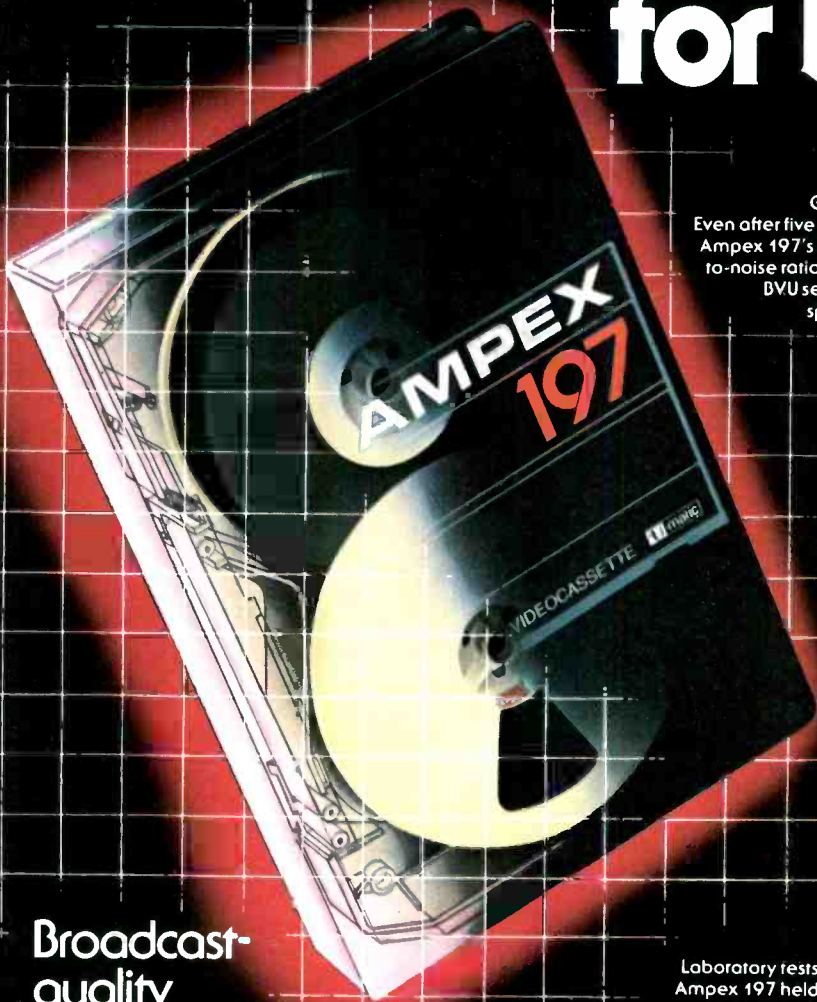
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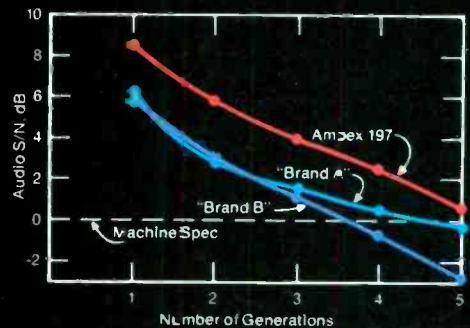
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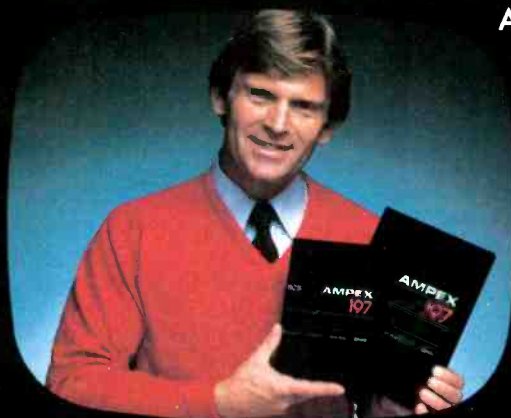
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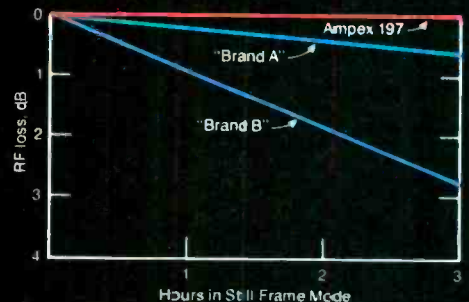
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Raising the steel presented major problems. The erection of the first 300 feet of tower onto its foundation went without incident, with steel members raised by a ground-based model 3900 Manitowoc crane. Above this height, a system of three luffing gin-poles, one on each leg, was substituted, but difficulties arose because of rigging geometry. For this reason, Radio Construction Company, the erection subcontractor for Kline Iron and Steel, fabricated a basket-boom arrangement. This new boom could swing from leg to leg within the center of the three legs. Support of the boom was by a series of cables attached to the legs. Guys from the top of the boom held it in place during lifts. This design allowed the pole to be luffed in any direction through 360°. A swiveling pulley at the top, called a rooster-head, allowed loads to be picked up for any leg. The original design called for ball-bearing races for the movable head, but long delivery time required changing this to a pressure plate system with electric hydraulic control mounted near the top. Building and installation of the basket boom delayed certain phases for about eight months, but construction on other phases proceeded.

After the basket boom was in place (a major accomplishment because of its 300-foot length) construction resumed at an accelerated pace. When ground crews lost visual contact with those aloft because of San Francisco's famous fog, radio contact kept work flowing.

Wind was the greatest hazard as the height increased. There are times at Sutro when you can enjoy calm at ground level and experience 40mph wind a few hundred feet in the air. Also, there are times when the ground level is fogbound and it is clear and sunny above.

Steel was supplied by US Steel and Bethlehem Steel with fabrication by Kline. The finished members, shipped by rail flatcar to San Francisco, were assembled and trucked to the job site. The whole thing went together like a giant erector set. The trusses were assembled on the ground and raised as a single unit. There was little welding on site, because everything was bolted together.

Almost everything exposed to the weather was hot-dipped galvanized, and all other members were coated with rust-inhibiting paint. (With the exception of touchup work, there has been only one major paint job in the 10 years of tower operation.)

### Transmission lines

Topping off occurred in December 1972 and the tower was ready for installation of transmission line and

antennas. This was a major logistic problem in itself. The line sections of RCA Universal line were 20 feet long. They had to be raised and fitted within the south tower leg. As a result of excellent planning by Kline and RCA, it went surprisingly well. The lines were fitted with compensators that tune out the reactive bumps caused by the many elbows and fittings; some are 1200 feet long. VSWR losses are kept low by using 6-inch



First of three leg sections being hoisted by basket boom for use at fourth level. Note the double angle to reverse tilt from 5° inward to 5° outward angle. Fourth level is used by owners and tenants for ENG and news radio communications. Small elevator runs to all levels. Fourth level also has small hoist for lifting communications cabinets and other gear. (July 1972)



Heaviest load that the basket boom must lift is the 92-foot-long, 35-ton top truss. All trusses were assembled on ground and lifted as one piece. In this case, outriggers were added after trusses were in place. Top trusses are square in cross section; other levels are triangular. (Oct. 18, 1972)

# This is Larry Boden

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# Sutro Tower statistics

- Overall height is 977 feet.
- Height above sea level is 1811 (AMSL).
- It is the highest structure in San Francisco.
- It is only a few feet shorter than the Eiffel Tower.
- There is three times as much weight, in concrete, below ground, as the weight of steel above ground. The center of gravity is 13 feet below ground.
- Steel, all domestic, weighs 3,400,000 pounds. The antennas add another 200,000 pounds.
- There are more than 25,000 feet of transmission line, all copper coax.
- Total cost including tower, building and antennas was in excess of \$12 million. Today's cost would exceed \$50 million.

line for VHF and 8-inch line for UHF stations. (Only one station uses 3-inch lines.)

The antenna structure is a combination of super-turnstile, traveling wave and polygon design. The Channel 4 and Channel 5 antennas are unusual; the stations share an antenna with filters keeping interaction to a minimum.

While the tower was being built, a companion construction project was the transmitter building adjacent to the tower. It incorporates the south leg of the tower within the building so that transmission lines can directly enter the tower.

### Station locations

The four FM stations use the north leg for their transmission lines. The FM antennas are located at and below the sixth level. The TV stations occupy the stacks above the sixth level: north stack (from top), Channel 9, Channel 32 and Channel 26 (unused); south stack, Channel 7 and Channel 44; and west stack, Channel 2 with the Channel 4/5 antenna on top.

The cover of this issue shows the antenna system. (The tower's east face is away from the observer.) The mast hanging down from the top level is a joint antenna for KGO-FM (top two

bays) and KFOG (single bay at bottom). The mast upward from the fifth level is the recently installed KOIT antenna. KQAK has a leg-mounted panel antenna on the right. The others are spare or abandoned.

All communication and ENG microwave systems are located at the fourth level, two down from the top, at the narrowest part of the tower. The third level is currently unoccupied. The second level contains microwave and other communications systems. Ground level is the first level.

During the final few months of work on the tower, the various stations installed their new transmitters in the recently completed transmitter building. On July 4, 1973, by mutual agreement, all of the stations began transmitting from the new facility. People who had never before enjoyed good reception got it. Many receiving antennas had to be re-oriented, but more people than ever before got good, clear TV pictures.

### Acknowledgements

The author expresses thanks to Harry N. Jacobs, retired director of engineering for the Sutro Tower, for his help in preparing this article. Thanks also to Raymond M. Holtz, former chief engineer, KPIX (also retired), for his assistance.



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VP0010	0-10.5	.5	Toggle	.5	.2	3	4 3/8 x 2 3/8 x 1 1/16
VP0127	0-127	1.0	Toggle	.5	.3	14	4 3/8 x 2 3/8 x 1 1/16
VP0255	0-255	1.0	Toggle	.5	.3	16	4 3/8 x 2 3/8 x 1 1/16
VP0317	0-317.5	2.5	Toggle	.15	.3	20	4 3/8 x 2 3/8 x 1 1/16
VP0635	0-635	5.0	Toggle	*.50	.4	25	4 1/16 x 3 1/16 x 2 1/16
VP1100	0-1100	10.0	Rotary	1.25	.4	30	4 1/16 x 3 1/16 x 2 1/16
VP1270	0-1270	10.0	Toggle	*3.00	.4	30	4 1/16 x 3 1/16 x 2 1/16
VP2075	0-2075	25.0	Toggle	*3.00	.5	40	7 3/8 x 4 1/16 x 2 3/16
VS0315	0-315	5.0	Strap	.25	.4	28	4 x 2 x 1 1/4
VS0635	0-635	5.0	Strap	.30	.5	33	5 x 2 x 1 1/4
VS1275	0-1275	5.0	Strap	1.25	.5	33	5 x 3 x 1 1/4
VS2075	0-2075	25.0	Strap	2.50	.5	40	6 1/2 x 3 1/2 x 2

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VRM1275	0-1275	5.0	Slide Switch	*3.00	.4	33	1 1/4 x 4 1/8 x 9
VRM2270	0-2270	10.0	Slide Switch	*3.00	.5	40	1 1/4 x 4 1/8 x 9
VRS0317	0-317.5	2.5	Strap	.40	.5	26	1 1/4 x 4 1/8 x 4
VRS0635	0-635	5.0	Strap	.75	.5	35	1 1/4 x 4 1/8 x 6
VRS1270	0-1270	10.0	Strap	1.50	.5	37	1 1/4 x 4 1/8 x 9
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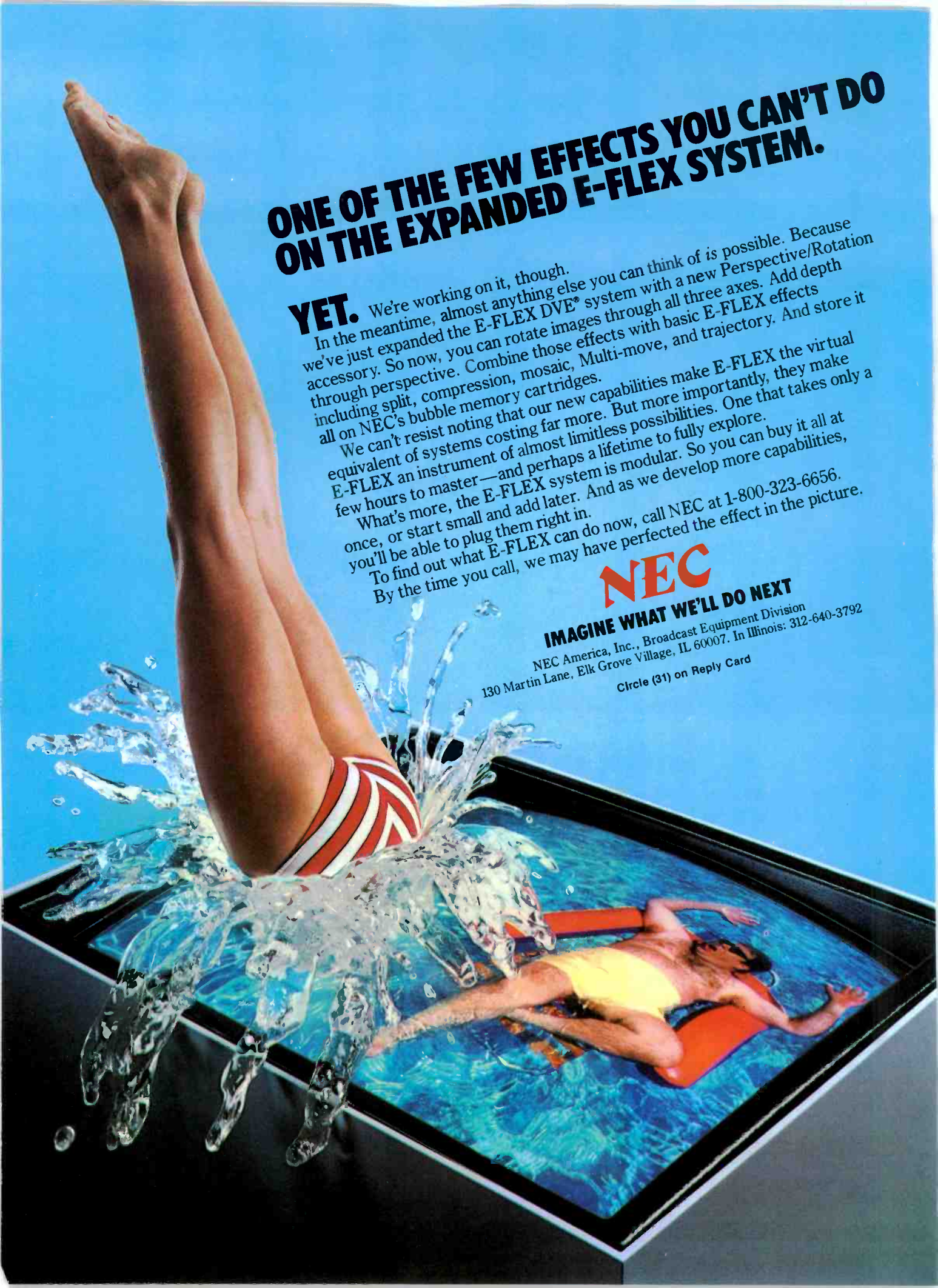
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# China TV revisited

By John H. Battison, director of engineering, WOSU-AM/FM/TV, Columbus, OH

In 1981 the general manager of the WOSU stations, Dale K. Ouzts, and I visited China and lectured on television at the Beijing (Peking) Broadcasting Institute as guests of the Chinese authorities. These impressions of the TV operation in China were described in my article, "Chinese Television Circa 1981," in the September 1982 issue of **Broadcast Engineering**.

At the end of our first visit, we were both invited to return for three months and bring our wives. It was not possible to return for the full three months in 1982, and pressure of work prevented Ouzts from returning. However, my wife, Sara, and I were able to accept the invitation for two weeks. On Sept. 2, 1982, we arrived in Beijing.

I presented a 30-hour course on directional antennas to the graduate students of the institute, and Sara taught English as a second language, also in the institute. (All students have to learn English, as well as Chinese, and many also take French and German.) The accompanying photo shows my graduate class, three of whom will be attending classes at OSU very soon!

Because we planned to visit the International Broadcasting Convention in England, we took a rather round-about route on the way back from China. We flew from Columbus, OH, to New York to London on TWA; then we took British Airways from London to Rome, Bahrein, Hong Kong and Beijing. On the return to London, we followed the same route, except that we stopped in Bombay, India, instead of Bahrein. This meant a lot of flying, but it was a great deal cheaper than going via the West Coast, and it gave us the opportunity to attend IBC in Brighton.

As a follow-up from our 1981 visit, the WOSU stations hosted four of the Broadcasting Institute professors from October 1981 through the end of 1982. Of this group, two were engineers, one was a producer and one was an English professor. They certainly enjoyed their stay with us, and we, at the WOSU station, in turn, enjoyed their presence. And it was exciting to see them again on my return to China.

## Chinese broadcasting

The TV situation in Beijing remains much the same as it was on my previous visit except that the operating hours have been increased considerably. All day the main chan-

nel, Channel 2, carries educational material. It was interesting to see



The author and his class of graduate students during a directional antenna course at the Beijing Broadcasting Institute.

## TV programmes

### September 11 (Saturday)

#### Channel 2

- 17:30 ABC of middle school math: Analytic geometry (54)
- 18:20 Learn to combine sounds into syllables (3)
- 18:30 Follow Me (24A)
- 19:00 News
- 19:30 Animal world: The Giant Whale
- 19:50 Stage and Screen (14)
- 20:05 TV play: Inside the Thick Forest at the Top of the Mountain
- 21:30 12th Party Congress news
- 21:50 Across Our Motherland: Jingbo Lake, Heilongjiang Province
- 22:15 Ancient Chinese music

#### Channel 8

- 19:00 Hygiene and Health: Shadow Boxing
- 19:20 Documentary: On the Way from Xiangyang to Chongqing
- 19:40 TV feature: School Run by Peasants
- 19:55 Drama film: Iron Bow as Go-between
- 21:50 news
- 22:20 12th Party Congress News

#### Channel 6

- 18:30 TV feature: Children
- 19:50 Canadian wild animals (2)
- 20:20 Have a Try (6)1. Home cooking: Chinese and Western pickles 2. Sightseeing in the outskirts of Beijing

Figure 1. Program listing from the *China Daily* (Sept. 11, 1982). Note the British spelling.

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View of control room and studio.

English capital letters, Arabic numerals, Greek symbols and standard math equations combined with Chinese on the screen. This emphasized the universality of mathematics as a language. Trigonometry was immediately recognizable, as were lectures in ac theory and similar topics. Entertainment hours, as shown on the copy of the local program in Figure 1, have been extended. Obviously, efforts are being made to provide more entertainment, as well as education, for TV viewers.

Incidentally, a correction is in order. In my previous article, I suggested that the antennas on top of the Central Broadcasting Administration of China (CBAC) building were used for normal broadcasts. I learned that these had been used experimentally earlier, and that telecasting now originates from a self-supporting 600-foot tower a few miles away. (Misinformation such as this is one of the pitfalls of translation.)

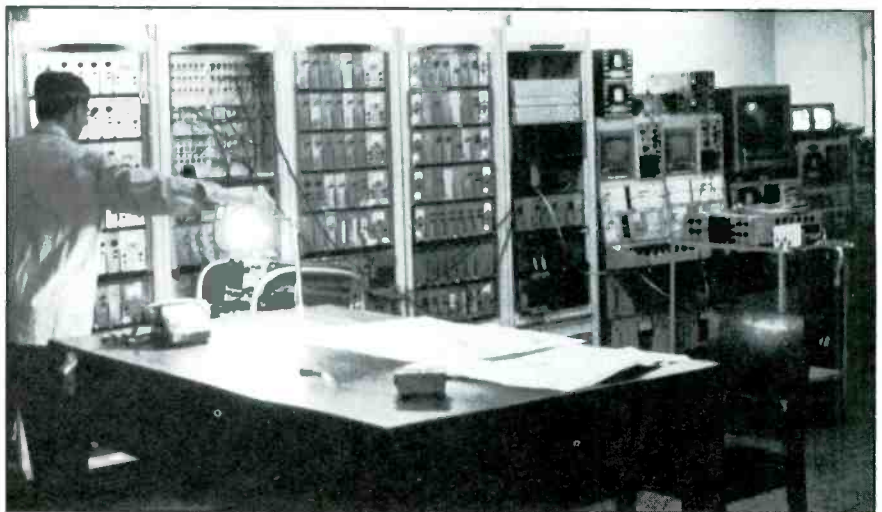
Construction of the new Beijing Broadcasting Institute has continued at a rapid pace; one of the buildings is now completed, although not yet occupied. Student enrollment has risen to about 1000, with about 300 professors, many lecturers and support staff.

### Shanghai

On leaving Beijing, we were taken to



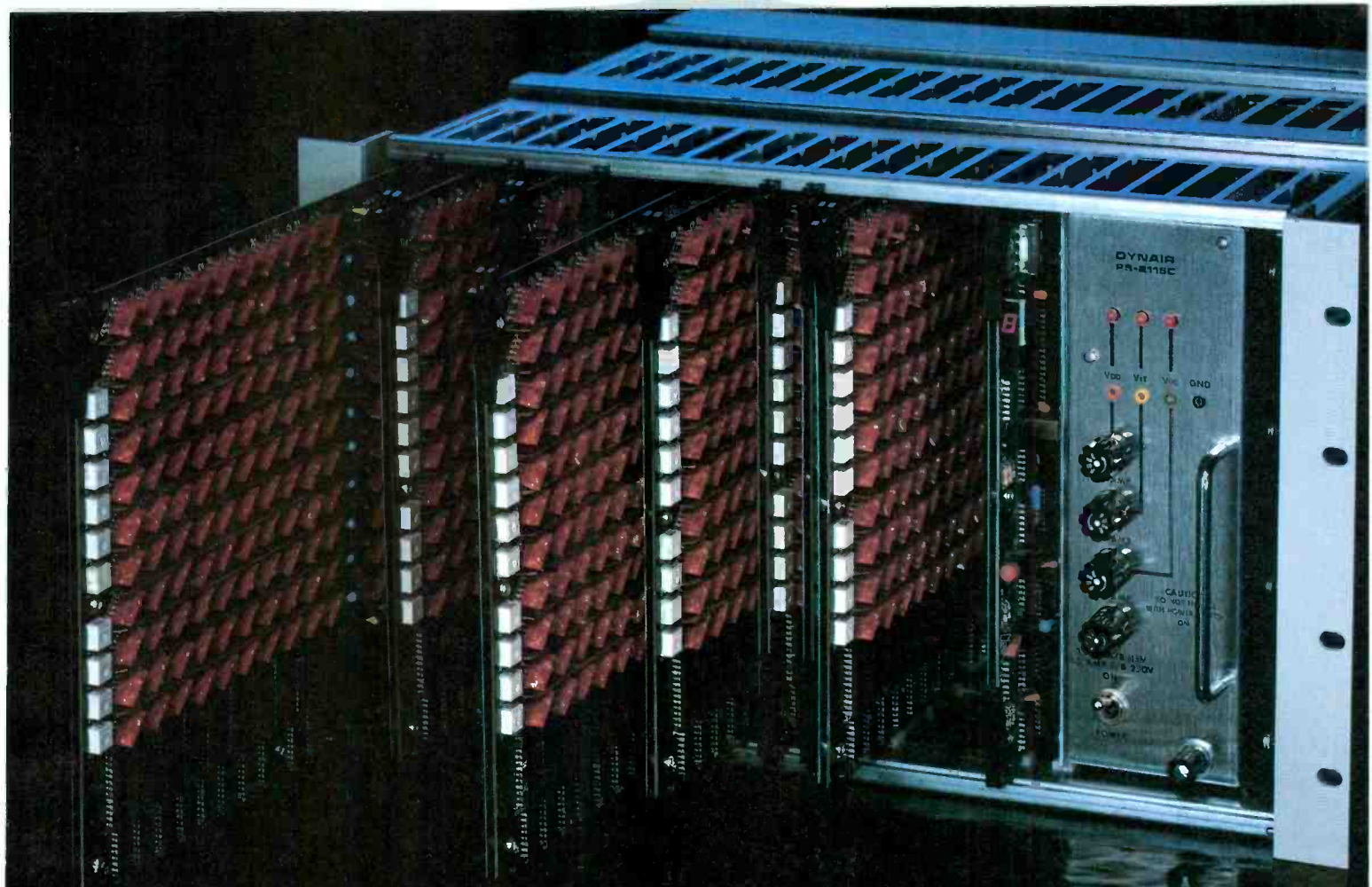
Main TV studio in Shanghai with laser-produced rainbow.



Control room in Shanghai TV.

Continued on page 42





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Continued from page 38

Shanghai, where my first port-of-call, of course, was the TV studios and transmitters. The TV studios in Shanghai appear to be newer than those in Beijing, and the main studio is larger. During our visit, the Regional Symphony Orchestra and its Choral Group were being videotaped. A photo on page 38 shows the interior of the studio, giving an idea of its size. One of the numbers called for a rainbow on the cyclorama. CBAC technicians devised a laser rainbow, and part of this rainbow is shown in a

photo on page 38, before it was completely developed. Some early Chinese-designed-and-built color cameras are used, together with some newer Sony cameras. It was interesting to note that 3/4-inch equipment is used, and some Sony VP 5850s and VP 5800s were seen. If my memory serves me correctly, there were also some Ampex Quads. Two photos (page 38 and this page) show various control rooms and technical facilities. A Chinese-built 3-tube flying spot scanner used for transmitting slides is shown in a photo on this page.

The studios are close to the TV

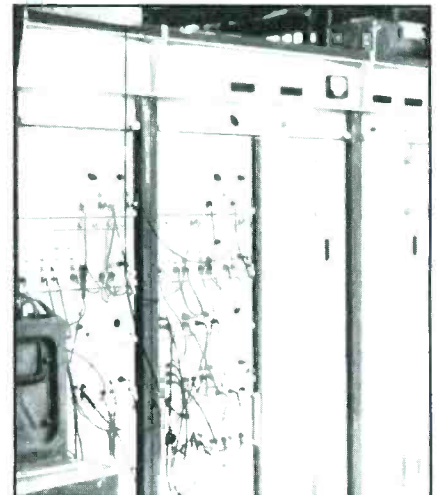
lower where the three transmitters for Channel 2, Channel 6 and Channel 20 are located. A comprehensive program of replacing obsolete equipment



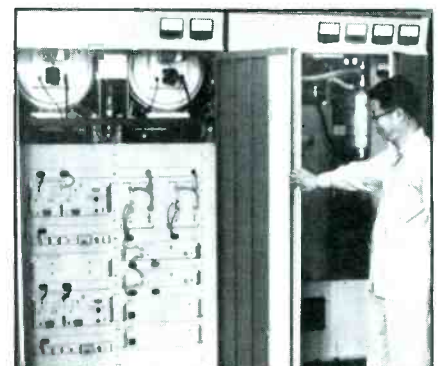
Master control in Shanghai TV.



Flying spot scanner constructed in China.



Low band TV transmitters.



New Channel 20 UHF TV transmitter.

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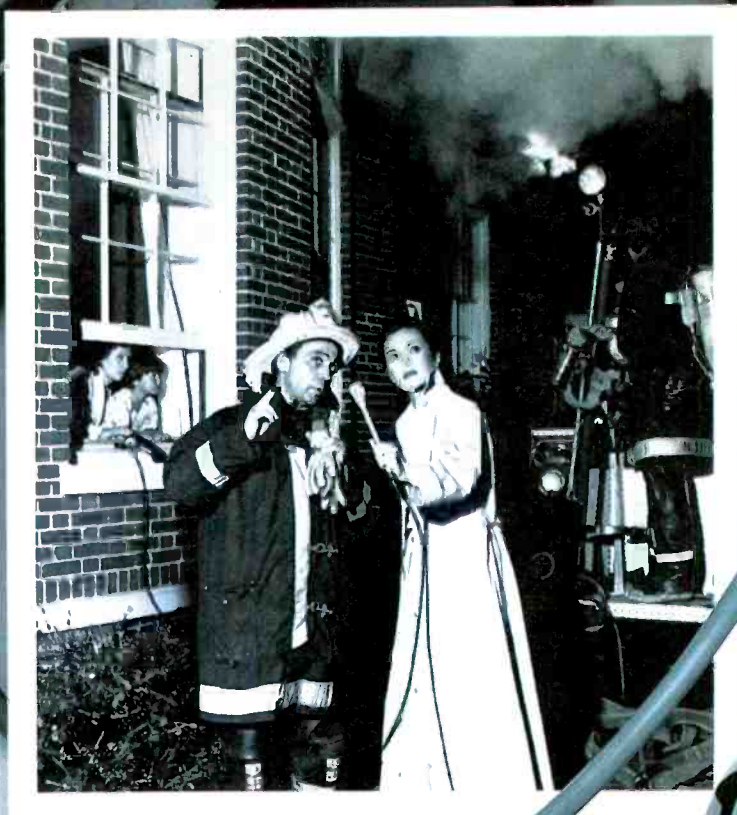
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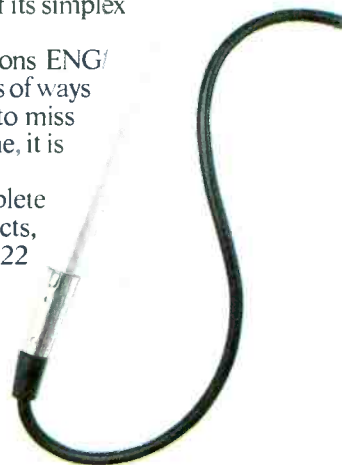
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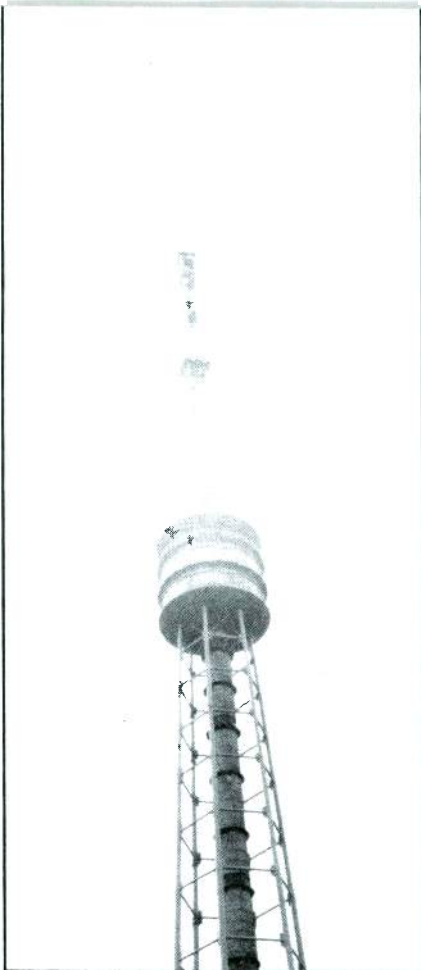
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View of TV/FM antenna tower in Shanghai. Elevator is in round tube on lower portion of tower.

is in progress; the old and new UHF transmitters are shown in a photo on page 42. Once again, the quality of operation and maintenance was high. Neither the inside nor the outside of the transmitters had traces of dirt or slack operation. We were received by Fan Yu-Xian, vice president of the Shanghai antenna station; Wang Zhu Yun, engineer; and Wang Zhigiang, leader of the Antenna Group.

The 600-foot TV tower carries the antennas for the three transmitters. It also carries the FM antennas. Because of language difficulties, there was a little problem in learning the ERP of the three transmitters. But it appears that the two lowband VHF transmitters have ERPs of about 50kW, with the Channel 20 transmitter at about 200kW. These figures apparently provide adequate service to Shanghai and its outlying districts.

Every city of any size in China now has at least one transmitter carrying the national program, on Channel 2 when possible. Also, there are many relay transmitters and translators, so

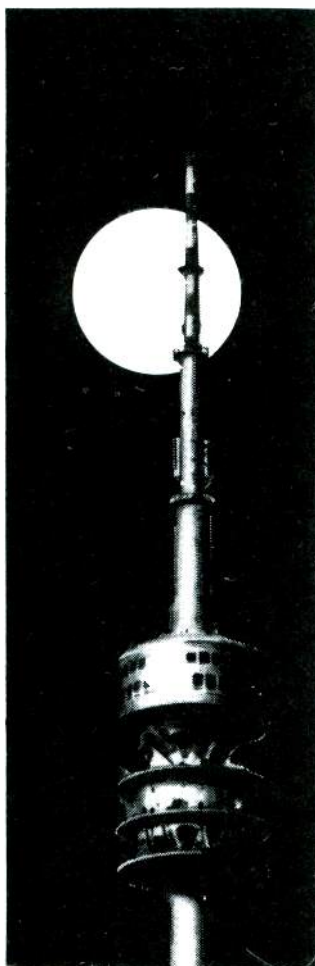
that a TV signal of some kind is available to much of China. Of course, in outlying areas, TV receivers are located at the various communes so that, in theory, most of the people can be served.

#### Final notes

It was a delightful and fascinating two weeks; as in the previous year, I was saddened to leave. In the 15 months between my visits, Beijing has changed considerably. There is now far more automobile traffic (I understand that Chinese citizens are now allowed to buy automobiles if they can afford them). There are more tourists, and it seems as though the cyclists have doubled in numbers. One sign of the times that I'm sure the Chinese would be happy to be without is what appeared to me to be smog in Beijing! Certainly every day that we were there, after about noon, visibility in Beijing decreased.

We left our hosts with regret amid mutual hopes of revisiting China and hosting more of the institute's staff at WOSU in the future. We wandered into the Friendship Store in Hangchow and purchased a Chinese screen for our home. It arrived on that slow boat from China in February.

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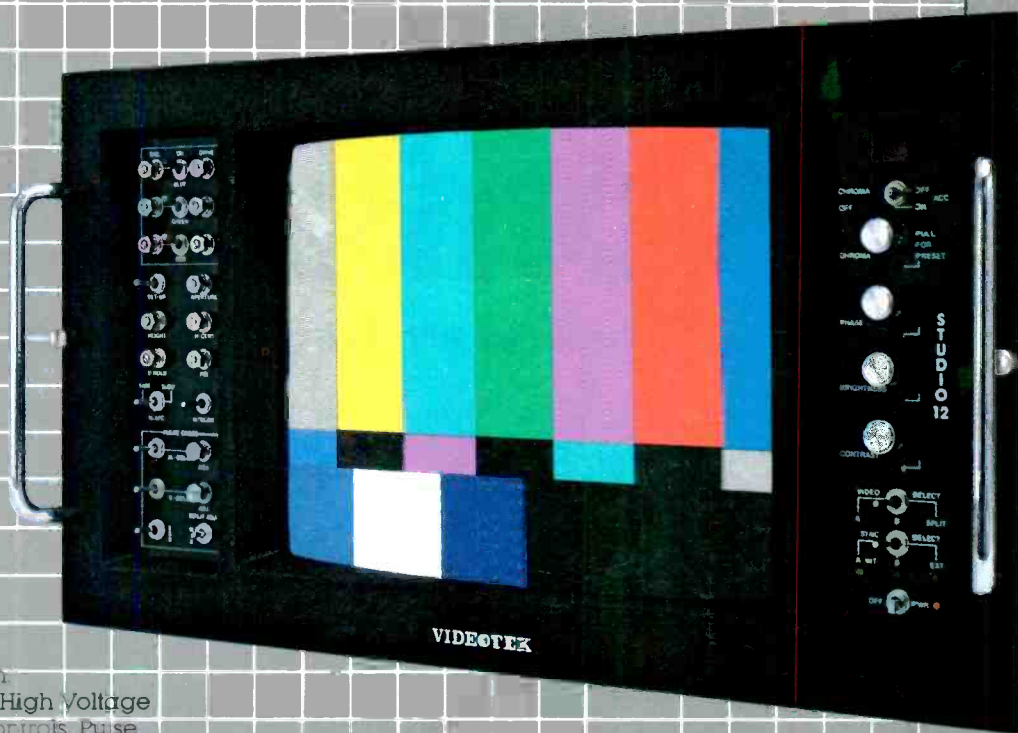
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# Conversations

An interview with Warren J. O'Buch of Conrac Corporation

---

During NAB-'83/Las Vegas, **BE** interviewed Warren J. O'Buch, director of marketing, Conrac Division, Conrac Corporation, Covina, CA. Part of this discussion, which included O'Buch's plans for introducing new products and aligning Conrac's marketing emphasis in light of rapid changes in the design, manufacturing, marketing and distribution of equipment for broadcasters, is presented here.

---

**Q:** What major changes do you see in monitors?

**A:** For us, it is the in-line monitors that have finally moved into broadcasting. A few years ago, a broadcaster would not have talked about them; everything was strictly delta-delta. However, because of international inroads, you now find in-line units in almost every part of the broadcast market.

**Q:** What was your major thrust at NAB-'83?

**A:** Conrac has been in the business for 36 years. Most of the other monitor manufacturers have been involved for less than five years. We used the convention to show people why we are going to be in the business for another 36 years. Our model 6200 is the first of several steps in that direction.

**Q:** Why wait until now for this product?

**A:** Conrac has waited to introduce an in-line monitor primarily because we wanted to "do it right," as we see the

product. What we have done is to introduce a Class I monitor. I feel safe in saying that no other current in-line monitor is a Class I system. The 6200 is an RGB-structured NTSC monitor. Standard units allow switched RGB/NTSC operation. In less than a year, we plan to add PAL. If there's a demand for a SECAM decoder, we'll look into that as well.

**Q:** What type of market are you seeking?

**A:** We're looking at master monitor applications. We're looking for people who cannot go all the way to a unit like our 6100, our top performance monitor. The 6200 will not replace the 6100, although it offers only 7% to 10% less of the performance characteristics. There is a significant cost difference, however, with the 6200 saving the customer about \$3000.

**Q:** Why are broadcasters interested in in-lines?

**A:** Primarily because of cost-effectiveness. Stations are looking for lower prices, and for equipment that reduces labor costs. For instance, automatic camera setup is a high cost feature, but the cost is justified to save labor. Also, broadcasters want lower priced monitors, particularly if they retain "broadcast quality." Our in-line proves that they can get even better quality. And there will be other advancements.

**Q:** What advances do you foresee?

**A:** We're looking at the possibility of adding beam current feedback (BCF), but that's a year or more away. To our knowledge, no one has approached it

yet. It's difficult to do BCF with an in-line, because you can't get at the guns like you can in a delta-delta system.

**Q:** How do you go about getting BCF?

**A:** In the 6100, there is a takeoff from the guns themselves, a tap that gives a constant feedback on the current flow. As the tube ages, it compensates for aging by keeping the current steady. So the picture you see on the 6100 today is the same as the one you'll see a year and a half from now.

**Q:** Why have delta-delta tubes been so popular?

**A:** The primary reasons have been stability and the fact that, in the past, they have been the only studio-quality tubes available.

**Q:** What about monitor reliability and stability?

**A:** We've found that broadcasters typically like to hold on to monitors until they retire them, often 15-18 years later. So they want stability and reliability, but price is important when you're on a limited budget and want to buy as many units as possible.

**Q:** Does Conrac have a tube division?

**A:** No. We buy our tubes offshore, but we place stringent requirements on tolerances and on phosphors, because broadcasters want their bank of monitors to display identical color with the same input.

**Q:** Do you use your monitor for computers and graphics?

**A:** Yes. In fact that's how we got into in-line monitors. For computer displays, they want convergence



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stability. With the in-line design, once you've built the video and scan electronics, you don't have to tinker with convergence.

**Q:** Are you looking at digital circuitry?

**A:** There are certain areas where you cannot get rid of the analog design. But on signal conditioning, syncing and control, you can digitize and use LSI to reduce discrete circuitry. We're

looking into those areas on future products.

**Q:** How about long-range planning?

**A:** We have a long-range planning group, headed by a Ph.D. in video engineering. This group has no product responsibility; it has technology responsibility. Its function is to develop the technologies that product engineers need for future monitor

designs. We're finding this to be successful. For example, the comb filter in the 6200 is a new design coming out of this group.

**Q:** How about HDTV?

**A:** We can now scan up to 1280 lines. Some of our 7211s typically operate at 1100 lines. When the industry is ready, we'll be ready. The problem will be for broadcasters to transmit a signal compatible to current receivers, as well as high definition sets.

We think you'll see high definition video movie theaters soon. It seems to be much cheaper to make movies on tape than it is on film.

**Q:** What is your corporate structure?

**A:** Conrac Corporation is diversified into a number of industries, but 80% of its \$160 million business is in telecommunications and displays. We are in the display section.


**Q:** Did you do anything exciting at NAB-'83?

**A:** Yes. In our exhibit, we showed a weather system that combined RGB technology with NTSC and a graphics generator from Phoenix Computers. Through a series of operations, they pick up satellite weather data and put it through a graphics processor. The setup allows you to pan over the entire section, zoom in for detailed weather, and broadcast it to various stations. It is being used in the Gulf region, where weather is important to the oil industry.

**Q:** Do you have a message for broadcasters?

**A:** Yes. Conrac is dedicated to serving broadcasters with quality products at a reasonable price. Enhanced R&D, as mentioned, is just one example of this dedication. In other areas, we're beefing up our service operations with major service centers across the country for quick response to broadcasters' needs; we're sharpening our marketing operations to better structure our new product development; and we're expanding distributor inventory and service. These are elements of an organization structured to better serve broadcasters.

**Q:** For your needs, was NAB-'83/Las Vegas a success?

**A:** Very much so. Conrac and the broadcast industry have been good for each other. We don't see an end to that relationship, and I think that the people who visited us at the show are aware of that. 

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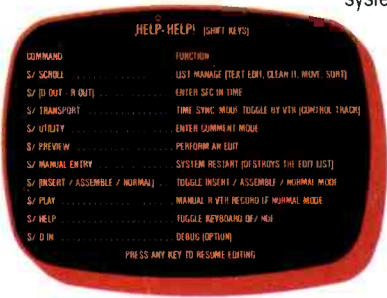
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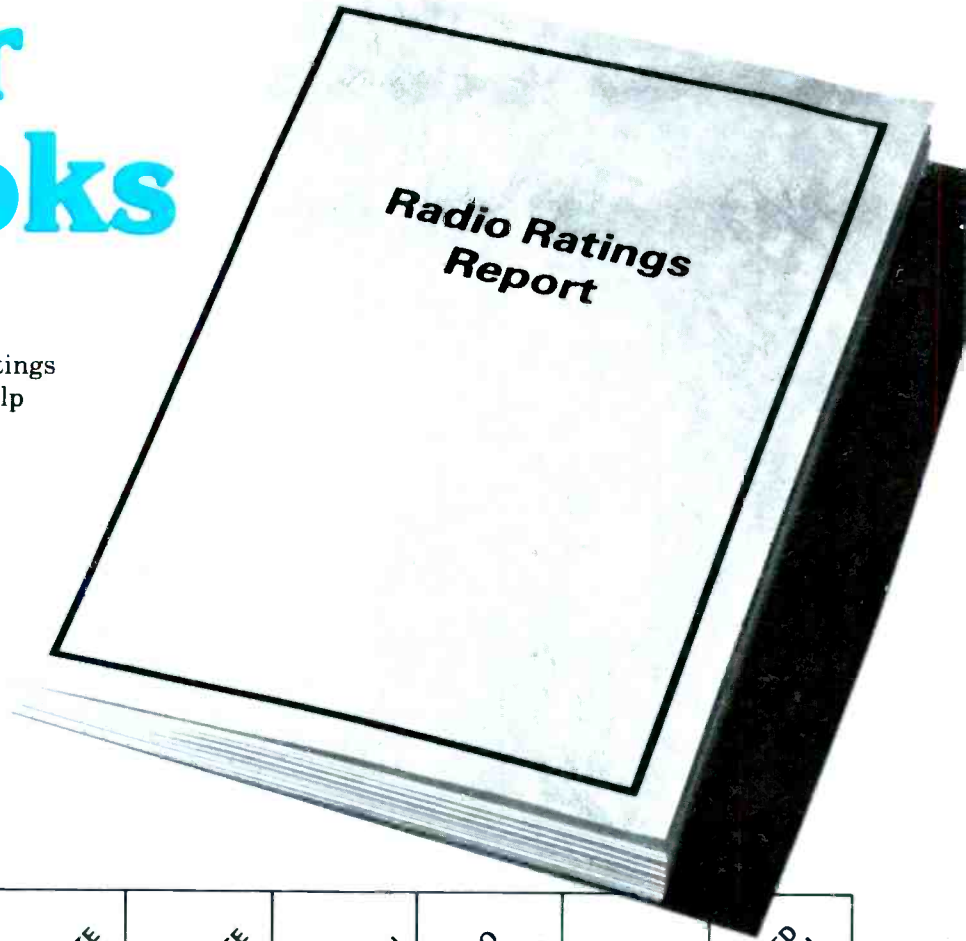


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<b>Harris MX-15</b>	±0.1 dB	0.08%	0.02%	80 dB	50 dB	0.172 dB	74 dB	58
<b>BE FX-30</b>	±0.1 dB	0.05%	0.05%	75 dB	45 dB	2 dB	not specified	30
<b>Continental 802A</b>	±0.1 dB	0.08%	0.08%	78 dB	not specified	not specified	not specified	26

May 1983 published specifications



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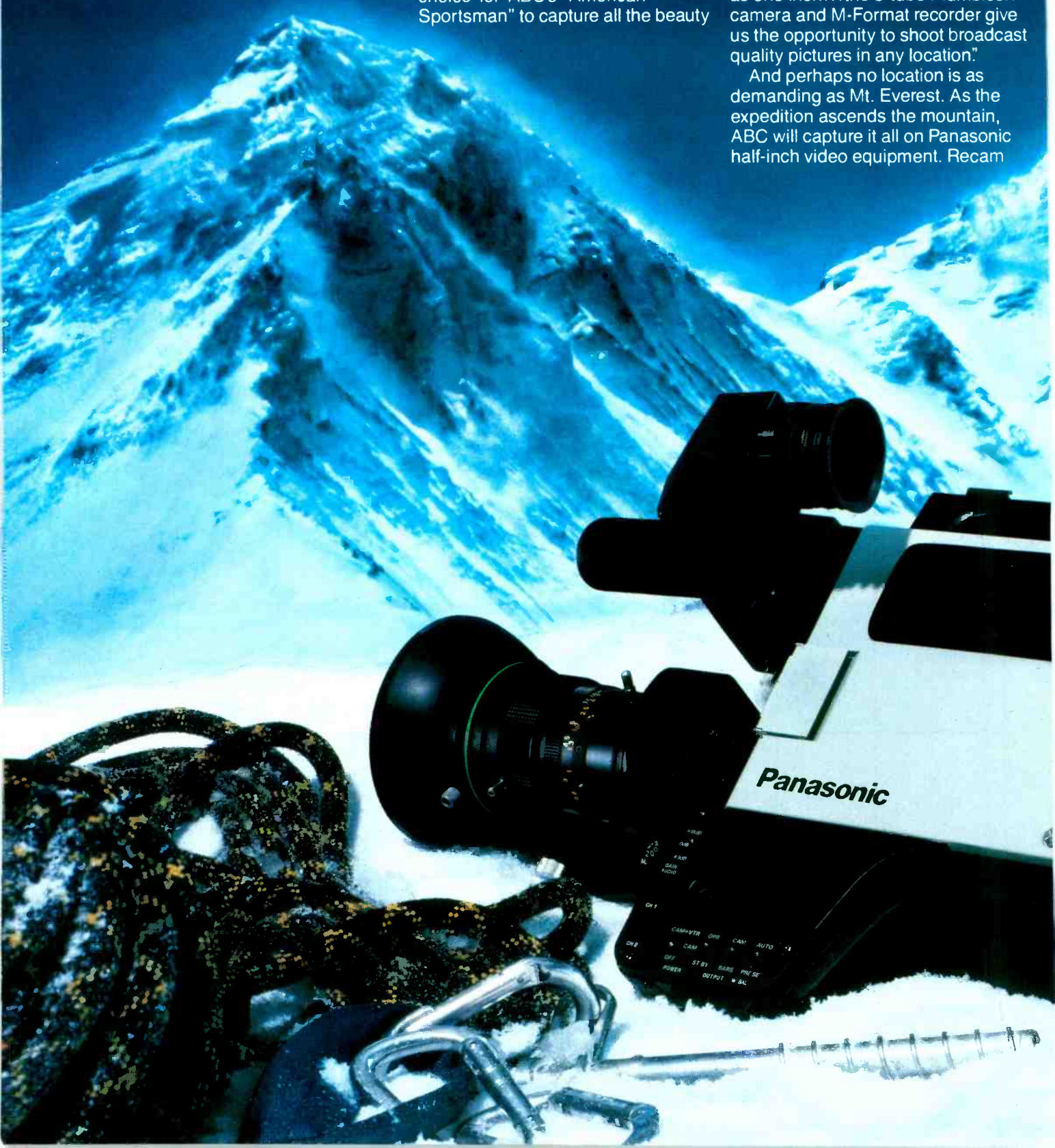
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# Recam to climb Mt. Everest.

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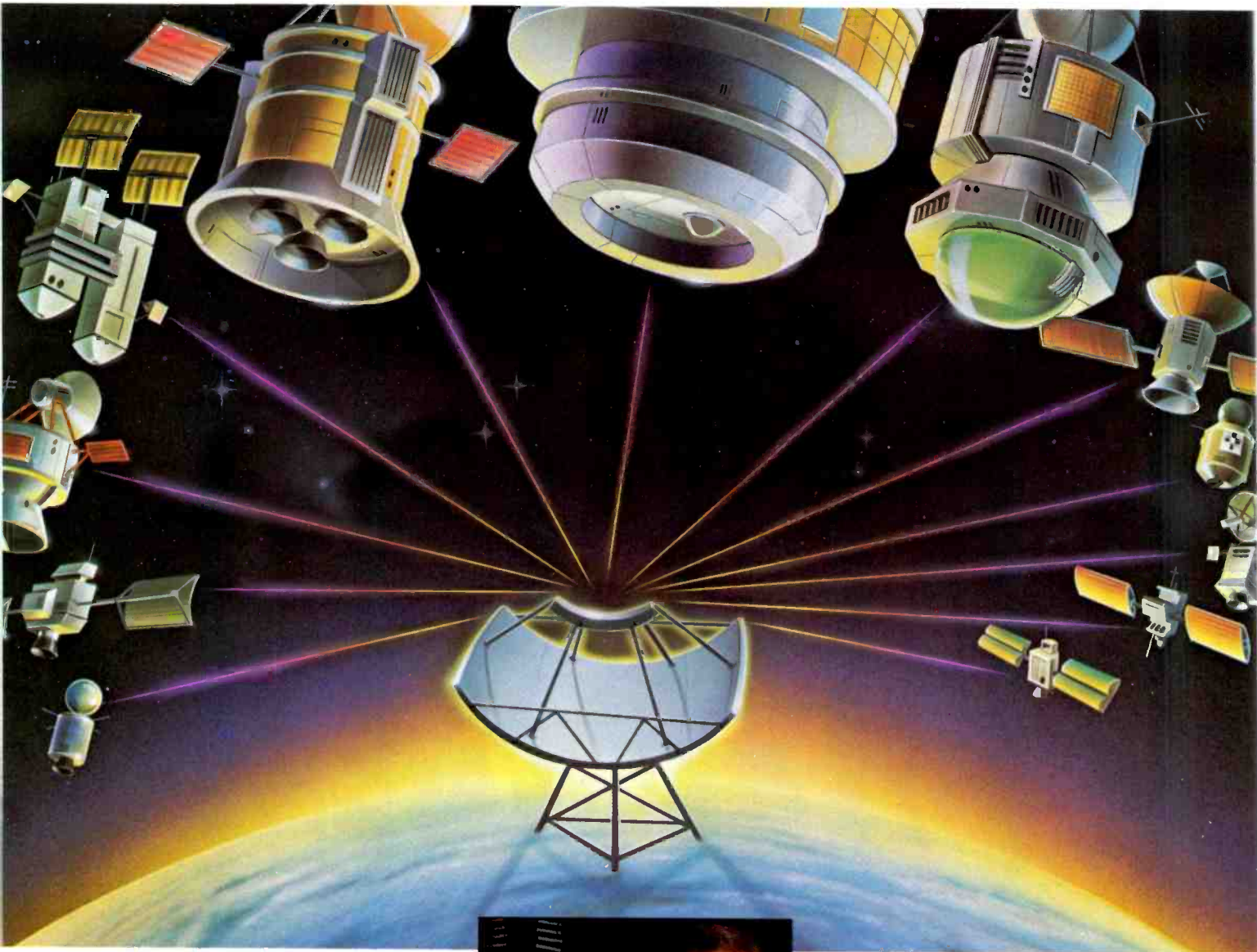
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**Mr. Rees Roberts**  
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# The film look for TV

By Leonard F. Coleman, director, motion picture and TV markets development,  
Motion Picture & Audiovisual Markets Division,  
Eastman Kodak, Rochester, NY

---

High speed, color negative film is changing the look of television, and the best is yet to come.

---

On a *Hill Street Blues* set at CBS Studios in Studio City, CA, John Flinn III, director of photography, pulls a deep focus so that characters in the background are sharply defined even though the main action is occurring in the foreground. "In real life, people in the next room aren't out of focus," Flinn said.

Meanwhile, at MGM Studio in Culver City, CA, Bill Spencer, ASC, is painting with light on a *Fame* set. It is a scene shot in a rehearsal hall. One of the principals is sitting alone in the dark. It's raining outside. Spencer decides to bring his key light down to 40fc and to use back crosslighting to silhouette the character. There is also blue light coming in through a window on the set, making it possible to "read" the rain washing down the panes of glass. Even under these conditions, Spencer has enough light to work at a camera stop sufficient to hold the entire rehearsal hall in focus while he does a slow, dramatic pan.

These are two examples of how the broad latitude of high speed color negative film is rapidly changing the look and cost of producing all types of TV programming. In both situations, talented directors of photography

have found that they can dramatically increase depth of field while shooting on big sets. The result is seen in the ambience of the image on the TV screen.

Eastman high speed, color negative film 5293/7293 was introduced in October 1981 at the SMPTE Technical Conference in Los Angeles. However, it was about six months before the 16mm and 35mm high speed, color negative films were available for general use. The high speed films are recommended for use at an exposure index (EI) of 250 tungsten.

Last November Kodak announced another dramatic breakthrough in high speed film technology. It introduced Eastman color, high speed negative film 5294/7294. These films, which replaced the first generation of high speed emulsions in June, had been tested previously in many circumstances with good reports.

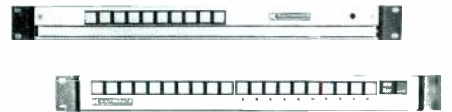
The new high speed negative films are rated for an EI of 400 tungsten in the 35mm format and 320 tungsten in the 16mm format. The 320 EI in the 16mm format reflects Kodak's decision to improve the image characteristics of the high speed 16mm film. Technically, this means that the new high speed 16mm film is finer-grained than 7293, which can be read in terms of improved S/N ratio by people working on the video side of the TV business.

Santiago Suarez, a commercial

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director/cinematographer associated with Ampersound Productions in New York, was an early user of the new high speed film in its 35mm format.

"It was a Canon camera commercial featuring three photographers taking pictures of a ballet dancer," he said. "They were using different camera and lens combinations with three different lighting conditions—backlighting, sidelighting and frontlighting.

"I was supposed to film the dancer and then freeze frame, simulating the different effects of the Canon lenses—a close-up, medium and wide-angle view of each situation," Suarez said. "I was shooting with a variable-shutter camera that allowed me to shoot the freeze frames at 30° shutter, which is about one-250th of a second. I did a simple test with the Eastman color, high speed negative film 5294. We used a single light bulb as illumination, and the results were incredible. The blacks held out, I could see into the shadows, the colors were warm, and it seemed to have as little grain as Eastman color negative film 5247. This film sees things the way that my eye does. What the eye sees, the film picks up."

From the beginning, high speed, color negative film made a deep impact on TV production, and the results have been felt throughout the program schedule. For example, news magazine and documentary crews found that they could travel lighter, move faster and, when necessary, work less obtrusively by using less or no artificial light.

"The 7293 has a great latitude and brightness range," said Walt Dombrow, an Emmy-winning news photographer, who has been with 60 Minutes for 15 years. "We are less at the mercy of the location. This is important because we often have to film under adverse conditions where we might have only a few moments to set up lights...I've been able to cut my lighting kit by a third."

Dombrow said that the high speed, color negative film is not a substitute for good lighting techniques. "We still have to light properly," he said, "we just need fewer lights to do that."

It was pretty easy for the staff at Kodak to anticipate some of the things that high speed negative film would make possible. They envisioned that the high speed film would prove to be a boon to TV program producers in situations in which they would need to work at lower light levels. They an-

Continued on page 58



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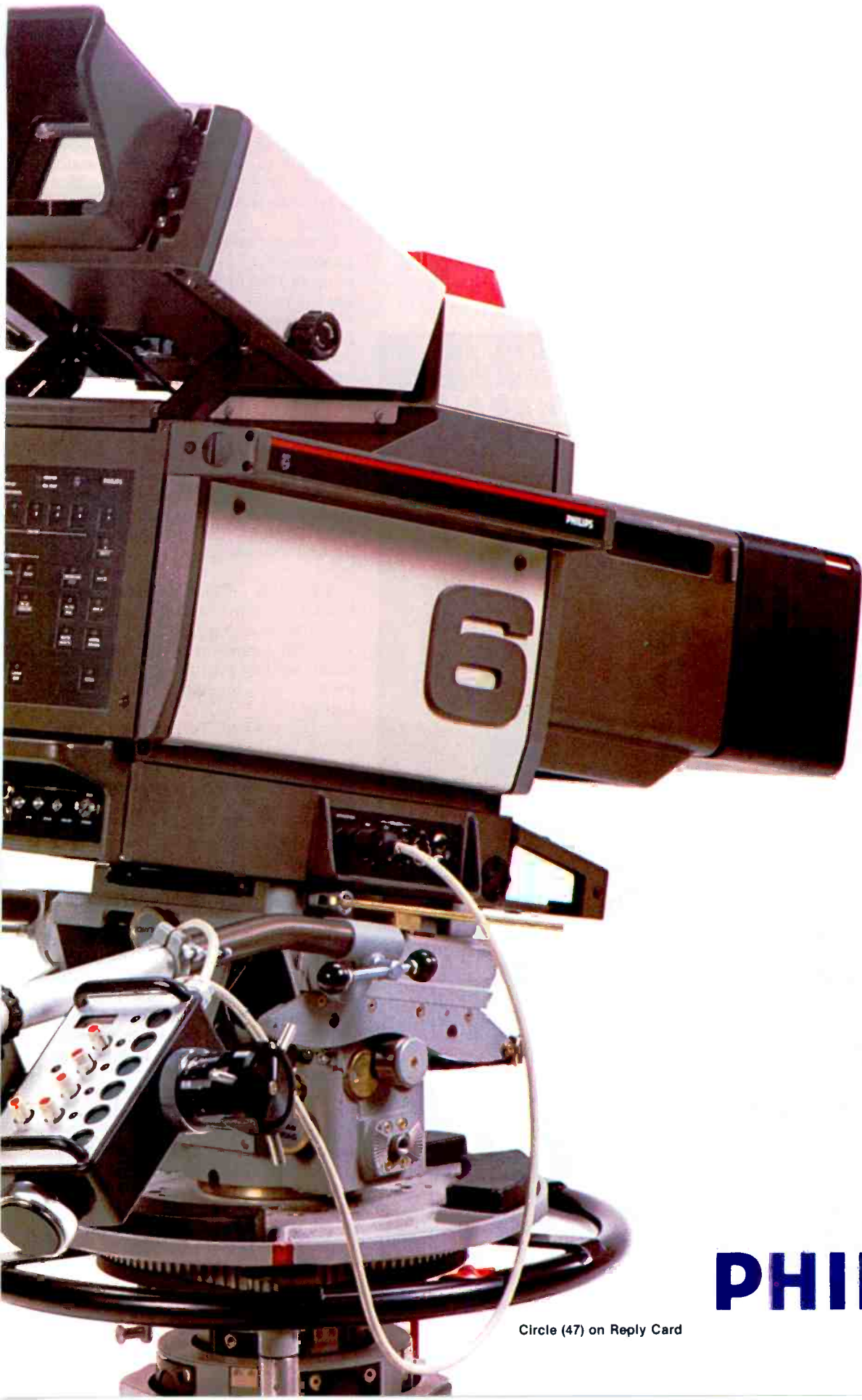
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Continued from page 54

ticipated that this would pay dividends for:

- practical locations, particularly interiors that were difficult or costly to light, and times when producers want to capture a look and feeling of reality by showing things the way they really are;
- night exteriors, or dusk, when the shooting day could be extended, if necessary, by the capability

for recording quality images at extremely low light levels; and

- production on sound stages, where a high speed film could halve the need for lighting, reducing air-conditioning and lighting bills.

It was also possible to foresee other situations, such as increased opportunities for cinematography in unusual circumstances, ranging from under-

water scenes to high speed car chases.

What was more difficult for us to anticipate was what would happen when we put a new tool like this into the hands of artists like Spencer and Flinn. One thing became immediately apparent: Cinematographers experimenting with the high speed emulsion found that they could easily stretch its latitude to extremes that previously would not have been considered.

In some circumstances, directors of photography have rated 5293 for EIs of up to 1500 or 2000, although that is not the norm. What makes this possible is the range of latitude built into the high speed emulsion, and the individual cinematographer's ability to compensate for under- or overexposure by asking the film laboratory to compensate for density and color balance.

If an EI of 1500 or 2000 sounds extreme, see for yourself with Columbia Pictures' *Blue Thunder*. Director of photography John A. Alonzo, ASC, used 5293 to film night aerial and ground sequences at EIs of 1750 and 2000.

Although *Blue Thunder* is a theatrical film, Alonzo, who has directed several made-for-TV movies, said that images exposed under extreme lighting conditions should look even better on the smaller video screen.

In this context, Terry Pound, director of field production for the South Carolina Educational TV Network, told how 7293 was used during the production of *Palmetto Special*. Key scenes in this PBS film series were exposed by using candles, camp fires and lanterns as source lights. A little fill light was used for artistic purposes. The result: The TV series has a realistic period look. There was only a minimal need for lighting equipment.

"TV viewers tend to associate a film-look with drama," Pound said. "The film-look tells viewers that this is a story taking place during a certain period in history. The look is as much a part of telling a story on television as the script."

In the long term, Pound's observation is a good description of how the 35mm and 16mm high speed color negative films are likely to affect TV production. The capability for working with less or more subtle light makes it more practical and possible to tell stories with pictures. With the improvements that have been made in the 5294 and 7294 emulsions, we believe that the best is yet to come.

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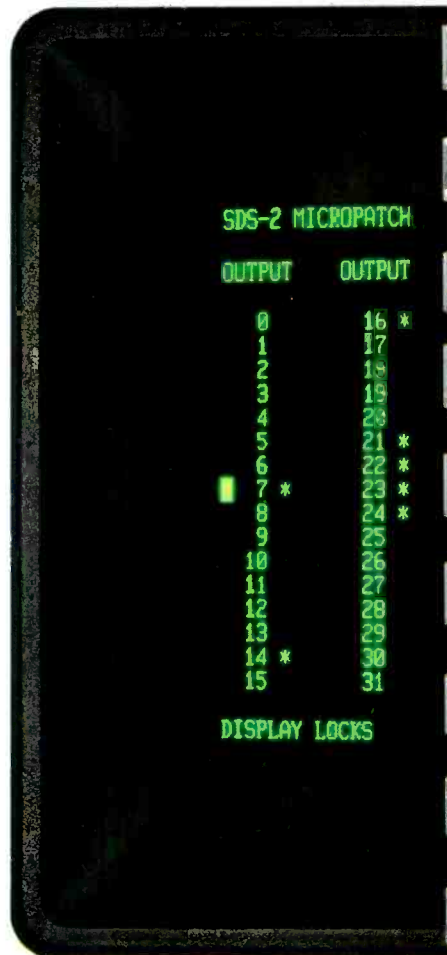
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# Field report:

# RCA Hawkeye VRC system

By Al Martin, director of engineering, WKBD-TV 50, Southfield, MI

In October 1982, WKBD-TV 50, Detroit, began a project to expand its local news operations, which culminated in the purchase of the RCA Hawkeye video recorder/camera system.

Our decision to expand came at about the time that manufacturers began showing the first ½-inch broadcast-type combination camera/VTR equipment. Fortunately, we had

not previously committed heavily to the ¾-inch videocassette format. Therefore, our choices were not limited by precedent in the type of equipment to buy.

After reviewing several systems available, we decided to purchase the Hawkeye system, mainly because of the 3-tube camera, excellent videotape playback quality and equipment availability from stock.

The system was delivered in mid-September 1982. We immediately proceeded with on-the-street operation for shakedown and learning purposes. We started using the Hawkeye on the air on Oct. 4, 1982, by inserting approximately 10 minutes of local news footage within the CNN Headline News Service program received from Atlanta via our 7m earth station. Later, we added a second 10-minute

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The Hawkeye system for field, studio and post-production applications. Shown (clockwise from upper left) are the HC-1 camera, HR-1 portable VTR, HE-1 edit controller and the HR-2 studio VTR.



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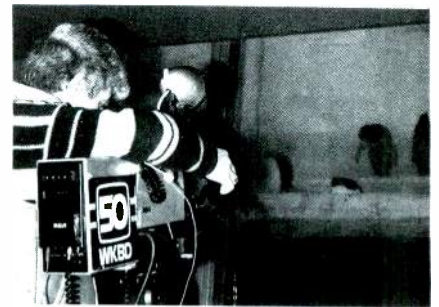
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local segment within one of the other CNN programs carried throughout the broadcast day.

In addition to the HCR-1 recording camera on-the-street, WKBD-TV purchased two HR-2 1/2-inch studio VTRs and one HE-1 edit controller to work with the HR-2s. With accessory adapters, the HC-1 camera can be separated from the HR-1 recorder, allowing camera and recorder to be used separately and independently, with a different camera recording into the 1/2-inch VTR and the HC-1 camera recording into another portable VTR, such as a 3/4-inch cassette recorder.



WKBD reporter Margo Williams interviews a student from a class that "adopted" some penguins at the Detroit Zoo. Tom Bradley records the event.



Bradley shoots a scene at the Detroit Zoo, showing the "adopted" penguins.

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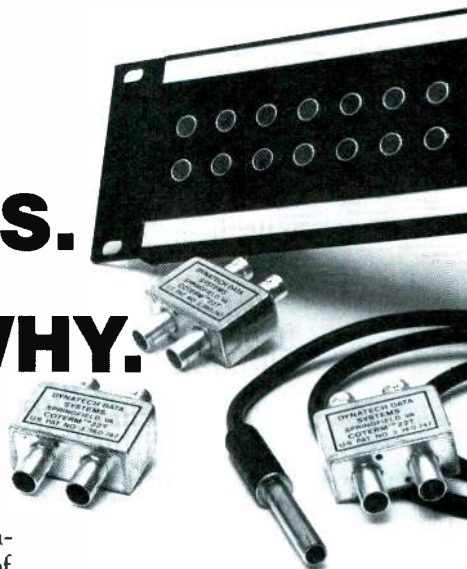
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Williams reads her script as Bradley monitors in recording.

This flexibility allows the station to use other equipment if a failure occurs in the camera or VTR.

It is our understanding that WKBD-TV was the first station in the world fully equipped in the new 1/2-inch broadcast format.

We have been pleased with the video quality derived from this system, when compared with many other stations in our market using the 3/4-inch format. WKBD dubs the completed 1/2-inch stories onto 2-inch cart for on-air playback flexibility purposes.

The HCR-1 recording camera is completely self-contained and weighs 24.6 pounds, including camera, recorder, lens, view finder, microphone, cassette and battery. The 10.5-pound camera uses three 1/2-inch Saticon tubes.\* It features a self-contained electronic view finder with indicators showing the status of certain camera and tape parameters. There are also +9dB and +18dB gain switches, comet tail suppression and contrast suppression.

\*The camera can also be equipped with 1/2-inch Plumbicon tubes.



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Belden optical fiber cable is also thinner and up to 30% lighter than conventional cable. That makes it easier to install on transmission towers, or through underground ducts. A recent installation of Belden cable on a 1500 ft. vertical tower was accomplished in less than one day.

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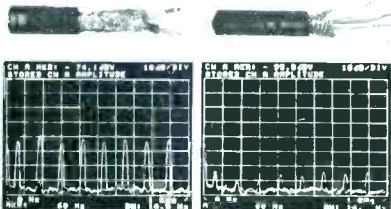
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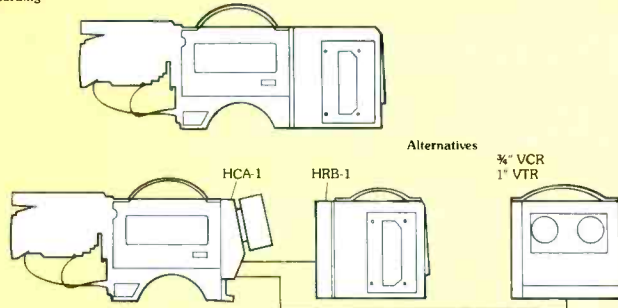
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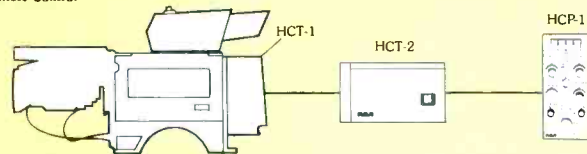
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# Suggested configurations for HC-1 system applications

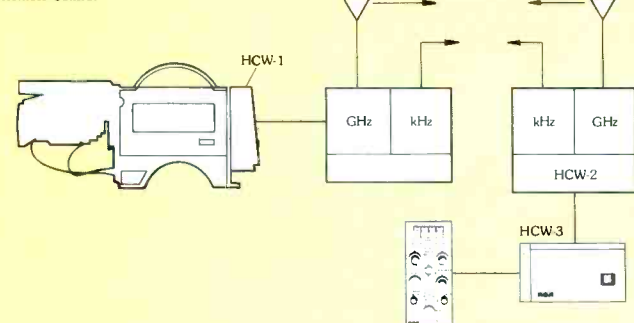
## Field Recording



## Triax Remote Control



## Wireless Remote Control



The f/1.4 optics system is totally sealed. The camera is equipped with automatic white balance, automatic black balance and automatic flare control. The indicators in the view finder show length of tape remaining in the cassette; iris setting of the lens; end of battery life; off-tape RF sensor for record verification; and audio monitor indicators for both audio channels. The camera has a 6-position filter wheel and S/N ratio of 55dB. Playback through the view finder, although not available at this time, is promised soon.

The HR-1 has a built-in back-space editor. The 9-pound recorder uses a

2-track recording system called ChromaTrak. Y (luminance) and I and Q (chrominance) information is recorded on separate video tracks by means of four video heads, two Y and 2 I/Q. There are two audiotracks, a control track and a time code track fed by an internal SMPTE/EBU time code generator. Twenty minutes of recorded time is provided on each T-120 standard VHS cassette.

The HR-2 studio recorder has four direct-drive servo motors; built-in jog and search capability (16 dial-selectable search speed plus still);

Continued on page 68

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ture of television transmission equipment exclusively. It's not a sideline with us. And we're not someone else's subsidiary. From transmitters to components, everything we develop and produce is mainstream to the transmission of television.

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**FIRST**  
to introduce external cavity klystrons.

**FIRST**  
to provide a regulated and adjustable power supply...PERVEAC.

**FIRST**  
to manufacture and employ plug in vacuum contactors for T.V. transmitters.



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Faithful color imagery is all about reproducing what the eye sees. And that is exactly what Leddicons do. Extended reds have a precisely-engineered response and a matched infra-red filter is incorporated to provide cut-off where you want it.

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Highlight image retention can be a production team's nightmare – the wrong choice of tube and highly polished orchestra instruments can end up looking like the aftermath of an aerobatics display. With EEV Leddicons, the problem is minimised by a unique target manufacturing process. The result is you can rely on Leddicons, even in the very difficult extended red channel where other tubes are simply unable to cope.

## Better tube quality – plus longer life

At long last a manufacturer who is prepared to talk about blemishes – but then we know Leddicons average less spotting than other tubes! The secret lies in the fact that all Leddicons must satisfy the most exacting manufacturing, testing and quality control standards. These not only preclude loose particles from the inside of the tube but also ensure longer tube life.

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The optimised electron optical design of Leddicons ensures the best possible geometry without distortion. Registration too is equally distortion free – we can, in fact, supply computer-matched sets for all three channels.

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Nothing tests a tube more rigorously than the range of frequencies generated by an orchestra. With EEV's unique anti-microphonic mesh assembly, Leddicons provide the cleanest pictures – even from cameras operating in areas of high ambient acoustic noise.



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Schaumburg, IL 60194. Tel: 312 843 8417. **North-Eastern Sales Office**, 250 Hamilton

Drive, Snyder, NY 14226. Tel: 716 839 5959. **Southern Sales Office**, Route 1, Anna,

TX 75003. Tel: 214 837 2464. **South-Eastern Sales Office**, Suite 100E,

15 Dunwoody Park, Atlanta, GA 30358. Tel: 404 394 9201.

**Tri-State Sales Office**, 7 Westchester Plaza, Elmsford, NY 10523. Tel: 914 592 6194.

**Western Sales Office**, 19001 40th Place, N E Seattle, WA 98155. Tel: 206 363 2200.

**IN CANADA EEV Canada Ltd**, 67 Westmore Drive, Rexdale Ontario M9V 3Y6.

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# tubes in the world.

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EEV is not only concerned with manufacturing the best tubes but also ensures the best delivery and after-sales service. Our reputation in this respect, like that of our Leddicons, is second to none.

To serve the needs of our broadcast customers in the USA and Canada best, we sell direct from our centers in New York and Toronto where we maintain a large inventory as well as full test facilities.

When you add up all the facts about EEV Leddicons, there is only one conclusion - namely, the definition of the best tubes for your camera. But don't leave it at that. Next time specify Leddicons for your new equipment and as replacements. Then find out what that definition really means in practice.

## Comprehensive range

EEV Leddicons are specified throughout the world for virtually every type of studio, EFP and ENG camera. The range covers 30mm (1 1/4 in), 25mm (1 in), 18mm (3/4 in) and 12mm (1/2 in) sizes. And the comprehensive choice of front- and rear-loading types includes diode gun, low output capacitance (LOC) diode gun, triode gun and tetrode gun highlight overload protection (HOP).

EEV Leddicons are fully interchangeable in most types of camera including:

BCC10/20/21	HL79/81/83	MNC80	TC80/85
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CEI310	KCU/KCK40	SK91/96	TK76
FOTON 1	LDK5/15/25	SK110	TTV1515/1516

# ONS<sup>®</sup>

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**EEV** Camera Tubes 

Circle (55) on Reply Card

## Manufacturer's specifications: Hawkeye system HCR-1 recording camera

<b>WEIGHT</b>			<b>DIMENSIONS</b>		
HC-1 Camera (Pb0)	9.7 lbs	4.4 kg	Length	21.5 in (546 mm)	
Adaptor Plate	.3	.1	Height—Optics & VTR Area	9.5 in (241 mm)	
HR-1 Recorder	9.0	4.1	—Camera Module Area	6.3 in (160 mm)	
Cassette (250m VHS)	.5	.2	Width—Camera	3.6 in ( 91 mm)	
Lens (Fuji 12x)	2.8	1.3	—VTR	4.6 in (117 mm)	
Battery (4.5 amp-hr silver-zinc)	1.5	.7	<b>POWER</b>		
Total	23.8 lbs	10.8 kg	HC-1 Camera (Pb0)	24 watts	
<b>SCAN STANDARDS</b>			HR-1 Recorder	12 watts	
EIA	.525/60		36 watts		
CCIR	625/50		<b>COLOR STANDARDS</b>		
			Types available for NTSC, PAL-B, PAL-M, SECAM-IIIB		

### VTR system

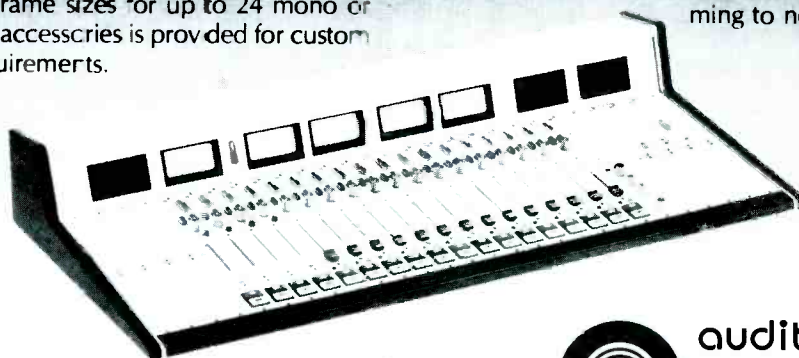
<b>General</b>			<b>Color Standards</b>		
Recording Format	RCA ChromaTrak		Differential Gain	.5%	
Recording Time	20 minutes (250 m VHS Videocassette)		Differential Phase	.5°	
Tape Speed	.02 m/sec (8 ips)		K-Factor (2T Sin <sup>2</sup> Pulse)	.2%	
Writing Speed	5.7 m/sec (225 ips)		Chrominance-Luminance Delay	.30 nsec	
<b>Video Performance</b>			<b>Audio Performance (Channels 1 &amp; 2)</b>		
Bandwidth:	525 Line	625 Line	Frequency Response	50-15,000 kHz ±3 dB	
Luminance	3.6 MHz	3.4 MHz	Signal-to-Noise (3% Distortion @ 1 kHz)	.50 dB	
Chrominance	1.0 MHz	1.5 MHz	Wow and Flutter (NAB unweighted)	.02% rms	
Signal-to-Noise:			Crosstalk	Better than -40dB	
Luminance	47 dB	46 dB	<b>Environmental</b>		
Chrominance	48 dB	48 dB	Temperature	0-40°C	
			Humidity	10% to 85% (non-condensing)	

# Sound quality.

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The Audiotronics 200 Series represents the culmination of latest technology applied for broadcast use. Standard features include Panny & Giles linear VCA controlling faders for reliability and precise tracking accuracy even on stereo channels, noiseless hall effect/CMOS on/off switching, local power regulation on every module to prevent mass failure built-in Control Room Monitoring controls, a comprehensive logic system and headphone amplifier with local equalization. Available in 4 mainframe sizes for up to 24 mono or stereo inputs, a full line of accessories is provided for custom tailoring to individual requirements.

- Monitoring and Communications for Two Studios
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- Remote Controls
- Redundant Powering
- Clock & Timer



Model 218

**Telephone Interface Accessory:** Enables complete handling, processing and recording of telephone calls without compromising other console functions.

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Telex: 533356

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- Fiber optic telemetry for all floating high voltage metering functions, incorporated into a complete latched fault and status display system.
- Clean, fully isolated, high voltage compartments, with double-filtered air cooling and front access. (No exposed high voltage in klystron areas.)

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Contact Comark's Sales Office for detailed specifications and further information.



10kW/30kW/55kW  
model shown

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Telex: 846075

International Headquarters  
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Southwick, MA 01077  
(413) 569-5939

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built-in drop-out compensator; and built-in audio limiter. It allows insert or add-on and split audio and/or video edits; automatic preroll; and an optional built-in TBC.

Each of the studio HR-2 edit

recorders have search modes up to eight times normal speed and allows Y, I, Q and/or NTSC inputs and/or outputs. These two recorders are interfaced with the HE-1 edit controller, allowing frame-by-frame editing.

The HE-1 edit controller has the following features: microprocessor control for two VTRs; 16-dial selectable tape search speed plus jog; automatic insert and add-on edit; automatic preview and review edit functions; split audio/video edits; control track counter display; selectable edit decision points (on the fly); and selectable playback or record VTR as source of edit decision points.

Table I shows some important performance specifications and comparisons between the Hawkeye and today's conventional 3/4-inch broadcast VTRs. The technical specifications between the 1/2-inch and 3/4-inch systems speak for themselves, but proof is in the viewing of playback pictures.

The system has been operational since mid-September. Although, as with any new equipment, there have been some minor startup problems, we are pleased with the operation of the entire Hawkeye system. Our biggest nagging problem has been with the batteries associated with the camera system.

The battery is an integral part of the camera because it snaps into a triangular housing that is part of the camera shoulder pad. At the time we purchased the system, the only battery available was a silver-zinc, which has proven to be less than desirable because it is prone to leak electrolyte. The number of charge/recharge cycles has proven to be approximately 100 times or less. However, RCA and the battery manufacturer have been cooperative with us in trying to resolve problems.

Since the bulk of this article was written, a nicad battery unit for the Hawkeye has become available from PAG of New York. It is our understanding that nicad charge/recharge cycle life should be approximately 1000 cycles, even though the battery running time per charge will be about 20 minutes, which is about half that of the silver-zinc we are presently using.

**Editor's note:**

The field report is an exclusive BE feature for broadcasters. Each will be prepared by the staff of a broadcast station, production facility or consulting firm. The intent is to have the equipment tested on-site. The author is at liberty to discuss his research with industry leaders and to visit other broadcasters and/or the manufacturer to track down pertinent facts.

In each field report, the author will discuss the full applicability of the equipment to broadcasting, including personal opinions on good features and serious limitations—if any.

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

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

For more details on the system, contact RCA, Front & Cooper Streets, Bldg. 2-2, Camden, NJ 08102.



Parameter	Hawkeye	3/4-inch
Chrominance S/N	48dB	38dB
Resolution chrominance bandwidth	1MHz	0.33MHz
Geometric fidelity (luminance distortion)	2%	6%
Third generation (Y-C registration error)	90ns	300ns

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It's fast and easy to operate. Just insert your cassette, press the button and the tape whirrs through at 25 times normal speed.

LED readouts display defect counts such as wrinkles, oxide voids and edge damage. At the same time, your tapes are gently cleaned.

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For more information about the new Professional Videotape Evaluator/Cleaner, please write or phone us free at 800/323-7520\*.



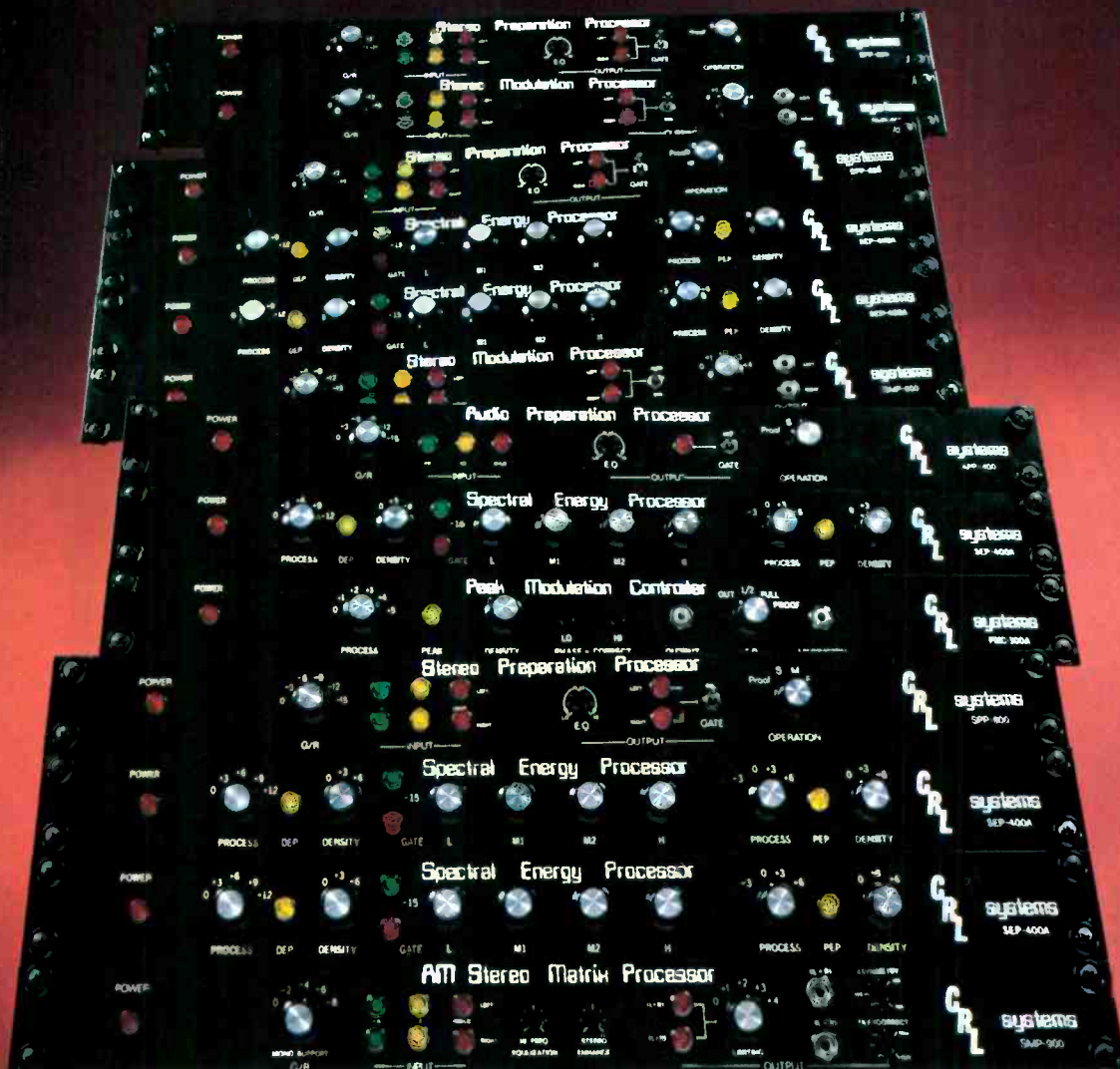
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# 3M

# Deregulation and audio proofs

By Donald L. Markley, facilities editor, D.L. Markley & Associates, Consulting Engineers, Peoria, IL

The FCC, in its trend toward deregulation, has proposed several changes that will be significant to the broadcast industry and will have a direct impact on those providing technical services to the industry.

In a Notice of Inquiry and Proposed Rulemaking released on March 18, 1983, the commission proposed eliminating a number of technical rules and opened the door for discussions on even more changes. The rules that the commission proposed to eliminate are those specifying performance criteria for AM, FM and TV stations. In short, the audio proof-of-performance will cease to exist.

At the same time, the commission is considering eliminating several other rules that it thinks are no longer necessary. In particular, those rules are ones that the commission considers to unduly restrict "technological innovation in communications technology."

In another proposed rulemaking issued on April 1 of this year, the commission proposed eliminating all regulations in parts 73, 74 and others of the *Rules and Regulations* that permit only persons holding a General Radio Telephone Operator's License to perform transmitter operation, maintenance and repair. The commission *does not* propose to abolish the license itself, just the rules that require its use in all services in which **BE** readers would customarily expect to use the license. This proposed rulemaking (Docket No. 83-322) also would eliminate the aircraft radio-telephone endorsement and the blind operator restrictive endorsement, because they are no longer needed. The commission also proposed increasing the license term for the General Radio Telephone License to lifetime and increasing the renewal grace period from one year to five years.

These rule changes and inquiries come from the commission's general movement toward deregulation of rules and regulations for broadcast services that it governs. This is part of a general movement occurring in the federal government today in many areas. It is not limited to the broadcast industry.

One of the reasons behind such changes is reducing the cost of regulation. It is hard to argue with attempts to reduce the expense of the regulating agency. The desire to reduce taxes is universal. We also often read of problems involved when specific areas are identified for tax cuts. The special interest groups involved always rise in mass to cry that some other agency should be the one to suffer tax fund losses.

In fairness to the commission, we applaud their efforts to reduce the regulatory costs involved in the broadcast industry. However, the point has

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been repeatedly raised that some regulation is necessary to provide guidelines for conscientious broadcasters and to provide some degree of initial filtering for broadcasters as they hire technical personnel to staff their facilities.

#### Technical support

Without reopening the argument about eliminating the First Class License, it is worthwhile to recall some of the concerns that were voiced. Primarily, the point was raised that broadcast operators no longer would have the small protection provided to them by the First

Class Radio Telephone License to ensure that they were hiring competent technical people to maintain their facilities. Although it is widely agreed that the First Class License was not a guarantee of competence, it did demonstrate that the holder had completed a minimal amount of study and work and had some knowledge, however shallow, of the commission's Rules and Regulations. Although the station operator still may ask what licenses the technical person holds or has held, it seems to be only a matter of time until all licenses are eliminated, other than the simple post-card variety.

To combat the problems involved with eliminating the licenses, it seems that the certification program currently offered by the Society of Broadcast and Communications Engineers should come into its own. This is a good, well-administered program that meets the criterion of "first-stage filtering" to the interview process for technical staff.

Again, although the SBCE certification program does not guarantee a high level of competence, it does guarantee a minimum level of effort. Also, the SBCE certification exam requires a reasonable amount of technical expertise and knowledge of the commission's Rules and Regulations. It is recommended, therefore, that the broadcaster look toward SBCE certification as a first criterion for any new technical personnel.

Large market broadcasters who have experienced, competent engineering staffs do not need these licenses or certifications to hire competent technical people. Their existing staffs have the expertise and knowledge to quickly determine the abilities of any applicant. Medium- to small market broadcasters who may have only one technical person on staff need this assistance most, and it is to those broadcasters that SBCE certification is recommended.

#### Audio proofs

Regarding the elimination of audio proof-of-performance measurements and other technical criteria, it is obvious that small market broadcasters or technicians working alone at remote stations are most in need of guidance.

The audio proof-of-performance, as required by the FCC, has for a number of years specified a minimal level of technical performance. Most well-maintained radio and TV stations in the country far exceed the minimal requirements identified in the commission's Rules and Regulations. As evidenced by many articles in *BE* and other magazines, the norm of performance has been toward frequency responses within  $\pm 1$ dB of the ideal and distortions well under 1% in stereo. Indeed, even more severe performance criteria have been suggested by several broadcasters.

Now that the commission is proposing to eliminate the audio proof-of-performance criteria, the time is right for some other organization to step forward with a more significant and applicable set of criteria toward which broadcast technicians can aim as they maintain and adjust their stations. Just as the SBCE is trying to provide the testing process to maintain technical quality in operators, some other organization must step forward

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and identify technical operating criteria for stations.

Again, major market stations do not necessarily need such criteria, because their large operating staffs and severe competitive situations cause them to maintain their equipment as best they can. However, medium and small market stations should have technical goals toward which they can work.

Discussions are currently under way among the **BE** staff and editors to develop such technical criteria. Suitable certificates could then be offered to recognize stations whose technical operation has reached the desired value.

It is my opinion that the technical criteria should be more strenuous than that requested by the commission in the soon-to-be-deleted proof-of-performance requirements. On the other hand, these criteria should not be beyond the reach of the average technician working at a station equipped with reasonably good equipment. That is, the certificates of achievement should be attainable by station technicians with equipment manufactured within the last 10-15 years. It should not be necessary to have the latest design in FM exciters to be able to attain a certificate of performance. Perhaps two or three different levels of technical achievement might be in order for this reason.

To help determine reasonable criteria for such performance awards, readers should write to **BE** and give their ideas on what should constitute reasonable and/or outstanding performance in broadcast stations today. Such comments will be given careful consideration.

Because neither the SBCE nor **Broadcast Engineering** is a regulatory agency, there can be no wrist slapping if an operator does not certify, nor if the station does not meet a reasonable technical criteria. SBCE certification and a Certificate of Performance from **Broadcast Engineering** should be considered guidelines and recognition of demonstrated performance, as opposed to requirements to meet regulatory restrictions.

I believe that guidelines are necessary to establish the bounds of the "Standards of Good Engineering Practice." The commission has repeatedly said it is up to the marketplace to determine standards of performance. Let those of us in the marketplace work together to establish minimal standards and desired goals.

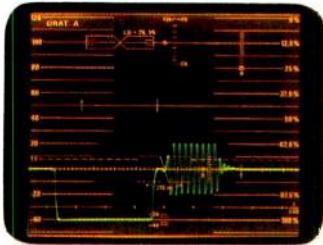
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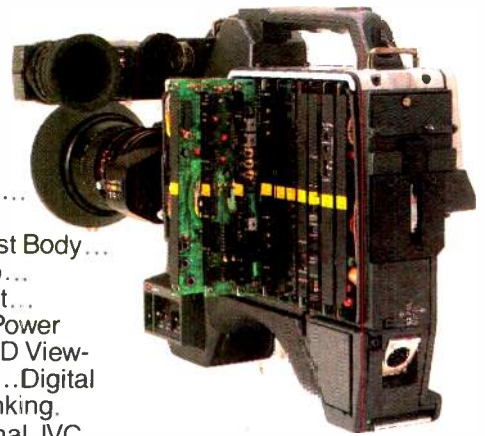
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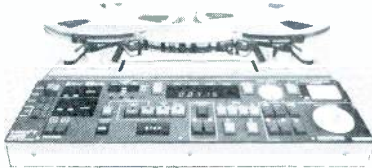
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# Montreux-'83: Reflections

## An interview with Joe Flaherty

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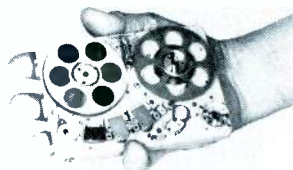
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Joseph A. Flaherty, vice president, Engineering and Development, CBS Television, New York, played a key role in organizing the HDTV demonstrations held at Montreux-'83. In this interview with **BE**, Flaherty reflects on some advances in broadcasting technology seen at the symposium and throughout the world.

**Q:** What was the highlight of Montreux-'83?

**A:** The highlight was HDTV. An unexpected feature was the vendors showing HDTV equipment, including General Electric, Philips and the Japanese companies. This equipment is beginning to move from the pure laboratory stage into practical prototypes. And, we saw creative applications of HDTV, with worldwide participation.

**Q:** What observations do you have concerning the push for high fidelity seen at the show?

**A:** The distinction I like to make is that these enhanced systems being studied for DBS are all transmission systems. It's important to get the signals to the home, but high definition is first and foremost a production system. Most of the enhanced systems have not been proposed for production, but rather for transmission.

I think that high definition should and will start in the production world, where we have always had high definition production—35mm film. I think that the first step is extremely important: to get high quality production in the can. This gives producers the maximum future flexibility for distribution in many media, including cinema.

I think there will be a hierarchy of distribution systems that will use high quality, original high definition pictures. First, for many years there will be 525-line NTSC and 625-line PAL and SECAM. Then, there will be one or more of the enhanced MAC-type systems. Probably one for DBS, one

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for cable and videodiscs and one, perhaps, for VCRs. Thus, there will be a family of systems, with varying qualities for consumer distribution. All are important and, I think, compatible with the move toward high definition. But the original product must be better than all of the subsequent distribution systems. I applaud the work in these enhanced areas, but all that I have seen so far are distribution systems.

**Q:** What is the status of implementing MAC, or some other form of enhanced transmission, with DBS?

**A:** The EBU has been having a series of meetings leading toward a DBS standard. The goal is for a single DBS broadcast standard in Europe.

MAC is one implementation of a broader technology called *time compression integration* with component signals. For perspective, when we decided to convert this world to a digital standard, which is a component signal, this was a move away from the composite signals of NTSC, PAL and SECAM. At NAB-'83 and at Montreux, almost every piece of new equipment was a component device. All of the 1/2-inch and 1/4-inch tape machines use component signals. Everything is moving in the direction

of components because of the vastly improved quality in signal processing capability.

MAC is a specific signal devised for DBS. It's a good one, but some studies are considering whether there should be some minor changes made in the time division. All the studies have been made at enormously accelerated rates because broadcasting companies in Europe are facing on-air deadlines and design commitments.

I don't think that any broadcasting standard has been formed in such a short time, particularly such an important standard. Consequently, these delays and discussions of frequency are a natural result of trying to make fundamental decisions in a short time. I am optimistic that there will be a single standard. It will be a MAC-type signal, perhaps with slight changes.

**Q:** At Montreux, as in other recent conventions, there was a push for higher quality TV pictures. Is this trend an industry push or one in response to viewer demands?

**A:** This situation is parallel to that which existed as color television was introduced. Although color was considered a great idea, progress was slow because of technological limitations that produced expensive

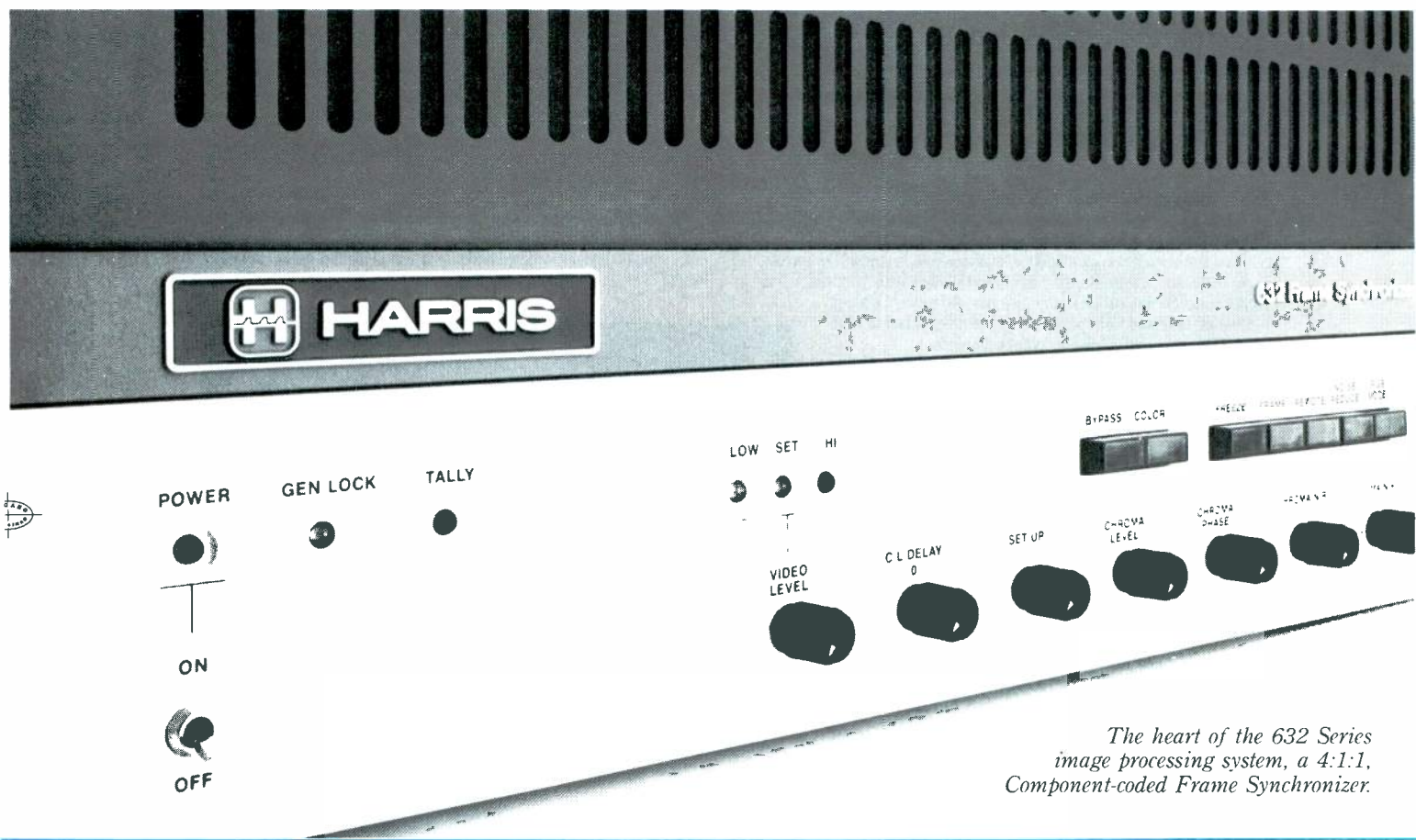
receivers.

The enhanced TV systems face a similar problem. People tend to view the largest picture possible without perceiving the imperfections that destroy reality. Thus, as people become experienced with high quality pictures, the demand for larger screens will go up rapidly.

**Q:** What about other technical aspects covered at Montreux '83?

**A:** There are two important phases to the symposium: the exhibition and the technical program. The technical program was still heavily into digits, digital recording techniques and satellite broadcasting—both the standard and enhanced varieties. In terms of a technology thrust, you have to say that the program examined all the new technologies...digits, DBS and high definition. But the emerging technologies now seem much closer to reality than they have been in any previous symposium.

The exhibition, which necessarily must deal with things on the shelf, still showed a great deal of the new technologies—the small format videotape, satellite receiving systems and transportable earth stations. Many of the technologies were not to hardware phase just two years ago.



*The heart of the 632 Series image processing system, a 4:1:1, Component-coded Frame Synchronizer.*



Montreux-'83 focused on new technologies affecting television. Because satellite distribution was an important topic, receiving dishes were more prominent this year than in previous years.

Another facet about this symposium is that cable has finally taken its rightful position in a much larger and more professional way. The program was superb and the exhibition showed expansion. That, too, reflects the acceleration of cable in Europe, with cable becoming an equal partner with broadcasting.

The symposium is unique: It's only television, broadcasting and cable. That's an interesting marriage and unique.

**Q:** Did you attend the component TV demonstrations?

**A:** Yes. There, again, you see switching systems going to components. I think that the time will come soon

when you will see a single NTSC encoder at the transmitter. At the studio, the switching systems, cameras and tape machines all will be running in components. Remember that the camera picks up the signal in RGB component form. In the past, we encoded to a composite form in the camera, and that's where we take the biggest quality loss, where we limit the bandwidth of the chrominance and luminance signal. We do all of our signal processing after we've taken the quality loss.

Nothing ever gets better; it only gets worse in this process. So it makes sense to maintain high quality component signals throughout the production chain and in the distribution

chain through satellite. In DBS, it may be a component signal beamed to the home...at least that's what the Europeans were proposing.

**Q:** Did you see the RCA CCD camera?

**A:** I saw it at the NAB-'83 convention in Las Vegas. I was impressed. It was the first practical demonstration of a broadcast-quality CCD camera. In fact, it was the most spectacular demonstration of CCD technology I've seen. It is a step toward a future digital and component camera. I was impressed and think that RCA should be congratulated.

**Q:** How do you see cable shaping up in Europe?

**A:** It's accelerating far more rapidly now than ever before, particularly in the United Kingdom and France, where the governments are pushing such technologies. And I think it is natural. First, cable technology is now so advanced that the European developments can bypass the early growth pains we saw in the United States. So the technology is in a better state for rapid development.

Also in Europe, because of geography and crowded conditions, the frequency spectrum has been divided so that fewer channels are

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# HDTV demonstrations:

## An international effort



Shown are participants in the HDTV demonstrations.

The extensive HDTV demonstrations at Montreux-'83 were prepared by a cooperative effort between Sony Corporation, the CBS Network and a variety of broadcasting organizations in Europe. Sony HDTV equipment and a technical crew visited London; Paris; Salzburg, Austria; Montreux; Venice, Italy; and Len-

ingrad, USSR, to produce special HDTV programs for this unique feature.

The equipment used was the same type as that shown by Sony in its HDTV demonstrations at IBC-'82. This consisted of two HDTV cameras operating on the NHK-proposed 1125-line, 60-field scanning rate; a pair of special 1-inch helical VTRs, built on a Type C transport, but modified to accommodate HDTV's higher bandwidth requirements; a switcher; an editing console; high resolution monitors; and a variety of necessary peripherals. This package was moved around Europe to produce the programs for Montreux-'83.

**Austria.** In August 1982, the Austrian National Network (CRF) installed a containerized unit with the Sony HDTV equipment at the side entrance of the Festival Building in Salzburg for the performance of the *Magic Flute*, which was being covered in PAL

by a group of regular ORF mobile vans.

Mounted inside the container, which was large enough to serve as a camera control room and recording center, were the director's color monitors, the switcher control panel, the two camera control units, an audio multi-track recorder, a videotape recorder and the time base corrector rack. To give good visual access by all three operators (switcher, director and CCU), the HDTV monitors were mounted in a curved configuration around the mixer/switcher control unit.

**France.** Shortly after the IBC-'82 HDTV demonstrations, the equipment was shipped to Paris, where the Societe Francaise de Production, France's largest national program production company, provided additional equipment and crews to create another unusual HDTV program.

The SFP equipped one of its large Eurovision vans with the HDTV gear and arranged with French authorities to produce a program about historical monuments of Paris. These included the Church of Notre Dame, the Arc de Triomphe, the Pompidou Cultural Center and Versailles. Mounted on a large crane,

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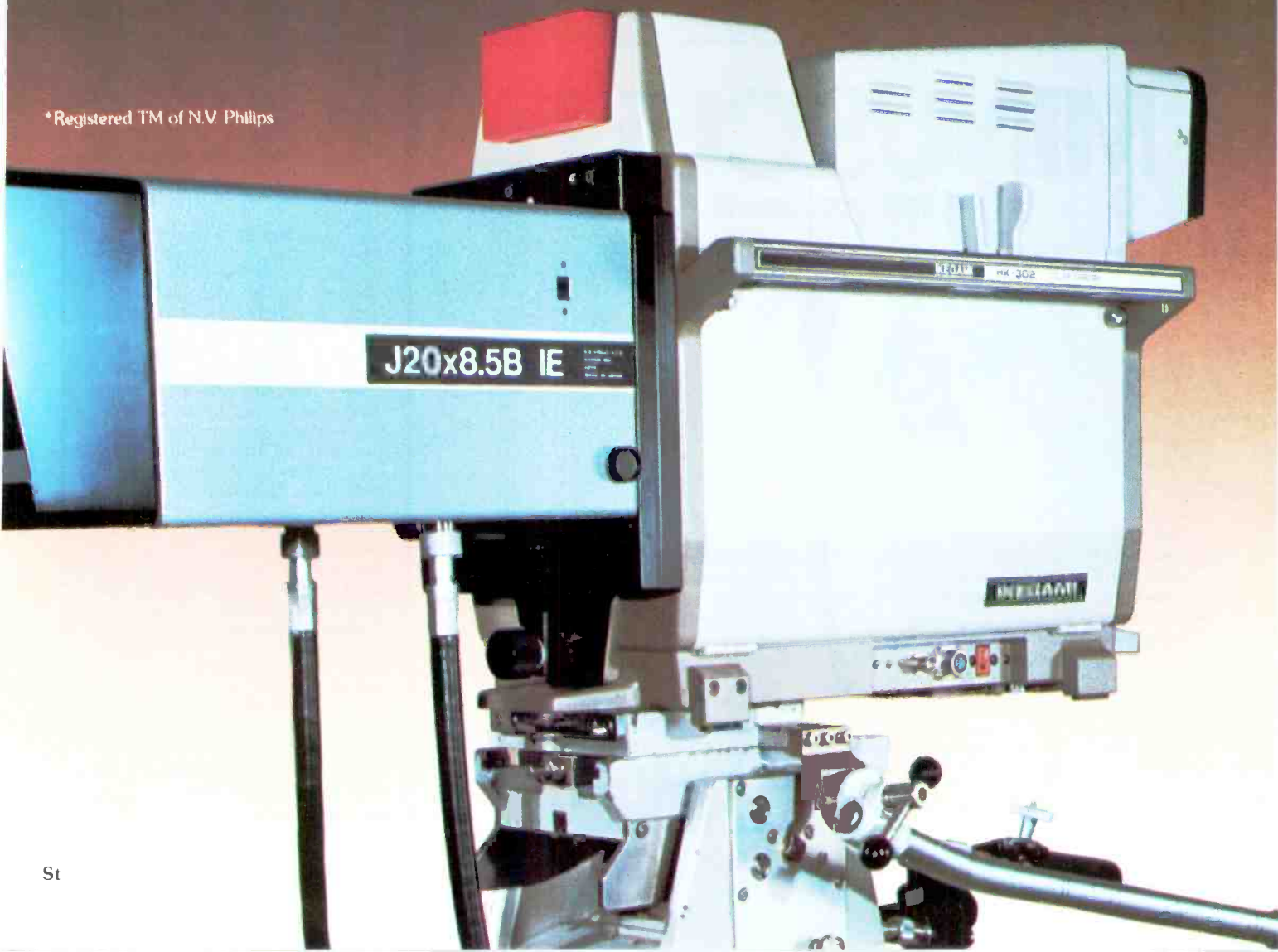
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the HDTV camera was used iconographically to sweep past frescoes and artistic details.

The crane used could extend as high as 46m and its movements could be controlled from the camera position at the end of its arm. The camera cable terminated in the van, where the CCU, HDTV video recorder and two monitors were located. A hydraulic platform was used at each location to facilitate loading and unloading of camera zoom lenses. A soundtrack was added to the video program to complete the production.

**The Soviet Union.** At the end of November 1982, Soviet Television's national network used the HDTV gear to produce a program at the Kirov Theater in Leningrad. A performance of *The Sleeping Beauty* was recorded in HDTV using cameras and the switching system. For dress rehearsals, the cameras were placed in a box to the right of the Imperial Box on the second tier, and on the right-hand front parterre (ground level). During the performance, the cameras were moved to better locations in a center box and a right-hand stage box on the first tier.

Because the Kirov Theater is not equipped with TV control

rooms, support equipment was installed in a corridor behind the second tier. This included the two CCUs, the HDTV VTR and the director's console with three monitors and peripherals. Soviet Television elected to use a camera control operator for each camera and not to have a vision mixer (switcher) operator, because the director personally operated the mixer during the program.

**England.** The HDTV equipment's next stop was at the BBC TV Theater in Shepherd's Bush, London. In early January 1983, the BBC produced a light entertainment show, shot with PAL cameras. The HDTV cameras were installed so that they could shoot in parallel with the regular studio cameras and record the same scenes without additional effort.

The full complement of HDTV production and editing equipment was installed in the VIP room of the theater, with the two camera CCUs and production console at one end of the room, and the two VTRs with their processing rack at the other end. BBC management and operating personnel saw, first hand, the operation and imagery of the HDTV system, and compared it with an identical program in the PAL format.

**Italy.** In late January and early February, the HDTV equipment was moved to Venice, where it came under the jurisdiction of RAI, the Italian National TV service. This was perhaps the most demanding application for the hardware and crew, because the severely cold weather, salty mist peculiar to winter in Venice and tidal effects had to be accommodated.

RAI did a short comedy featuring the traditionally colorful character of Harlequin. Because one of the production's purposes was to assess the possibility of producing feature films by means of HDTV, the program was done film-style. Also, a film camera was used in parallel with the HDTV camera in several sequences.

The program was produced on location in Venice, with a group of three small vans specially outfitted with the HDTV equipment. One van served as camera control, with sound and vision mixing included; the second van housed the VTRs; and the third van supplied lighting and power from a motor generator set.

Moving the vans around Venice was another challenging problem. Shifting the vans on barges, accessible only during high tides, was a risky, tricky exercise. As an added handicap, the city officials decided that the vans could be moved only on protective planks placed on the pavement. So, most of the time, they operated from floating barges.

**Switzerland/United States.** The Montreux Jazz Festival provided the Swiss site for HDTV program production.

Also shown were sequences of HDTV tapes produced in the United States by Francis Ford Coppola and Glen Larson Productions, which represented similar HDTV experiments.

#### Summary

The demonstrations of these programs in Montreux were via Sony 3-tube, large-screen projectors and GE Talaria large-screen TV projectors which were modified to operate on the 1125-line, 60-field system.

Dr. Paolo Zaccarian (Rome), director of engineering and development for the CBS TV Network in Europe, coordinated this HDTV international operation. The equipment was supplied by Sony, and the production facilities by each of the participating networks. Plans for the Montreux demonstrations were approved by Raymond Jaussi, director of the International Television Symposium, and put together by the organizing committee.

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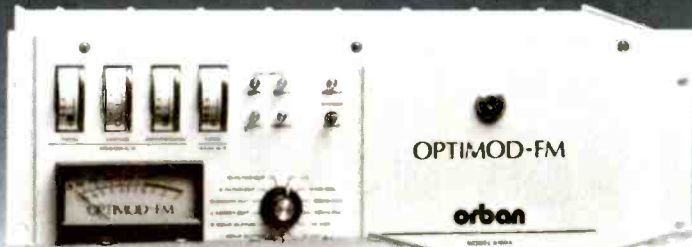
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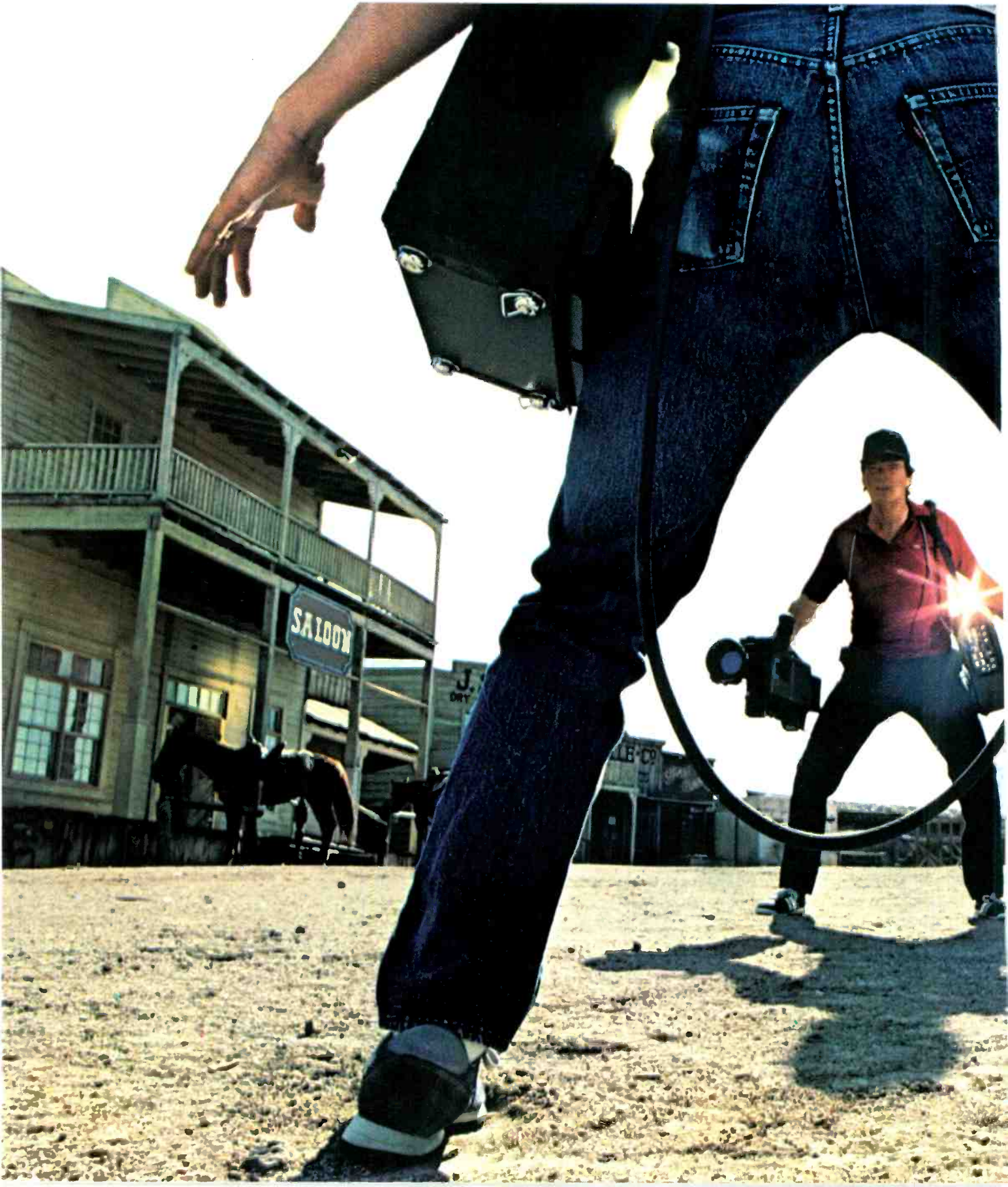
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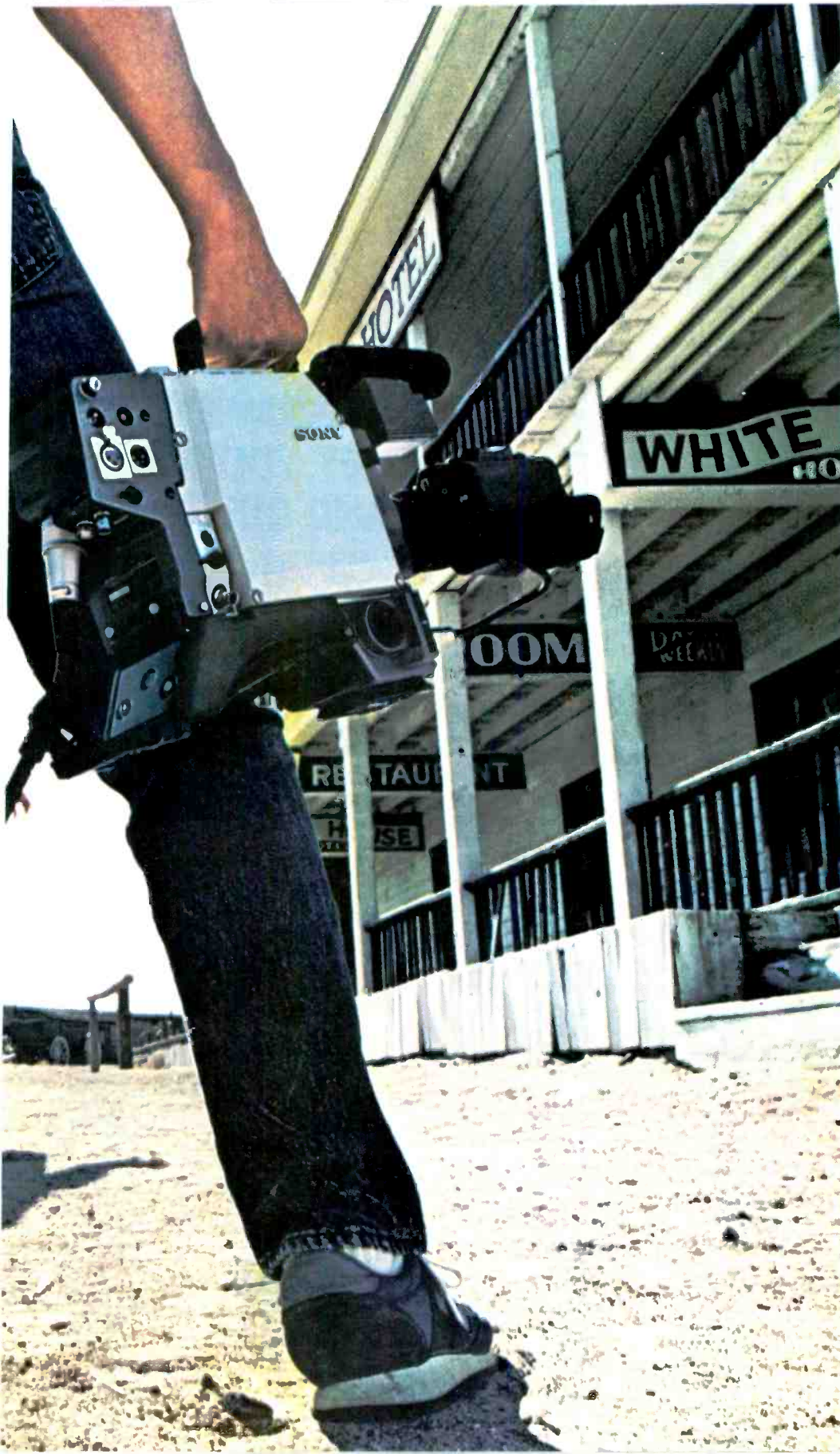
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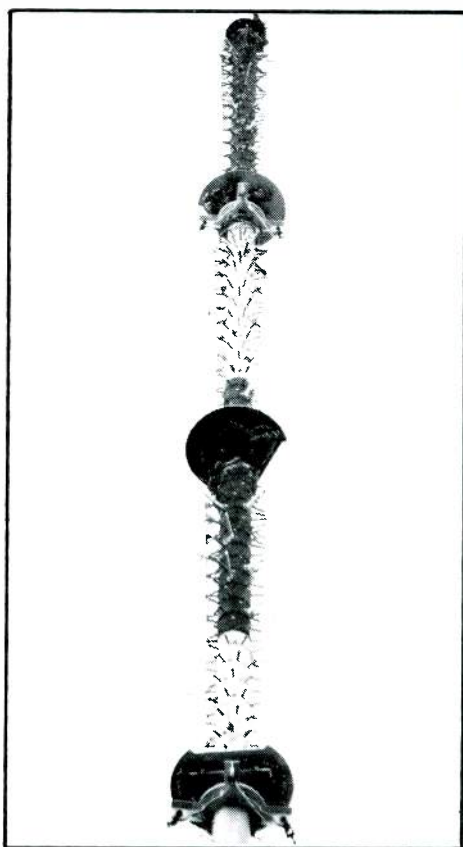
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Continued from page 86

available for over-the-air broadcasting. Thus, cable is emerging as an ideal delivery system for Europe. And the public demand for alternate programs explains the success of those cable systems. Cable is a growth industry there.

**Q:** How did you see the emphasis on DBS in Europe as compared to the United States?

**A:** Europeans are farther into the implementation state. There are many organizations that have made positive decisions, commitments, purchases of equipment and launch dates. So, Europe is 2-3 years ahead of the United States in true DBS.

**Q:** Do you see a greater emphasis on stereophonic, high quality sound and on multilingual television?

**A:** The emphasis is increasing. It is actually working in Germany and Japan. In the United States we are still struggling with the EIA committee, but I expect it will come to a decision this fall. That technology's time has come, even for existing terrestrial systems. The DBS systems in Europe are proposing 6-8 channels of digital sound.

I think that digital sound is a more important development than people have realized. From its rapid development in the record industry, in mastering and now in distribution of small discs, you have to think that once the public has become accustomed to digital sound it soon will not accept the analog systems.

The industry has done a good deal to improve TV sound in the last 10 years by going to a 16kHz line and following improved studio practices. But that's evolutionary. The rapid growth and success of FM and records show that people want high fidelity sound. That sound has to be included in television or the industry will suffer.

**Q:** How do you perceive the progress in teletext services?

**A:** In France, mainly because of government support, there is a rapid movement into an integrated videotex/teletext operation, stemming from the telephone directory. In the United Kingdom, teletext growth appears to be accelerating.

I'm pleased with our own progress. We have had the Extravision Service on the air now since NAB-'83. More than 90% of the affiliates are carrying the service. I think teletext is rolling and the standard is pretty clearly determined with the networks. I expect to see a lot of receiver makers providing NABTS decoders soon.

**Q:** In terms of world standards efforts, is the United States taking a strong

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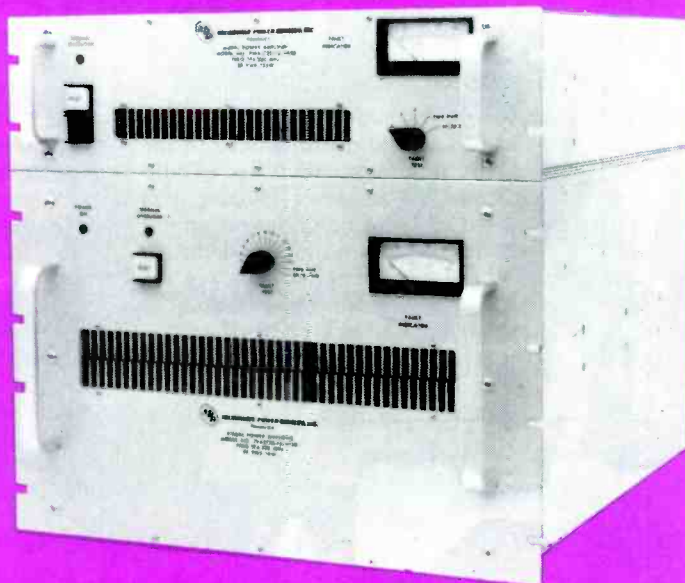


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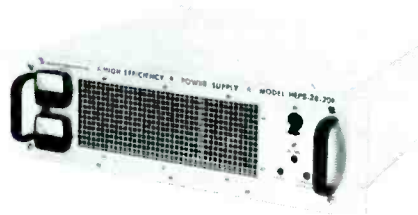
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# Birth of a camera

By Fred Haines, Harris Broadcast Division, Quincy, IL

Daring to design a new ENG/EFP camera today requires determination in the face of strong competition. But Harris considered it a distinct challenge because of the strong penetration and pricing strategy of off-shore suppliers, plus a lack of in-depth US competition. After evaluating user needs for a rugged, low-profile, high performance camera, Harris decided to design its advanced ENG/EFP camera system, the TC-90.

**New equipment philosophy**  
Various technologies associated

with camera design are constantly gathering momentum, and timing of a new product introduction is more important each year. Because a product conceived today may be hopelessly out-of-date in a few years, new designs must include analysis and use of appropriate future technology. This requires innovation based on careful planning.

Because Harris already has in production a modern computer setup studio camera, the TC-85, the new product would be designed to complement the existing studio camera. But could Harris improve enough on cur-

rent designs to create demand for such a new product? After all, there are 36 ENG/EFP cameras listed at \$20,000 and up according to a recent ENG/EFP camera roundup.

Field surveys of TV networks and TV stations and extensive meetings established the following design goals:

- Design the lightest weight 3-tube prism-optic camera.
- Provide visibility to the right over the top of the camera.
- Concentrate on operator comfort and convenience.
- Design a rugged camera case.
- Use LSI chips for stability and

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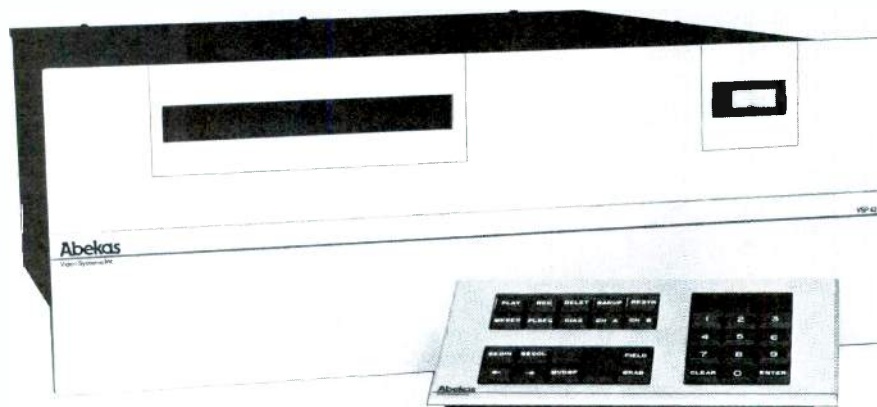
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low power consumption.

- Use ½-inch tubes for small size and low weight.
- Build-in certain features which, in most cameras, are add-ons at extra cost and weight.
- Cut power consumption to a minimum for long battery life.
- Make service and maintenance as convenient as possible.
- Design a camera with system versatility and make it easy to convert from ENG to studio/EFP and back again.

Backing up these design goals was a comprehensive marketing and business plan that defined domestic, international and special-niche markets; outlined costs for development; included a detailed product definition with specification goals; compiled a competitive analysis; and listed required resources including manpower, merchandising, factory support, tooling and a field service plan.

Approval of the total plan from corporate management set design and production in motion.

#### Weight reduction program

For years camera operators have been struggling with heavy equipment that has hampered their mobility and staying power. The TC-90's weight of 7.9 pounds\* was achieved through a combination of the new ½-inch (13mm) diameter pickup tubes and numerous innovative packaging techniques. All this was in keeping to a goal to develop the industry's lightest high performance, 3-tube prism camera.

Light weight requires that careful attention be paid to relatively heavy camera parts and components. It was natural, therefore, to investigate use of the new ½-inch (13mm) diameter pickup tubes. What we found was that these tubes had performance rivaling ⅔-inch (17mm) tubes, but they were dramatically smaller and lighter.

Also, much smaller prism-beam splitters and lenses contribute to a smaller and lighter camera. The camera has such a low profile that the operator has no difficulty seeing to the right over the top.

The ½-inch (13mm) tubes have many advantages compared to ⅔-inch (17mm) tubes. The following are 80XQ Plumbicon characteristics:

- lower weight; no focus coil required;
- 35% less volume;
- 6W less power consumed (three tubes);
- -56dB S/N ratio;
- improved geometry and registration;

\*Weight without lens and view finder, including tubes.



The TC-90 ready for an ENG assignment.

- less heat for a more stable camera;
- smaller prism and lenses;
- reduced microphonism;
- less lag;
- diode gun for comet tail suppression;
- G4 connection at tube front for better bypassing and minimum sweep ringing; and
- low capacitance target connection.

Low camera weight also requires that the mechanical and electrical component parts count be minimized. And for mechanical parts, the number of functions performed by each part must be maximized.

The elegantly simple construction scheme chosen consists of a front and rear casting joined by four rods. These are tensioned by the case that slides over the camera's internal structure from the rear. Because the case is screwed to the rear casting and bears against the back of the front casting, the case is compressed as the four rods are tensioned. The resulting structure is extremely light, yet unusually strong.

Absent in the TC-90 are the usual card cages, card guides, brackets, connector panels, doors, panels and sealing gaskets typically found in cameras. An example of the multiple function philosophy for mechanical parts are the rods that are slotted and



Shown (from right) are 25mm, 17mm and 13mm pickup tubes and yoke assemblies.



TC-90 camera, with housing removed, shows internal construction.

provide positive positioning for the 10 PC boards, as well as skeletal integrity between the front and rear castings.

Throughout the design phase, each part, either mechanical or electrical, was weighed and tabulated to track weight as the design progressed. Other weight reduction measures included use of a magnesium front casting, solder resist instead of solder coating on PC board ground plane areas, and thinner-than-usual PC board epoxy material. The boards are based on 0.031-inch-thick stock, which reduces camera weight and length. This saved 38% in weight compared to the commonly used 0.062-inch-thick board material.



Camera operators easily can see over the camera to the right.

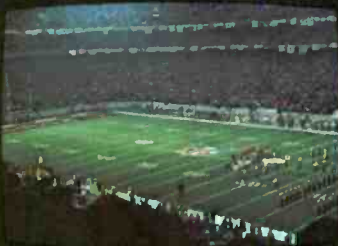


# 40 to 1

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\*1" cameras. Also available in 30mm plumbicon.



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### No blind-siding

In general, the height of a camera is fixed by the size of the prism-beam splitter and the room required by the three tubes in the vertical plane. The 1/2-inch tubes and their prism are considerably smaller than the 2/3-inch equivalents. This allows a low profile camera that is only about six inches high from the shoulder to the top of the case. The operator can easily see over the top of the TC-90, which can save a lot of shots that might otherwise be missed for lack of visibility.

### Keeping the camera operator in mind

The TC-90 design philosophy

stresses operator comfort and convenient operation. In addition to the primary concern of weight reduction, much effort was devoted to lowering the camera's center of gravity, which is only about 2 1/2 inches above a 4-inch-wide base on the shoulder.

This low center of gravity was accomplished by orienting the prism so that the blue tube is on the bottom, lowering the centerline of the lens. Also, placing the heavy PC components at the bottom of the circuit boards and the on-board battery pack low at the rear further lowered the center of gravity.

Stability and comfort are assured



The camera housing is a graphite-fiber-filled composite material for strength, durability, lightness and rainproofing.

through a compliant shoulder pad for a good fit on the shoulder, transverse ribbing for ventilation, and a balanced camera weight distribution when the lens and battery pack are attached.

### Rugged housing

When TV networks and broadcasters were surveyed before the camera design, they said that damage to camera housings was one of their biggest problems. Thus, a search was made for a new material for the housing that would be lighter than metal and have greater resistance to damage. Graphite-filled composite material finally was selected because it has low weight, toughness and conductivity. The housing is coated with a metal flash before it is painted to improve its conductivity. This is important in an ENG camera to keep out radio frequency interference.

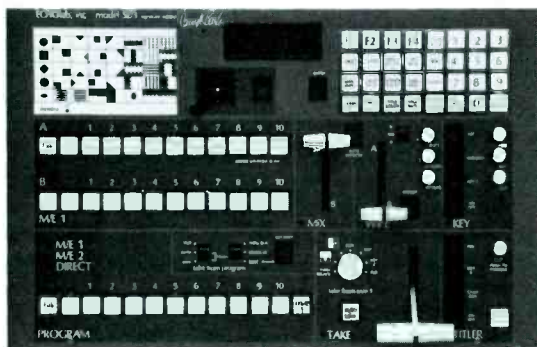
### The LSI story

To minimize power consumption and circuit drift, lower weight and cut down on adjustments, 14 LSI chips are used throughout the camera. Most of these circuits are designed around the differential amplifier. They are exceptionally stable over a wide ambient temperature range.

For example, one of the many trouble spots in portable cameras of the

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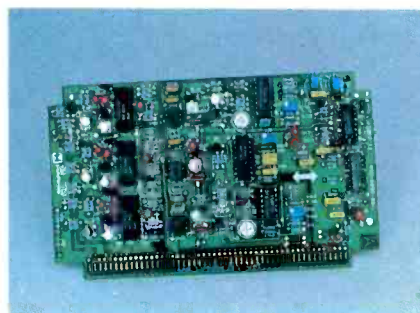
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Typical TC-90 PC board shows all components lying down on board for ease of maintenance, immunity to shock and vibration, and improved heat transfer for enhanced component life.

Continued on page 102

# Microdyne's New Multiple Feed System Lets You Receive Up To Five Satellites



With new programming constantly being added, you may want to pick up programs from several satellites. Previously, this would involve the expense of another dish. Now with Microdyne's new multiple feed system you may be able to add programming from additional satellites at about 1/5 the cost of a new dish.

The MSF-16 Multiple Satellite Feed System can receive up to five satellites on the same parabolic reflector when the satellites are located in close proximity. In a TVRO system designed with adequate margins, the MSF-16

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Existing Microdyne/AFC antennas can be easily retrofitted to accommodate this new system. Only the spars and brackets of the feed support hardware must be changed — no other antenna changes are required. This simple modification can be done by the user or by Microdyne field service personnel.

Even if you purchased your existing antenna from another manufacturer, it may still be possible to modify it for use with the Microdyne

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In the past ten years,  
computers have gotten smarter,  
cameras have gotten simpler,  
ovens have gotten quicker,  
beer has gotten lighter,  
bodies have gotten leaner,  
athletes have gotten richer,  
hi-fi has gotten higher,  
radio has gotten stronger,  
studios have gotten smaller,  
towers have gotten taller,  
movies have gotten longer,  
cars have gotten shorter,  
film has gotten faster,  
outerspace has gotten closer  
and blue jeans have gotten classier.

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It's electronically better. There are new, high performance components, including NE5500 Series amplifiers. There's an exclusive ITC/3M playback head for smooth frequency response and improved signal-to-noise. We've added a toroidal power transformer with fully regulated and protected power supplies. And a digital cue tone detector controlled by a powerful microprocessor.

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START

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**3M**

last generation was differential drift of the gamma correction circuits with temperature variations. But in the TC-90, the red, green and blue gamma circuits are inside a single LSI chip. When the camera is subjected to temperature extremes, the three circuits accurately track because they are on a common semiconductor substrate, so that color errors are avoided.

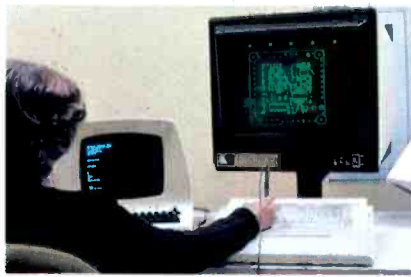
**Built-ins, not add-ons**

In many cameras, certain options are attached at the camera rear or bolted to the side. In the TC-90, we decided to build in as many of these as possible. Accordingly, inside the camera are a sync generator, gen-lock, program microphone amplifier and a studio-type intercom system. For the future, there are two spare PC board slots with connectors ready for new developments.

For EFP use, remote CCU interface circuitry is included inside the camera. There is no need for an add-on module to convert the TC-90 for studio/EFP applications.

**Power miser**

From the beginning, Harris knew



Computer PC board design is accomplished through an interactive CRT terminal with keyboard and a light pen

that if the camera's power consumption could be kept low, then the camera could use a smaller, lighter on-board battery pack. Because the TC-90 was to contain its many built-in circuits, this was not an easy task.

During the design effort, engineers carefully kept track of each milliwatt. Each circuit was analyzed to find the best compromise between performance and power drain. The result is a camera that consumes only about 20W. And this means that a small battery pack will operate the camera from 1-2 hours.

**Easy maintenance**

Typically, the maintenance technician is pressed for time when a

camera needs a tube changed or requires repairs/adjustments. Furthermore, his job is often hampered by inaccessible subassemblies and standup components that make it difficult to connect an oscilloscope or multimeter to a circuit.

In the TC-90, all components are lying down on the PC boards. This contributes to ease of service, reliability under shock and vibration, and improved heat transfer for longer component life. All components are clearly marked with silk-screened designators on the boards, and adjustment potentiometers are mounted at the edges of the boards to be accessible without use of a card extender.

Should a tube need to be replaced, the procedure is simple. Unscrewing four screws and unplugging two connectors allow the complete removal of a tube/yoke assembly from the prism housing.

**A system-ready camera**

There are many times when a portable camera must be used in a studio or in a mobile production van to supplement larger cameras. The TC-90 has built-in capability to make rapid conversion to studio/EFP use easy.

An optional digital control system with a 16-function CCU (Camera Con-



**&**



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## Quartercam™ from Bosch. If you're going half-inch, you're only going half-way.

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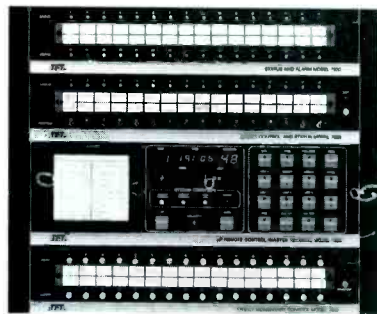
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PC boards are automatically tested by this computer system.

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Black balance is accomplished by switching the balance switch to the black position. This causes the lens to close its iris; black balance is complete in 0.3 second and the iris opens to its previous setting.

White and black balance are held in a memory circuit for 30 days or more, even if the camera is turned off or an on-board battery pack is replaced.

#### Conveniences

Built-in, split-field color bars and a built-in diagnostic test signal add to the convenience of recording and maintenance.

Provision for mounting a sun gun and microphone are included with the camera. A folding handle for easy field transport folds down out of the way for an unobstructed view over the top of the camera.

At the rear, an array of connectors provides interface between the camera and a VCR, the remote CCU, an intercom system and an external monitor. If the on-board battery runs down, a switch transfers the camera to the VCR battery, if a VCR is connected to the camera.

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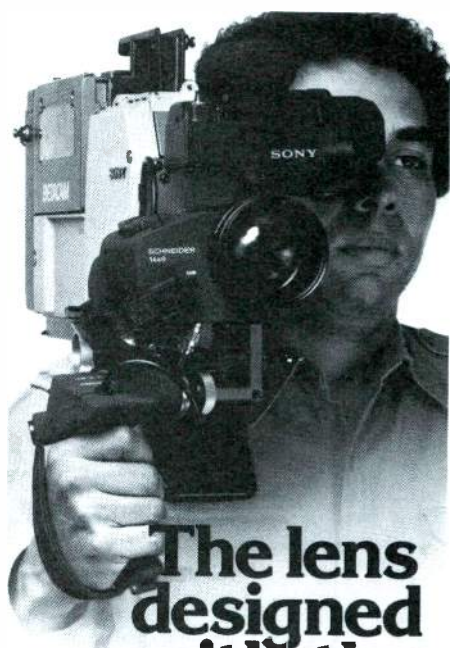
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## 14X ENG/EFP

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All PC boards are temperature- and power-cycled in a modern chamber for 60 hours to shake out any marginal components.

view finder ocular indicate the status of *Record*, *End of tape*, *Tape battery low* and *Camera battery low*. A push-pull switch on the *Contrast* control turns a view finder peaker on to aid critical optical focusing.

### PC boards

Increasingly complex products, user requirements, government regulations and competitive pressure are forcing many industries to use factory automation subsystems. Harris uses a modern CAD (computer-aided design) system to minimize errors in design and to increase the productivity and efficiency of the engineering and manufacturing processes.

In the design of PC boards, an electronic pen, menu and keyboard enable operators to call up schematic symbols from a stored symbol library. They use the pen and a CRT to create schematic diagrams from engineering sketches interactively.

Once the schematic is entered on the CRT, the computer makes a complete component listing for that PC board. Then it automatically places components on the board to minimize total wire length. An automatic routing of circuit traces is completed in a short time, and establishes the shortest feasible interconnections. These computer-routed paths circumvent common user-defined obstacles such as tooling holes, silk-screened areas, "keep-out" areas and traces of other signals that might cause crosstalk or feedback problems.

This smart system goes on to perform even more tasks automatically, such as comparing the PC board component list against the schematic component list, and automatically checking the design for compliance with design rules, such as trace spacings, pad-to-line clearances, etc. After computer generating the PC board artwork, the system automatically prepares control tapes for the numerically controlled driller/router in the factory PC board facility.

Thus, this space-age system saves time, increases productivity, allows

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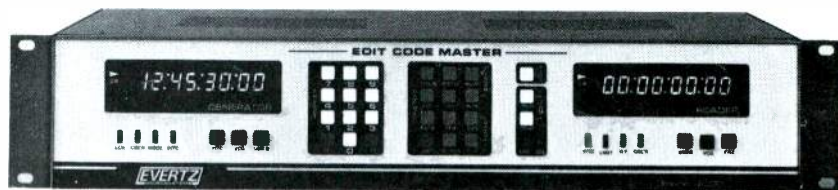
offers all of these features:

- reads vertical interval time code at speeds from still frame to 30x play speed and more ...
- uses a high resolution character generator/keyer ...
- displays alpha numeric text recorded in the user bits ...
- decodes source identification, e.g.: CAM3, VTR2, etc. ...

And now we have added two additional super features ...

- BCD output in bit parallel/digit serial format or an optional set of 6 control outputs which allow remote control of VTRs etc., via routing switchers or patchfields without any need for a separate machine assignment system ...
- longitudinal time code output permitting VITCode to LNGT code translation ...
- all at the same low price!

The 4300 always generates longitudinal time code at play speed regardless of the speed of the tape being read. This enables your LNGT readers and editors now to read time code accurately down to still frame. You can select field accurate edits right off the master ... an enormous benefit when both speed and accuracy are required. And the unit mounts conveniently on the back of a monitor!



The top of the line ECM 4000 Edit Code Master combines a generator and reader for both VITCode and longitudinal time code with a high resolution character inserter, making it the comprehensive answer to all time code needs. It reads from still frame to full wind speeds directly off the VTR output. Alpha numeric user bit capabilities enable the storage of tape indexes, program comments and source identification.

Watch for the new 4100 VITCode reader, 4500 Portable VITCode generator and 4600 VITCode source identification system from the people who are dedicated to better time code systems.



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### Computer tests

One of the most time-consuming and error-prone tasks in the manufacture of complex electronic products is the inspection and test of PC boards. We use a 3060 computer, working with programmable test equipment, to automatically check boards for shorts and opens and to verify that components are properly inserted and are of proper values. The 3060 checks a typical PC board in about two minutes, compared to 30-45 minutes required for a manual check.

The boards are next tested for functional integrity under power and with signal inputs from another computerized system. This system digitizes the video and other signals and automatically checks them against specifications. We have found that product reliability is greatly enhanced if the PC boards are burned-in at an elevated temperature with frequent on-off power cycles. Marginal components are weeded out rapidly by this method and fail during burn-in rather than in the field.

Final camera testing is done by skilled technicians using test charts, special diascopes and a TV set with studio lighting.

### Summary

The TC-90 features improvements in weight, size, performance, reliability, durability, ease of maintenance, and operator comfort and convenience.



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EIMAC tubes available cover power ranges from 100W to

1,000W peak sync/visual in the UHF range which can be used in combined aural and visual transmitting applications as well as separate diplexed transmitters. EIMAC tubes meet or exceed stringent IMD and gain requirements. Tubes used in MDS or ITFS service are capable of providing up to 50W peak sync/visual.

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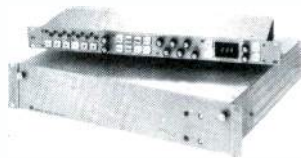
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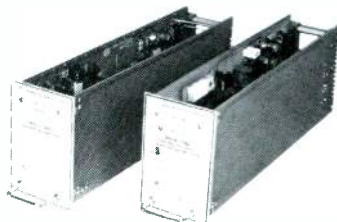
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# Understanding the peak program meter

By Larry Lamoray, international marketing manager, Auditronics, Memphis, TN

Although the peak program meter (PPM) is one of two pieces of equipment allowing practical visual monitoring of audio levels, few North American broadcasters are aware of or understand its applications and advantages.

The second piece of equipment, the VU meter, is what the name implies: volume unit or volume indicator. These meters usually are constructed of a rectifier and moving coil indicator set for a 300ms response time to 0VU (100%) reading and a similar fall-back time. The ballistics are chosen for indication of the average input level and designed to approximate the human ear's response. (In actual use, when presented with a complex waveform input, the VU indication is not exactly the average level, but a compromise caused by delay and inertial overshoot of the mechanical movement mass.)

Although VU meters now are available as electronic displays, the same ballistics and idiosyncrasies are

built into them to match those of mechanical-type meters. VU meters also have a small indication range— $-20\text{dB}$  to  $+3\text{dB}$ —limiting their usefulness over the spectrum of possible uses (for example, voice or classical music vs. contemporary or rock music), and often a low level indication is observed as a small wiggling of the pointer at the lower end of the meter, or no indication at all.

Peak program meters are also what their name implies: *peak indicators*. They are designed for use when the maximum level of program content must be known, as in tape recorder inputs, transmitter feeds or disc cutting chains. PPMs built to IEC standard 268-10\* (DIN 45406) have a response (integration) time of only 10ms to 0dB or 100% indication, and a fall-back

\*PPMs built to other standards such as Nordic N9 (1974), EBU 3205-E and British Standard 4297;1978 are also available and in common use, but are not discussed here because of their similarities and the author's desire for simplification.

Table I.

Typical PPM specifications per IEC 268-10 (DIN 45406)

Suppression of asymmetry: 60dB minimum.

Measuring range:  $-55\text{dB}$  to  $+5\text{dB}$  (0dB indication =  $+6\text{dBm}$  Ref 0.775Vrms, adjustable) or  $-70\text{dBm}$  to  $-15\text{dBm}$  in offset mode.

Integration time: 5kHz level providing a steady tone indication of 0dB, will provide the following indications when applied as a tone burst:

10ms burst =  $-1\text{dB} \pm 0.5$

5ms burst =  $-2\text{dB} + 1$

3ms burst =  $-4\text{dB} + 1$

0.4ms burst =  $-15\text{dB} + 2$

Fall-back time: 1.5s/20dB, 2.5s/40dB, adjustable.

Filter:  $-12\text{dB/octave}$  above 20kHz.

Polarity reversal error: 0.5dB maximum.



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time of 1.5s/20dB. These standards were selected by European broadcasters to accurately indicate short signal peaks: peaks of less than 10ms will be indicated at reduced level, but are of a high enough frequency not to be perceived as distortion by the human ear. The standard also provides a display usable without fatiguing the eye.

Although moving coil PPMs are available, most modern designs use an electronic display, thereby eliminating overshoot problems. (Many moving coil PPMs are designed with a reverse-loaded movement, thereby minimizing delay and over-

shoot.) The display range is typically -50dB to +5dB, with many models including 20dB offset capability allowing accurate indication to -70dB, making the PPM ideal for use on any program material. Indications greater than 0dB are distinguished by eye-catching illumination, making it easy to scan several units at a glance.

#### History and design of PPMs

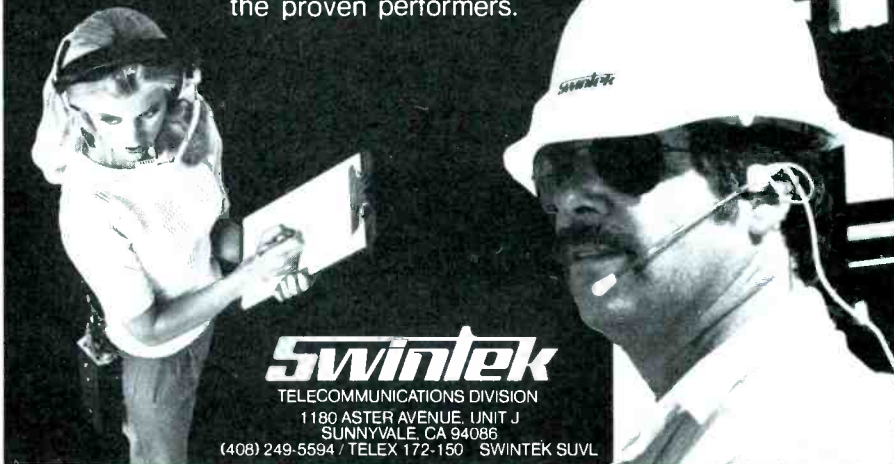
Peak program meters have been used for decades throughout the European broadcast community. Many of the earlier, expensive designs included lamps, with mono units taking up an entire 19-inch rack width; later

designs used a mechanical movement fitted with mirrors and lenses projecting a light beam on the rear of a glass plate, hence the common nickname *light beam meters*. Today's designs commonly use a neon bar-graph display manufactured by the Burroughs Corporation and are much less expensive than in the past. Display and control elements are combined in an efficient package for mounting in minimum space; power consumption is low, typically 3.6W for a stereo PPM; and the unit neither generates noticeable heat, nor is susceptible to normal temperature variations. Unlike VU meters, PPM inputs include buffering so that no external buffer is required to ensure non-degradation of the monitored signal.

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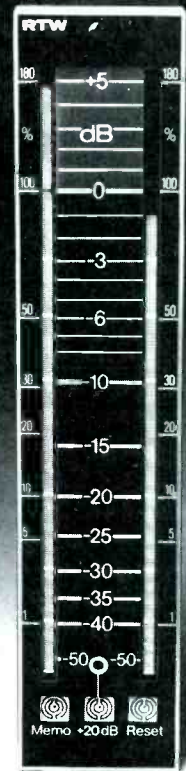
The Swintek Mark 200 is the world's finest and most dependable wireless intercom system. Each system is designed to meet your specific requirements using standard, fully tested, precision Swintek electronic components that are protected by all metal cases. Swintek—the proven performers.



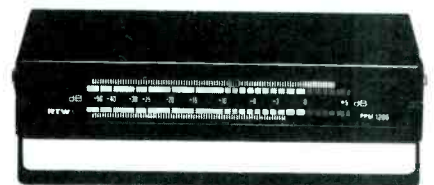
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The RTW 1114 stereo peak program meter includes 5-inch displays with 101 segments each, peak memory and input level 20dB offset.



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# RM1608

## SPECIFICATIONS

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### HUM & NOISE (20Hz to 20kHz) $R_s = 150$ ohms (INPUT GAIN "-60")

- 128dB Equivalent Input Noise (E.I.N.)
- 95dB residual output noise: all Faders down.
- 80dB (84dB S/N) PGM Master volume control at maximum and all CH PGM assign switches off.
- 64dB (68dB S/N) PGM Master volume control at maximum and one CH Fader at nominal level.
- 73dB (77dB S/N) STEREO Master Fader at maximum and all CH STEREO level controls at minimum level.
- 64dB (68dB S/N) STEREO Master Fader at maximum and one CH STEREO level control at nominal level.
- 80dB (70dB S/N) ECHO SEND volume at maximum and all CH ECHO volumes at minimum level.
- 75dB (65dB S/N) ECHO SEND volume at maximum and one CH ECHO volume at nominal level.

### CROSSTALK

- 70dB at 1kHz: adjacent Input.
- 70dB at 1kHz: Input to Output.

### MAXIMUM VOLTAGE GAIN (INPUT GAIN "-60")

- |        |  |
|--------|--|
| PGM    | 74dB: MIC IN to PGM OUT.<br>24dB: TAPE IN to PGM OUT.<br>34dB: ECHO RETURN to PGM OUT.<br>14dB: PGM SUB IN to PGM OUT. |
| STEREO | 74dB: MIC IN to STEREO OUT.<br>24dB: TAPE IN to STEREO OUT.<br>34dB: ECHO RETURN to STEREO OUT.                        |

- |        |  |
|--------|--|
| ECHO   | 70dB: MIC IN to ECHO SEND.                                   |
| C/R    | 74dB: MIC IN to C/R OUT.<br>24dB: 2 TRK IN to C/R OUT.       |
| STUDIO | 74dB: MIC IN to STUDIO OUT.<br>24dB: 2 TRK IN to STUDIO OUT. |

### CHANNEL EQUALIZATION

± 15 dB maximum

HIGH: from 2k to 20kHz PEAKING. MID: from 0.35k to 5kHz PEAKING. LOW: from 50 to 700 Hz PEAKING.

HIGH PASS FILTER - 12dB/octave cut off below 80Hz.

OSCILLATOR Switchable sine wave 100Hz, 1kHz, 10Hz

PHANTOM POWER 48V DC is applied to XLR type connector's 2 pin and 3 pin for powering condenser microphone.

DIMENSION (W x H x D) 37-1/2" x 11" x 30-1/4" (953 mm x 279.6 mm x 769 mm)

Hum and Noise are measured with a -6dB/octave filter at 12.47kHz; equivalent to a 20 kHz filter with infinite dB/octave attenuation.

\*0dB is referenced to 0.775V RMS.

• Sensitivity is the lowest level that will produce an output of -10dB (245mV), or the nominal output level when the unit is set to maximum gain.

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And in the tradition of Yamaha's sound reinforcement mixers, the RM1608 sets new standards of reliability as well as ease of operation. For complete information, write: Yamaha International Corporation, P.O. Box 6600, Buena Park, CA 90622. In Canada, Yamaha Canada Music Ltd., 135 Milner Ave., Scarborough, Ont. M1S 3R1.



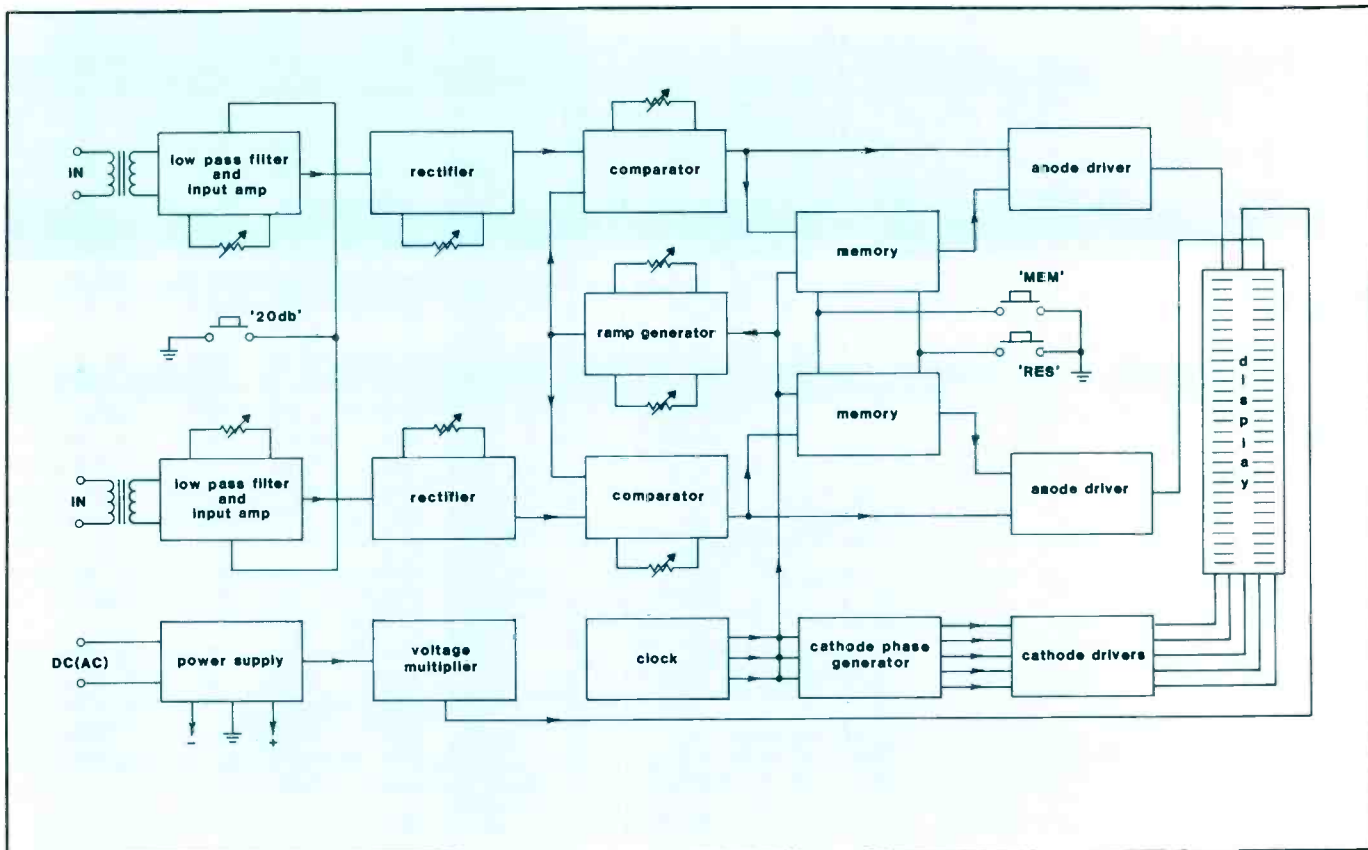


Figure 1. Typical block diagram of a peak program meter.



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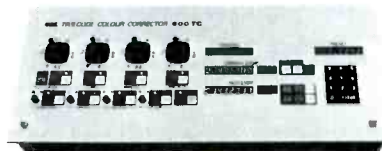
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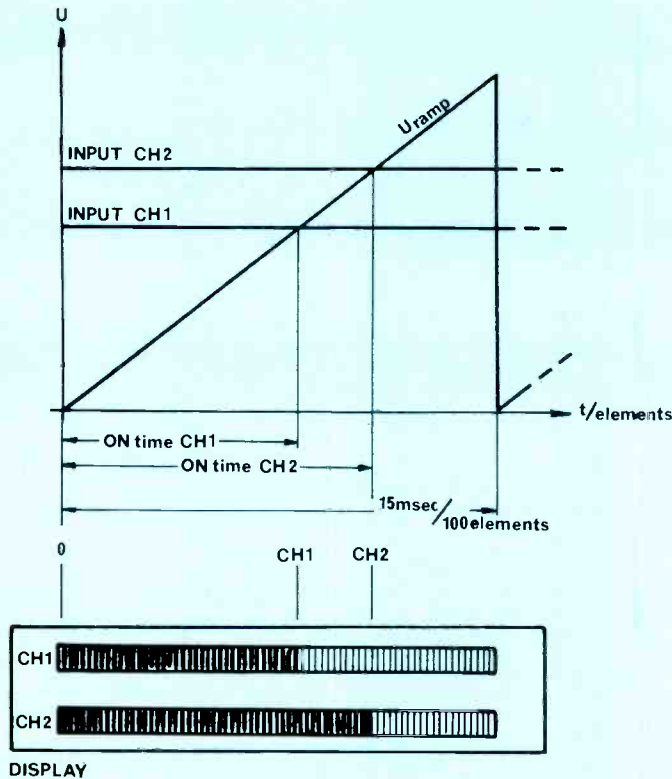


Figure 2. Bar segments are commanded on by comparison of the rectified audio input level and a master ramp voltage.

Typical circuit design encompasses the following stages. (See Figure 1.) The input is transformer-isolated with a balanced, bridging input impedance of 10k $\Omega$  or greater.\* Input signals are passed through a low-pass filter to prevent false indication caused by residual high frequencies from tape recorder bias and erase circuitry or RFI from typical broadcasting transmission equipment. Next is a precision full-wave rectifier, followed by a comparator. This comparator is also fed by the master ramp, a precision sawtooth voltage generated in synchronization to the master clock (approximately 70Hz). The rectified audio level is compared to the ramp. Then the anode driver is turned on for all display elements from minimum indication to the point where the audio level matches that of the ramp. Figure 2 shows the command of the bar segments.

Powering varies among available models; some use 110Vac mains, while others require 24Vdc or bipolar 15Vdc. All generate 220Vdc internally for use as the biasing voltage for the neon display element.

\*Some lower-priced models have unbalanced transformerless inputs, as do models modified for high speed duplicating applications.

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EEV4a

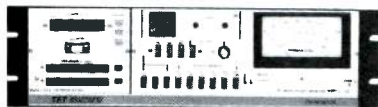
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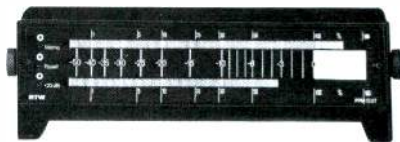
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The RTW 1227 stereo peak program meter is self-contained. It includes 10-inch displays with 201 segments each, peak memory and input level 20dB offset.

Models are available in a wide range of cost, size and function, with bar graphs ranging in size from 5-10 inches, and with 101, 201 or 301 display elements per bar. Most models include scales for horizontal or vertical clamping, and some include peak memory and input level offset functions, often with remote control. Prices\* range from \$394 to \$1314 for stereo units. Accessories for rack-mounting or cases with integral power supply are available.

### Why PPMs?

Although VU meters are excellent tools when used as volume indicators, peak meters have specific advantages for certain applications, particularly for monitoring final program material in the production or transmission stage. Instead of applying constant limiting or compression to program material, PPMs can be installed to accurately monitor and ensure that maximum peak output levels are not exceeded. With a limiter or compressor installed in the audio chain merely as a fail-safe device, audio quality will be improved.

Because of their wide scale range and accurate indication, PPMs are invaluable for matching levels during assembly or punch-ins in production, and the peak memory feature, available on many models, requires only one glance at the end of a production session to see if maximum output level was ever exceeded. If so, only output level adjustment is required to remedy the problem.

Interface to PPMs is simple, requiring only the connection of power and audio, usually via an XLR-type connector. User acceptance is excellent because of the improvement in perception of program information and the ergonomic design of the display and ballistics. As sound quality becomes more important to broadcasters, the higher cost of PPMs is offset by their advantages.

\*Prices indicated are for units manufactured by RTW, available in the United States and Canada exclusively from Auditronics.

### Acknowledgement

The author wishes to thank Otto Jungling and Rudi Twelker of Radio-Technische Werkstätten for their assistance in preparing this article.



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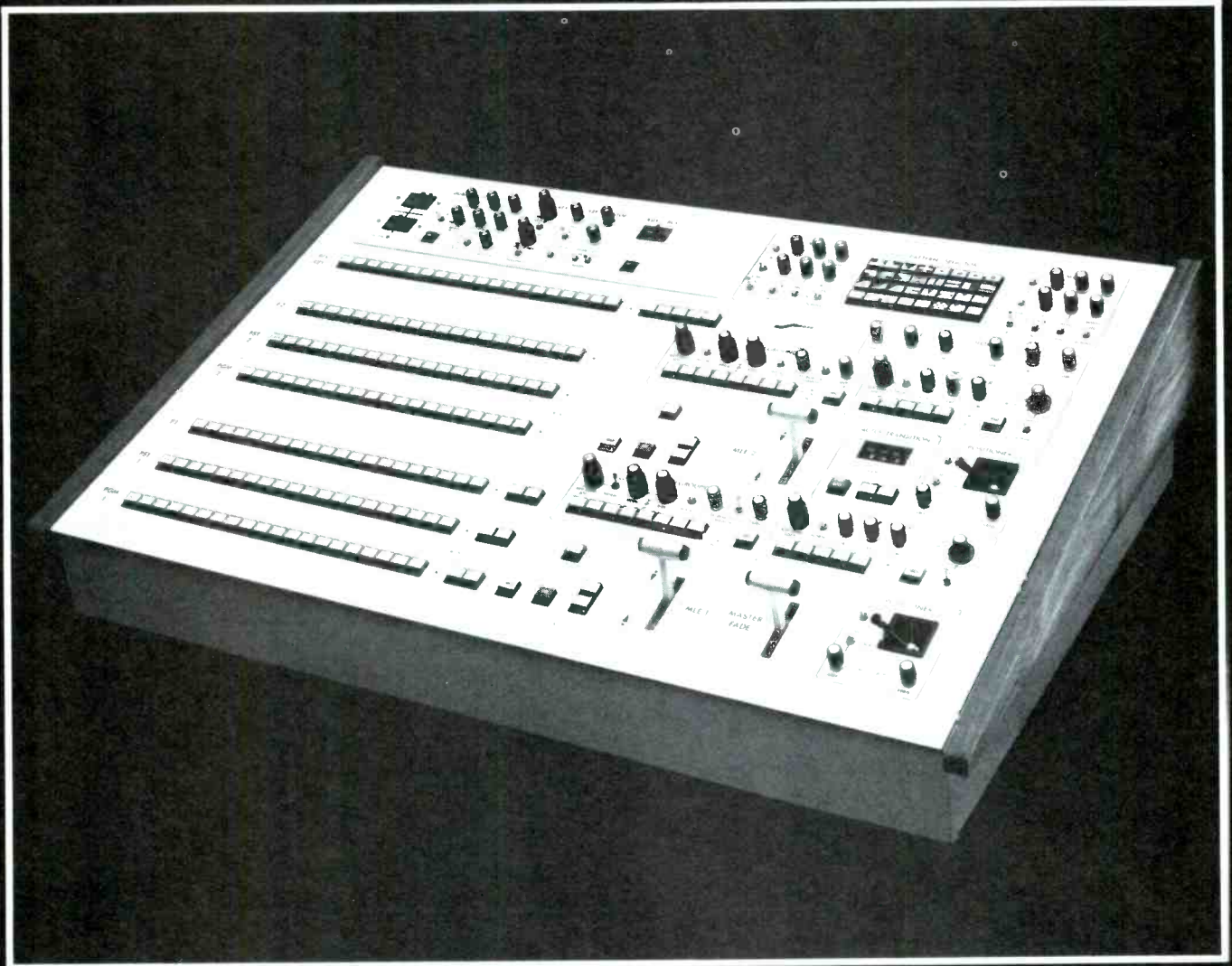
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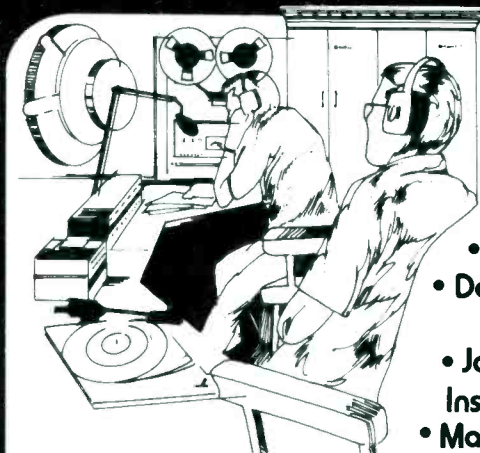
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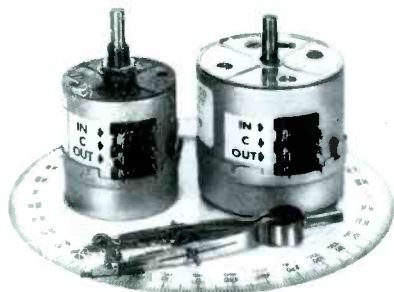
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## News

Continued from page 24

Merit Award for outstanding community service to the Norfolk, VA, and Virginia Beach areas. To help reduce unemployment, WVAB promised to give free air time for a 6-month advertising campaign to companies that created 100 jobs between January and April.

This prize, worth more than \$15,050, enticed four companies to create a total of 570 jobs. All four companies were considered winners and they will share the advertising time. Doris Hindlin, employment coordinator, Virginia Employment Commission, said unemployment in the region was 8.1% in January, but now is 7.7%.

### Emmy awarded to videographics system developer

Ten years have passed since the "SuperPaint" electronic graphics system produced its first picture on April 10, 1973. During this period, the career of Dr. Richard Shoup, SuperPaint designer, has undergone many phases. One of these involved founding Aurora Systems (San Francisco) to produce his digital videographics equipment. The crowning event, however, was receiving an Emmy Award, presented by the National Academy of Television Arts and Sciences on Sept. 12 in New York. The Emmy represented the engineering award for the development of the electronic graphics creative system.

In developing SuperPaint, Shoup thought that combining digital techniques with video techniques would result in a useful artistic tool for TV applications. Shoup, who has a Ph.D. in computer science and a BSEE degree, both from Carnegie-Mellon University, worked at the Xerox Palo Alto Research Center at the time of development.

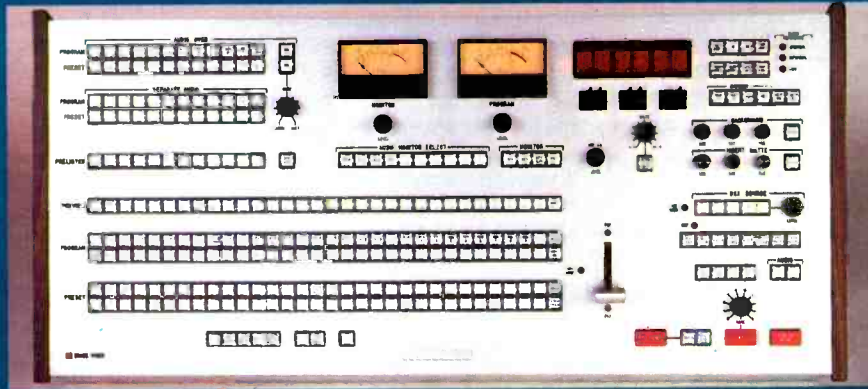
Premiering on a PBS TV program in 1976, SuperPaint was used extensively during the NASA Pioneer Venus mission (December 1978). It created visualizations of spacecraft maneuvers during the encounter with Venus. The system also created simulations of scientific experiments and early results on that mission.

Based on SuperPaint, the upgraded Aurora/100 videographics system is well-known to viewers of KRON-TV 4 (San Francisco) and CATV's The Weather Channel, a John Coleman-Landmark Communications weather service. KSL-TV 5 (Salt Lake City), WTJV-TV 4 (Miami) and the Post Group production facility are currently using the Aurora/100 equipment. Additional units have gone to France, Japan and London. The system at



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KRON-TV has produced covers for **Broadcast Engineering**. (See June 1981, December 1981, Spec Book 1982, and February 1983.)

### Moffet dies

John A. Moffet, president of Moffet, Larson & Johnson, died on June 1. Moffet was in the consulting engineering business since 1946.

He was a member and past president of the Association of Federal Communications Consulting Engineers, a life member of the Institute of Electrical and Electronic Engineers, a senior member of the Society of Broadcast Engineers, a member of Kappa Sigma, an associate member of NAB and a member of Broadcast Pioneers.

### Fuji H621 named broadcast standard videotape

Fuji's H621 1-inch videotape has been named the standard reference tape\* by the NHK (Japan Broadcasting Corporation) and Japan's Association of Commercial Broadcasters, which consists of 116 private stations.

The selection of the H621 was because of its consistently high product quality and picture reproduction capabilities.

In 1980, Fuji's H701E 2-inch videotape was recognized as the stan-

ard reference tape by the same associations in Japan, making Fuji now the sole supplier of reference videotape in both formats.

\*Reference tape refers to the videotape by which broadcasters agree to standardize all parameters of performance.

### Hughes Communications files for Ku-Band satellite system

Hughes Communications and subsidiary, Hughes Galaxy, filed with the FCC in April for authorization to construct, launch and operate a Ku-Band domestic satellite system. The first of the three spacecrafts would become operational in 1987.

The proposed Ku-Band satellites will be a wide-body configuration designated HS 393. Each has 16 transponders, high power 45W traveling-wave tube amplifiers and a radiated power approaching the authorized broadcasting limits in this frequency band and 50dBW EIRP, allowing the satellites to provide communications to small earth terminals. Each satellite, designed to benefit from the launch economies of the space shuttle, will have a 10-year design life.

Hughes' Ku-Band application requested adjacent eastern orbital slots at 76° West longitude and 74° West

longitude (to be located with Hughes' Galaxy II) and a western slot at 121° West longitude for Hawaiian and Alaskan coverage.

The satellites may be used for video distribution, general business communications services and teleconferencing.

### Taft installs Artel systems

Taft Broadcasting recently installed Artel's SL2000 fiber-optic systems for audio and video transmission at the Johnson Space Center in Houston. The systems link the NASA TV Control Center and the Public Affairs Building, which are 1km apart. This allows the transmission of broadcast quality audio and video without equalizers or amplifiers.

To install the 6-channel video feeds with associated audio subcarriers over the 1km distance, Taft ran the fiber-optic cables from the TV Control Center through the Space Center utility tunnels to the cable trays in the Public Affairs Building. The SL2000 used T2020 plug-in modules at the transmit end and R2020 modules at the receive end. The modular system incorporates full diagnostic self-monitoring, self-testing and self-alarms to simplify setup and operation.

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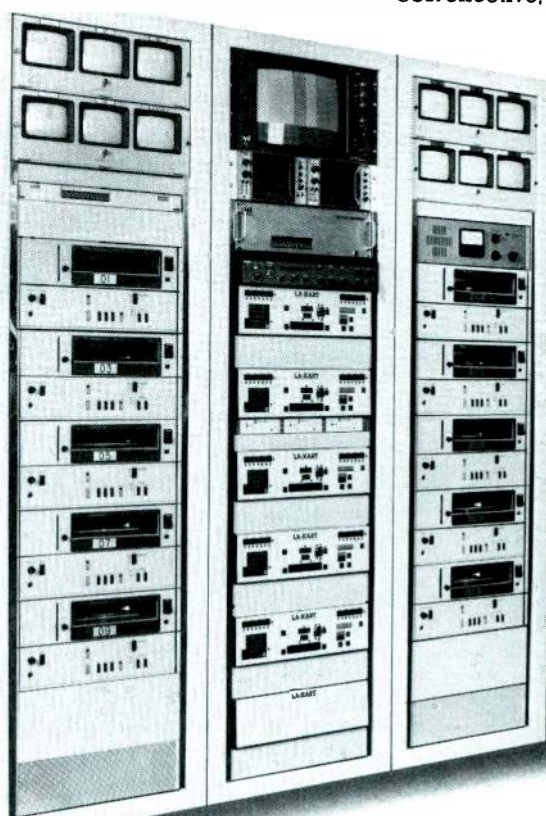
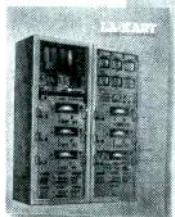
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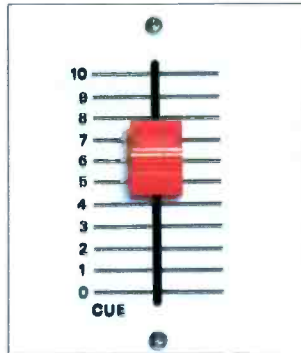
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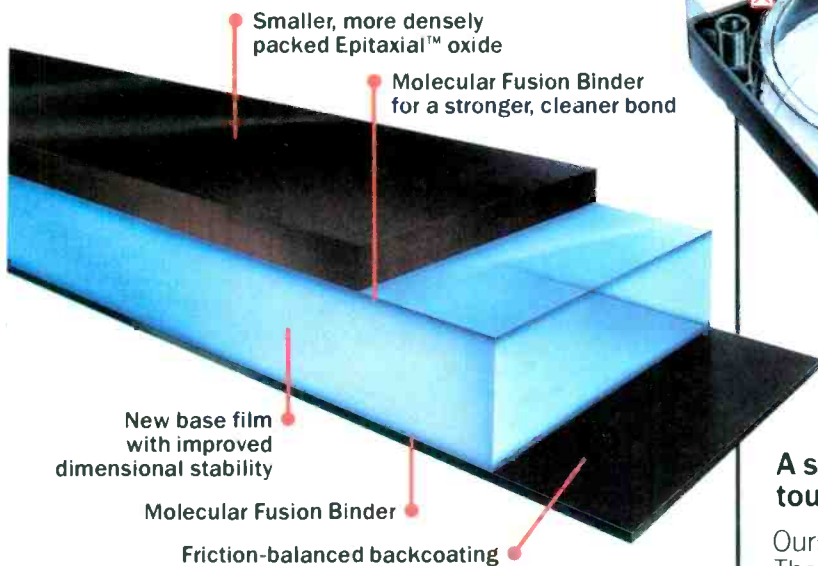
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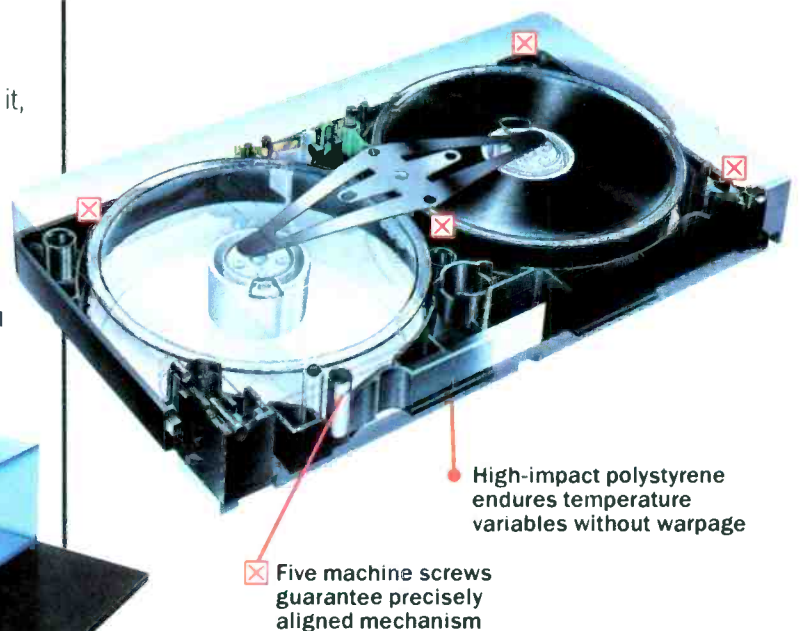
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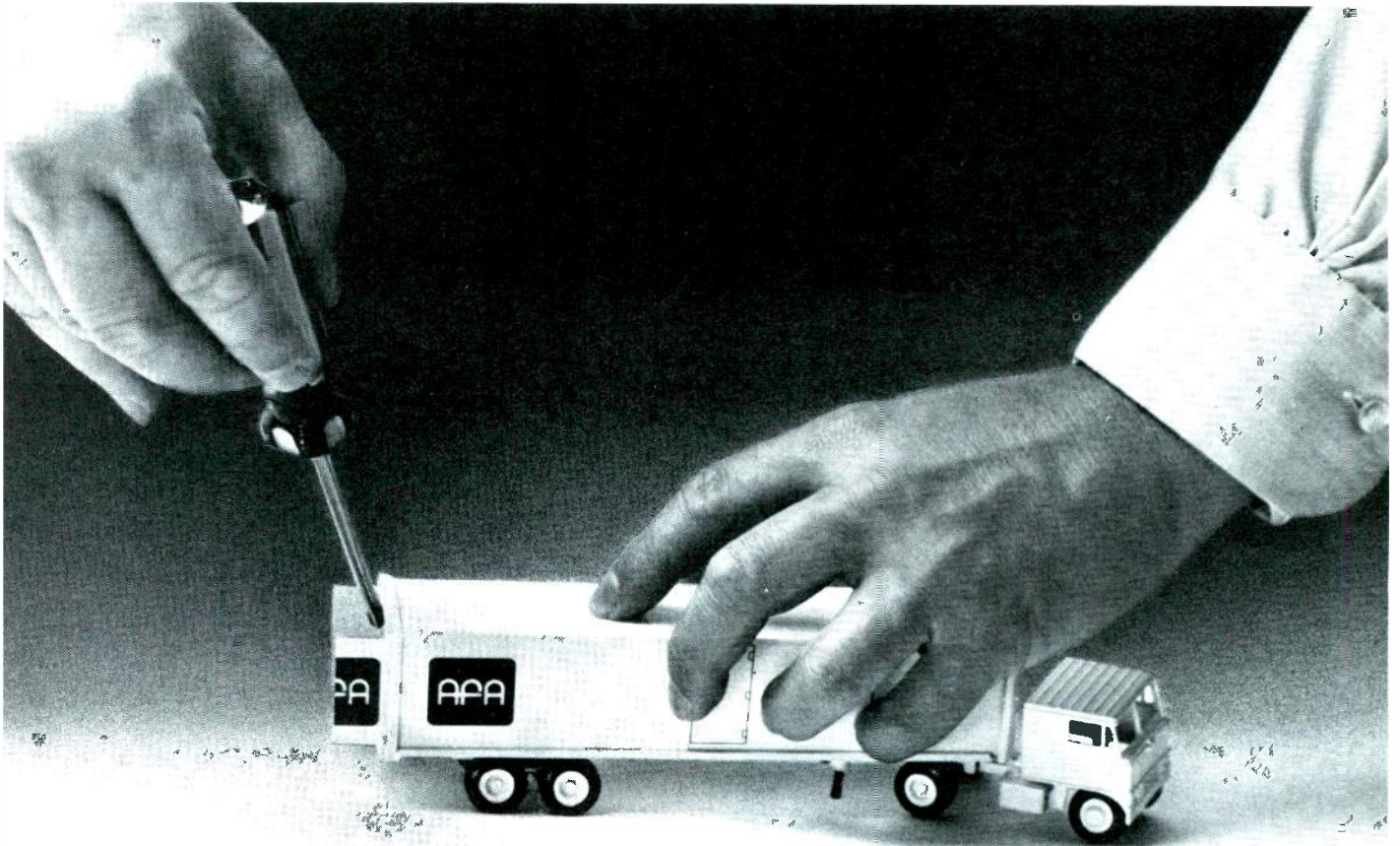
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- *Product Directory* section begins on page 128.
- *Broadcast Product Manufacturers' Addresses* section begins on page 181.
- *Broadcast Product Dealers/Distributors* section begins on page 207.

Since our first edition of the *Buyers' Guide* 15 years ago, the broadcasting industry has grown tremendously in complexity of equipment and completeness of broadcast services. Just as the industry has responded to the use of new technologies — most notably the microprocessor, in all phases of automation — the *Buyers' Guide* has responded by providing the most complete directory possible for engineers, managers and purchasing agents requiring broadcasting equipment or services. Reflecting the current healthy state of our industry, this year's *Buyers' Guide* features 656 product categories, lists more than 1049 manufacturers, and contains more than 230 advertisers. It is the result of a dedicated staff effort to make it our finest tool for purchasing the industry's hardware, software and services.

Each year, **Broadcast Engineering** mails extensive questionnaire forms to suppliers around the world. They are asked to identify, by special code number, every product they currently market. In the process, scores of new products and companies are added, while lines that have been phased out — and companies that have left the field — are deleted. Once amassed and assembled, these new data are processed through a unique computer operation, programmed to "read" the code numbers and assign company names and *Red Listings* to appropriate product headings.

**Advertisers** are listed in red in the *Product Directory*. These *Red Listings* include the ad page location to serve as a direct reference to the product information you are seeking.

**Broadcast product manufacturers' addresses** are featured beginning on page 181. In this section, you will find a complete, alphabetized index of mailing addresses for all of the companies listed in the *Product Directory*. Additional information appears in the index listing for advertisers in this issue: the name and telephone number of the home office sales manager, followed by, in many cases, a roster of regional sales contacts for that company.

**Broadcast product dealers/distributors** are listed separately in the section beginning on page 207, followed by the states they serve and the products/services they provide. Ads for dealers/distributors in this issue appear either on the page of each company's listing or on the facing page. A complete explanation of this section appears on page 207.

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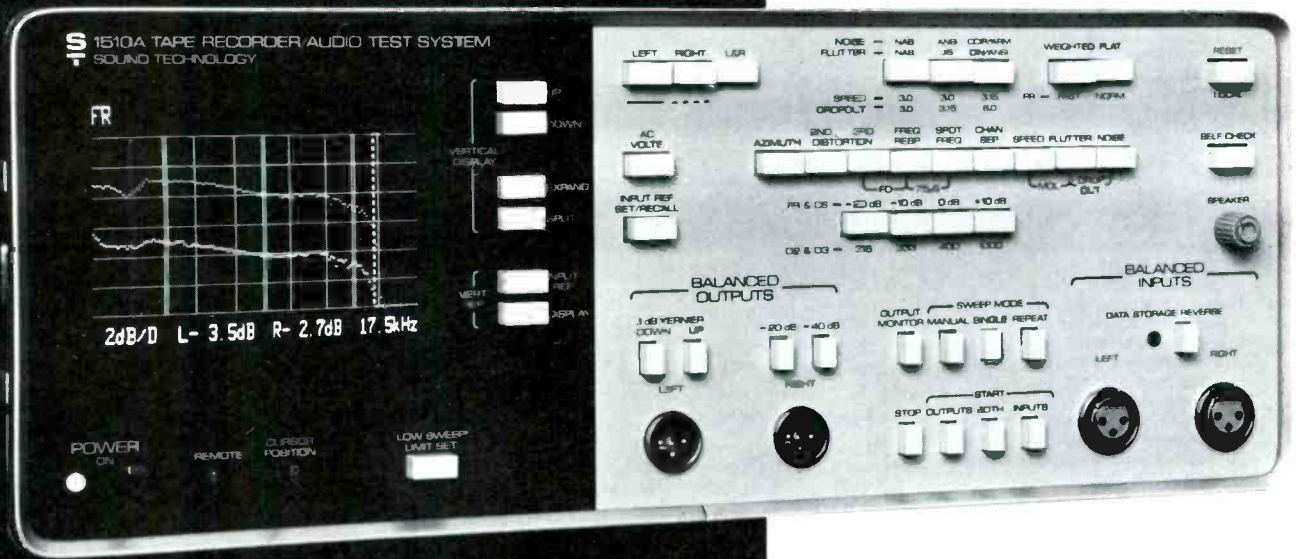


# Product directory

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 Pinzone Communications Products Inc.  
 Potomac Instruments, Inc.  
 TFT Inc.  
 Video Aids of Colorado  
 VIF International
- Alarms, Fire and Smoke**  
 (Including Suppression Systems)
- Atlas Sound  
 Fenwal Inc. Div. of Kidde, Inc.  
 Potomac Instruments, Inc.
- AM Stereo Systems**
- Delta Electronics Inc. (VA)  
 DYMA Engineering, Inc.  
 Harris Corp. Broadcast Group  
 Texar Inc.
- Amplifiers, AF-AGC**
- ATI-Audio Technologies Inc.** .....206  
 Advancing Technology Corp.  
 Altec Lansing Int'l.  
 Audio + Design (Audio & Design Recording, Inc.)  
 Broadcast Electronics, Inc.
- Circuit Research Labs, Inc.** ...71, 239  
 dbx, Inc.  
 Delta Electronics Inc. (VA)  
 DYMA Engineering, Inc.  
 Elcom-Bauer  
 Eventide Clockworks, Inc.  
 Gregg Laboratories  
 Harris Corp. Broadcast Group  
 Inovonics Inc.  
**Logitek Electronic Systems, Inc.** .....222  
 Marti Electronics  
 McCurdy Radio Ind. Inc.  
 McMartin Industries, Inc.  
 Modular Audio Products Unit of Modular Devices, Inc.  
 Monroe Electronics, Inc.  
 Moseley Associates, Inc.  
 Rupert Neve Inc.  
 Opamp Labs, Inc.  
**Orban Associates Inc.** .....173  
 ProTech Audio Corp.  
 RCA Cablevision Systems  
 RHG Electronics Laboratory, Inc.  
 Richmond Sound Design, Ltd.  
 Scientific Systems, Inc.  
 Sono-Mag Corp.  
 TM Systems, Inc.  
 TTC-Wilkinson Radio Div.  
 Texar Inc.  
 Thomson-CSF Broadcast, Inc.  
 Transist-O-Sound Inc.  
 UREI Inc.  
 Valley People, Inc.
- Amplifiers, AF Compressing**
- ANT Telecommunications (Formerly AEG-Telefunken)  
 ATI-Audio Technologies Inc.  
 Advancing Technology Corp.  
 Altec Lansing Int'l.  
 Aphex Systems Ltd.  
 Arrakis Systems Inc.  
 Audio + Design (Audio & Design Recording, Inc.)  
**Auditronics, Inc.** ..... 68  
 Bogen Div. Lear Siegler, Inc.  
 Broadcast Electronics, Inc.  
 Broadcast Technology, Inc.  
 Century 21 Programming Inc.  
**Circuit Research Labs, Inc.** ...71, 239  
 Coastcom  
 dbx, Inc.  
 DYMA Engineering, Inc.  
 EMT-FRANZ GMBH  
 Elcom-Bauer  
 Eventide Clockworks, Inc.  
 Fostex Corp. of America  
 Gotham Audio Corp.  
 Gregg Laboratories  
 Inovonics Inc.  
 Integrated Sound Systems Inc.  
 Kahn Communications, Inc.  
 LPB Inc.  
 Marti Electronics  
 McCurdy Radio Ind. Inc.  
 McMartin Industries, Inc.  
 Modular Audio Products Unit of Modular Devices, Inc.  
 Monroe Electronics, Inc.  
 Moseley Associates, Inc.  
 Rupert Neve Inc.  
 Opamp Labs, Inc.  
**Orban Associates Inc.** ..... 87,173  
 ProTech Audio Corp.  
 Quad-Eight Electronics  
**RTS Systems, Inc.** .....147  
**Ramko Research Inc.** ..... 81  
 Richmond Sound Design, Ltd.  
 Sescom, Inc.  
 Shure Brothers Inc.  
 Sono-Mag Corp.  
 Spectra Sonics  
 Symetrix Inc.
- TM Systems, Inc.  
 TTC-Wilkinson Radio Div.  
 Technical Projects Ltd.  
 Texar Inc.  
 Thomson-CSF Broadcast, Inc.  
 Transist-O-Sound Inc.  
 UREI Inc.  
 Valley People, Inc.  
 VIF International
- Amplifiers, AF General Purpose**
- ADM Technology, Inc.  
**ATI-Audio Technologies Inc.** .....206  
 Altec Lansing Int'l.  
 Aphex Systems Ltd.  
 Arrakis Systems Inc.  
 Audio + Design (Audio & Design Recording, Inc.)  
 Audisar  
 Autogram Corp.  
 Bogen Div. Lear Siegler, Inc.  
 Brabury Ltd.  
 Broadcast Electronics, Inc.  
 Broadcast Technology, Inc.  
 Coherent Communications  
 Connectronics Corp.  
 Michael Cox Electronics Ltd.  
 Crown International, Inc.  
 Datatek Corp.  
 Datatronic, Inc.  
 Datum Inc.  
 DYMA Engineering, Inc.  
 Excalibur Electronics, Inc.  
 Fostex Corp. of America  
 Hammond Industries Inc.  
 HEDCO (Hughes Elec. Devices Corp.)  
 High Country Engineering  
 Integrated Sound Systems Inc.  
 International Nuclear Corp.  
 Ivie Electronics, Inc.  
 Johnson Electronics Inc.  
 Larus Corp.  
 Link Electronics Ltd.  
**Logitek Electronic Systems, Inc.** .....222  
 MBI Broadcast Systems  
 MRI Systems Ltd.  
 Marti Electronics  
 McMartin Industries, Inc.  
 Meret Inc.  
 Micro-Trak Corp.  
**Modular Audio Products Unit of Modular Devices, Inc.** .....219  
 Monroe Electronics, Inc.  
 Rupert Neve Inc.  
 Opamp Labs, Inc.  
 Panasonic Co. Technics  
 Panasonic Industrial Co. A-V Sys. Div., Pro Audio Sys.  
 Perma Power Electronics, Inc.  
 ProTech Audio Corp.  
 OSC Audio Products Inc.  
 Quad-Eight Electronics  
**RTS Systems, Inc.** .....147  
**Ramko Research Inc.** ..... 81  
 Richmond Sound Design, Ltd.  
 ROH Corp.  
 Scantex Labs Inc.  
 Sescom, Inc.  
 Shure Brothers Inc.  
 Sono-Mag Corp.  
 Spectra Sonics  
 Straight Wire Audio, Inc.  
 TM Systems, Inc.  
 TTC-Wilkinson Radio Div.  
**TEAC Corp. of America** ..... 27  
 Telectro Systems Corp.  
 Telex Communications, Inc.  
 Texar Inc.  
 Tiffen Mfg. Corp.  
 Transist-O-Sound Inc.  
 Ultra Audio Pixtec  
 UREI Inc.  
 Ward-Beck Systems Ltd.
- Yamaha International Corp. Combo Div.
- Amplifiers, AF Peak Limiting AM**
- ATI-Audio Technologies Inc.  
 Advancing Technology Corp.  
 Altec Lansing Int'l.  
 Audio + Design (Audio & Design Recording, Inc.)  
**Auditronics, Inc.** ..... 68  
 Broadcast Electronics, Inc.  
 Century 21 Programming Inc.  
**Circuit Research Labs, Inc.** ...71, 239  
 Delta Electronics Inc. (VA)  
 DYMA Engineering, Inc.  
 EMT-FRANZ GMBH  
 Elcom-Bauer  
 Enertec/Schlumberger Dept. Audio Professionnel  
 Eventide Clockworks, Inc.  
 Gotham Audio Corp.  
 Gregg Laboratories  
 Harris Corp. Broadcast Group  
 Inovonics Inc.  
 Kahn Communications, Inc.  
 LPB Inc.  
 Marti Electronics  
 Modular Audio Products Unit of Modular Devices, Inc.  
 Moseley Associates, Inc.  
**Orban Associates Inc.** ..... 87,173  
 ProTech Audio Corp.  
 Quad-Eight Electronics  
**Ramko Research Inc.** ..... 81  
 Sono-Mag Corp.  
 Spectra Sonics  
 Symetrix Inc.  
 TM Systems, Inc.  
 TTC-Wilkinson Radio Div.  
 Texar Inc.  
 Thomson-CSF Broadcast, Inc.  
 UREI Inc.  
 Valley People, Inc.  
 VIF International
- Amplifiers, AF Peak Limiting FM**
- ATI-Audio Technologies Inc.  
 Advancing Technology Corp.  
 Audio + Design (Audio & Design Recording, Inc.)  
**Auditronics, Inc.** ..... 68  
 Broadcast Electronics, Inc.  
 Century 21 Programming Inc.  
**Circuit Research Labs, Inc.** ...71, 239  
 DYMA Engineering, Inc.  
 EMT-FRANZ GMBH  
 Elcom-Bauer  
 Enertec/Schlumberger Dept. Audio Professionnel  
 Gotham Audio Corp.  
 Gregg Laboratories  
 Inovonics Inc.  
 LPB Inc.  
 Marti Electronics  
 McMartin Industries, Inc.  
 Modulation Sciences, Inc.  
 Moseley Associates, Inc.  
**Orban Associates Inc.** ..... 87,173  
 Quad-Eight Electronics  
**Ramko Research Inc.** ..... 81  
 Sono-Mag Corp.  
 Spectra Sonics  
 Symetrix Inc.  
 TTC-Wilkinson Radio Div.  
 Texar Inc.  
 Thomson-CSF Broadcast, Inc.  
 UREI Inc.  
 Valley People, Inc.  
 VIF International



# NEW!



## The Sound Tech 1510A ... the most advanced audio measurement system available today.

### WHY?

Because one 1510A can do in minutes what used to take hours with more conventional and ordinary test set-ups, and at a price you can afford. It can also show you test results you've never seen before.

Designed around the most advanced microprocessor hardware, the 1510A incorporates all the necessary on-board software programs to get the job done: you don't need to waste time and money writing programs.

### DESIGNED FOR THE BROADCASTER

The Sound Technology 1510A features differential inputs, electronically balanced outputs with a clean low-distortion signal (typically .003%) from +30 dBm to -70 dBm.

### WHAT WILL THE 1510A DO?

Here's a small sample of the varied jobs the 1510A will perform for you:

- Exclusive asynchronous inputs and outputs for remote location

testing (satellite, transmitter, studios)

- Total tape recorder and cart machine mechanical and electronic checks
- Transmission line analysis
- Automated production testing using GPIB option
- One-third octave spectral analysis of noise
- Verify mixing console performance
- Evaluation of audio quality for VTR's
- Verify threshold points on compressor/limiters using compression ratio test
- Thoroughly evaluate and certify magnetic film and audio tape
- Complete reference turntable and phono cartridge analysis

### FOURTEEN COMPREHENSIVE AUDIO TESTS

Here are some of the tests you can run with the 1510A:

- Frequency Response;  $\pm 0.1$  dB
- Channel Separation
- Autoranging AC Volts
- Phasing

- 2nd and 3rd Harmonic distortion vs. level
- Spectral and composite noise
- Dynamic range vs. frequency
- Wow and Flutter
- Delta speed and drift
- Compression ratio
- Dropout vs. time

### TV AUDIO GOING STEREO?

The 1510A is the only two-channel test instrument available today. When the FCC decides on a TV stereo system, the 1510A will be ready to go to work for you.

### WHAT ABOUT AUTOMATION?

With the addition of the General Purpose Interface Bus, the 1510A can be run using a computer. Testing time is cut down to seconds rather than minutes. Using the bus, the engineer can set up a regular equipment maintenance schedule.

### CALL SOUND TECHNOLOGY TODAY!

We'll be pleased to send full information on the 1510A and our other industry standard test equipment. Or, for immediate action, call (408) 378-6540.

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**T** TECHNOLOGY

1400 DELL AVENUE  
CAMPBELL, CALIFORNIA 95008  
Telephone: (408) 378-6540  
Telex: 357445

See Adv. Page

See Adv. Page

See Adv. Page

See Adv. Page

**Amplifiers, AF Remote**

ATI-Audio Technologies Inc.  
Altec Lansing Int'l.  
Arrakis Sytems Inc.  
Audisar  
Bogen Div. Lear Siegler, Inc.  
Broadcast Electronics, Inc.  
Broadcast Int'l. Inc.  
Broadcast Technology, Inc.  
DYMA Engineering, Inc.  
Edcor Product Assurance Corp.  
HEDCO (Hughes Elec. Devices Corp.)  
Ivie Electronics, Inc.  
McMartin Industries, Inc.  
Micro-Trak Corp.  
Opamp Labs, Inc.  
ProTech Audio Corp.  
Richmond Sound Design, Ltd.  
Scantex Labs Inc.  
Scientific Systems, Inc.  
Shure Brothers Inc.  
Spectra Sonics  
Straight Wire Audio, Inc.  
TTC-Wilkinson Radio Div.  
Telfax Communications  
Ultra Audio Pixtec

**Amplifiers, Bridging**

ADM Technology, Inc.  
ATI-Audio Technologies Inc.  
American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp.  
Audisar  
Autogram Corp.  
Bogen Div. Lear Siegler, Inc.  
Broadcast Electronics, Inc.  
Broadcast Technology, Inc.  
Datatronix, Inc.  
Delta Electronics Inc. (NC)  
DYMA Engineering, Inc.  
Edcor Product Assurance Corp.  
Excalibur Electronics, Inc.  
Gould Inc. Instruments Div.  
Grass Valley Group, Inc.  
HEDCO (Hughes Elec. Devices Corp.)  
ITI Electronics, Inc.  
International Nuclear Corp.  
Jerrold Div. General Instrument Corp.  
Micro-Trak Corp.  
**Modular Audio Products Unit of Modular Devices, Inc. ....219**  
Opamp Labs, Inc.  
ProTech Audio Corp.  
Quad-Eight Electronics  
RCA Cablevision Systems  
RCI (Recording Consultants Inc.)  
**Ramko Research Inc. .... 81**  
Richmond Sound Design, Ltd.  
ROH Corp.  
Scantex Labs Inc.  
Scientific-Atlanta, Inc.  
Sescom, Inc.  
Sono-Mag Corp.  
Spectra Sonics  
Straight Wire Audio, Inc.  
UREI Inc.  
Video Masters, Inc.

**Amplifiers, Clamping**

American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp.  
Central Dynamics Corp. See also American Data  
Central Dynamics Ltd.  
Michael Cox Electronics Ltd.  
Di-Tech Inc.  
DYMA Engineering, Inc.  
Dynair Electronics, Inc.  
Dynamic Technology Ltd.  
Grass Valley Group, Inc.  
Harris Corp. Broadcast Microwave  
HEDCO (Hughes Elec. Devices Corp.)  
Industrial Sciences, Inc. (ISI)  
International Nuclear Corp.  
Leitch Video Ltd.  
Lenco Inc. Electronics Div.  
MRI Systems Ltd.  
Richmond Hill Labs Ltd.  
Sigma Electronics, Inc.  
Telemet Div. A Geotel, Co.

Video Masters, Inc.

**Amplifiers, DC**

Central Dynamics Corp. See also American Data  
Central Dynamics Ltd.  
Crown International, Inc.  
Datel-Intersil Inc.  
Datum Inc.  
DYMA Engineering, Inc.  
Exact Electronics Div. of Dynatech Nevada Inc.  
Gould Inc. Instruments Div.  
Opamp Labs, Inc.  
Panasonic Industrial Co. Audio Video Systems Div.  
Potomac Instruments, Inc.  
Spectra Sonics  
TM Systems, Inc.  
Valley People, Inc.

**Amplifiers, De-esser**

ADM Technology, Inc.  
ATI-Audio Technologies Inc.  
Audio + Design (Audio & Design Recording, Inc.)  
Century 21 Programming Inc.  
DYMA Engineering, Inc.  
Orban Associates Inc.  
Valley People, Inc.

**Amplifiers, Distribution Audio**

ADM Technology, Inc.  
ANT Telecommunications (Formerly AEG-Telefunken)  
**ATI-Audio Technologies Inc. ....206**  
Alice (Stancoil Ltd.)  
All Mobile Video  
Alphaton Elektroakustik  
Altec Lansing Int'l.  
American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp.  
Arrakis Sytems Inc.  
Atlantic Research Corp.  
Audio + Design (Audio & Design Recording, Inc.)  
Audio Metrics By Radio Systems  
Audiolab Electronics, Inc.  
Audisar  
Auditronics, Inc.  
BGW Systems Inc.  
**BSM Systems ....187**  
Bogen Div. Lear Siegler, Inc.  
Bonneville Productions Div. of Bonneville Int'l. Corp.  
Robert Bosch GmbH  
Brabury Ltd.  
Broadcast Audio Corp.  
Broadcast Electronics, Inc.  
**Broadcast Systems, Inc. .... 23**  
Broadcast Technology, Inc.  
Bryston Ltd.  
Central Dynamics Ltd.  
Channelmatic, Inc.  
Clyde Electronics Ltd.  
Crow of Reading Ltd.  
Datatek Corp.  
Datatronix, Inc.  
Di-Tech Inc.  
DYMA Engineering, Inc.  
Dynair Electronics, Inc.  
Dynamic Technology Ltd.  
ESE  
Edcor Product Assurance Corp.  
EELA Audio, c/o Audio + Design Recording, Inc.  
Electrocraft Consultants Ltd.  
Enertec/Schlumberger Dept. Audio Professionnel  
Excalibur Electronics, Inc.  
Farrtronics Ltd.  
Fernseh Inc.  
**Graham-Patten Systems, Inc. ....110**  
**HEDCO (Hughes Elec. Devices Corp.) .... 16**  
ICM Video  
Image Video Ltd.  
Industrial Sciences, Inc. (ISI)  
International Nuclear Corp.  
Johnson Electronics Inc.  
Knox Video Products

LPB Inc.  
Larus Corp.  
Link Electronics Ltd.  
**Logitek Electronic Systems, Inc. ....222**  
MBI Broadcast Systems  
MRI Systems Ltd.  
Marconi Electronics Inc. Broadcast & Communication Div.  
Micro-Trak Corp.  
**Modular Audio Products Unit of Modular Devices, Inc. ....219**  
Modulation Associates Inc.  
Rupert Neve Inc.  
**Omicron Video ....206**  
Opamp Labs, Inc.  
**Orban Associates Inc. ....173**  
Pacific Recorders & Eng. Corp.  
Panasonic Industrial Co. Audio Video Systems Div.  
Pro-Bel Ltd.  
ProTech Audio Corp.  
**RTS Systems, Inc. ....147**  
Raindirk Ltd.  
**Ramko Research Inc. .... 81**  
Richmond Sound Design, Ltd.  
ROH Corp.  
**Russco Electronics Mfg. Inc. ....264**  
Scantex Labs Inc.  
Scientific Systems, Inc.  
Shintron Co. Inc.  
Sigma Electronics, Inc.  
Sonosax  
Spectra Sonics  
Straight Wire Audio, Inc.  
TTC-Wilkinson Radio Div.  
Tape-Athon Corp. Cavox Stereo Productions  
Technical Projects Ltd.  
Telectro Systems Corp.  
Telemet Div. A Geotel, Co.  
Television Equipment Associates  
Thomson-CSF Broadcast, Inc.  
Tweed Audio USA Inc.  
Ultra Audio Pixtec  
UREI Inc.  
Vamco  
Video Aids of Colorado  
Video Masters, Inc.  
Videotek, Inc.  
Vital Industries Inc.  
**Ward-Beck Systems Ltd. .... BC**

**Amplifiers, Distribution Pulse**

All Mobile Video  
American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp.  
Avitel Electronics Ltd.  
Robert Bosch GmbH  
**Broadcast Systems, Inc. .... 23**  
Central Dynamics Corp. See also American Data  
Central Dynamics Ltd.  
Channelmatic, Inc.  
Crow of Reading Ltd.  
Datatek Corp.  
Di-Tech Inc.  
DYMA Engineering, Inc.  
Dynair Electronics, Inc.  
Dynamic Technology Ltd.  
Electrocraft Consultants Ltd.  
Fernseh Inc.  
GBC Closed Circuit TV Corp.  
GEC McMichael Ltd.  
**Graham-Patten Systems, Inc. ....110**  
Grass Valley Group, Inc.  
HEDCO (Hughes Elec. Devices Corp.)  
Ikegami Electronics (U.S.A.), Inc.  
Industrial Sciences, Inc. (ISI)  
Lang Video Systems Corp.  
Leitch Video Ltd.  
Lenco Inc. Electronics Div.  
MRI Systems Ltd.  
Marconi Electronics Inc. Broadcast & Communication Div.  
**Omicron Video ....206**  
Piher Electronica S. A.  
Pro-Bel Ltd.  
QSI Systems Inc.  
Quick-Set Inc.  
RCA Cablevision Systems  
Richmond Hill Labs Ltd.  
Rohde & Schwarz Sales Co.  
Scientific-Atlanta, Inc.  
Scientific Systems, Inc.  
Shintron Co. Inc.  
Sigma Electronics, Inc.  
Telemet Div. A Geotel, Co.  
Television Equipment Associates  
Texscan  
3M Co., Broadcast & Related Products Div.  
Tweed Audio USA Inc.  
Utah Scientific, Inc.  
Vamco  
Varian Associates, Inc. Electron Device Group  
Video Aids of Colorado  
Video Masters, Inc.  
Videotek, Inc.  
Viscount Industries Ltd.  
Vital Industries Inc.

Television Equipment Associates  
Video Aids of Colorado  
Video Masters, Inc.  
Videotek, Inc.  
Vital industries Inc.

**Amplifiers, Distribution Video**

All Mobile Video  
American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp.  
Antenna Development & Mfg., Inc.  
Apert-Herzog Corp.  
Avitel Electronics Ltd.  
Blonder-Tongue Lab., Inc.  
Robert Bosch GmbH  
**Broadcast Systems, Inc. ....23**  
Central Dynamics Corp. See also American Data  
Central Dynamics Ltd.  
Channelmatic, Inc.  
Cohu, Inc. Electronics Div.  
Comprehensive Video Supply Corp.  
Michael Cox Electronics Ltd.  
Crow of Reading Ltd.  
Datatek Corp.  
Delta Electronics Inc. (NC)  
Di-Tech Inc.  
DYMA Engineering, Inc.  
Dynair Electronics, Inc.  
Dynamic Technology Ltd.  
ESE  
Electrocraft Consultants Ltd.  
Fernseh Inc.  
For-A Corp. of America  
Foundation Elec. Instruments Inc.  
GBC Closed Circuit TV Corp.  
GEC McMichael Ltd.  
**Graham-Patten Systems, Inc. .... 110**  
Grass Valley Group, Inc.  
**HEDCO (Hughes Elec. Devices Corp.) .... 16**  
ICM Video  
Ikegami Electronics (U.S.A.), Inc.  
Image Video Ltd.  
Industrial Sciences, Inc. (ISI)  
International Nuclear Corp.  
Javelin Electronics  
Knox Video Products  
Lang Video Systems Corp.  
Leitch Video Ltd.  
Lenco Inc. Electronics Div.  
Link Electronics Ltd.  
**M/A-Com Microwave Power Devices .... 91**  
MRI Systems Ltd.  
Magnavox CATV Systems, Inc.  
Marconi Electronics Inc. Broadcast & Communication Div.  
Meret Inc.  
**Omicron Video ....206**  
Opamp Labs, Inc.  
**J. Osawa & Co., Ltd. .... 260**  
Panasonic Industrial Co. Audio Video Systems Div.  
Piher Electronica S. A.  
Pro-Bel Ltd.  
QSI Systems Inc.  
Quick-Set Inc.  
RCA Cablevision Systems  
Richmond Hill Labs Ltd.  
Rohde & Schwarz Sales Co.  
Scientific-Atlanta, Inc.  
Scientific Systems, Inc.  
Shintron Co. Inc.  
Sigma Electronics, Inc.  
Telemet Div. A Geotel, Co.  
Television Equipment Associates  
Texscan  
3M Co., Broadcast & Related Products Div.  
Tweed Audio USA Inc.  
Utah Scientific, Inc.  
Vamco  
Varian Associates, Inc. Electron Device Group  
Video Aids of Colorado  
Video Masters, Inc.  
Videotek, Inc.  
Viscount Industries Ltd.  
Vital Industries Inc.



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**See Adv. Page**

**Amplifiers, FM**

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 Bayly Engineering Ltd. Member of  
 AEG-Telefunken Group  
 Belar Electronics Lab., Inc.  
 Broadcast Electronics, Inc.  
 CCA Electronics Corp.  
 Catel/Tomco Divs. of United Scientific  
 Corp.  
 Communifonics Ltd.  
 Enertec/Schlumberger Dept. Audio  
 Professionnel  
 LNR Communications, Inc.  
**M/A-Com Microwave Power  
 Devices ..... 91**  
 McMartin Industries, Inc.  
 RHG Electronics Laboratory, Inc.  
 Singer Broadcast Products, Inc.  
 TTC-Wilkinson Radio Div.  
 Tepeco Corp.  
 Varian Associates, Inc. Electron Device  
 Group

**Amplifiers, IF**

Catel/Tomco Divs. of United Scientific  
 Corp.  
 RHG Electronics Laboratory, Inc.

**Amplifiers, Line**

ADM Technology, Inc.  
 ANT Telecommunications (Formerly  
 AEG-Telefunken)  
**ATI-Audio Technologies Inc. ....206**  
 Altec Lansing Int'l.  
 American Data, A Div. of Central  
 Dynamics Corp. See also Central  
 Dynamics Corp.  
 Amplica, Inc.  
 Aphex Systems Ltd.  
 Arrakis Systems Inc.  
 Atlantic Research Corp.  
 Audisar  
 BGW Systems Inc.  
 Bayly Engineering Ltd. Member of  
 AEG-Telefunken Group  
 Blonder-Tongue Lab., Inc.  
 Bogen Div. Lear Siegler, Inc.  
 Bonneville Productions Div. of  
 Bonneville Int'l. Corp.  
 Brabury Ltd.  
 Broadcast Audio Corp.  
 Broadcast Electronics, Inc.  
 Broadcast Technology, Inc.  
 Bryston Ltd.  
 Brystonvermont Ltd.  
 Crown International, Inc.  
 Datatek Corp.  
 Datatronix, Inc.  
 DYMA Engineering, Inc.  
 Excalibur Electronics, Inc.  
 GBC Closed Circuit TV Corp.  
 Grass Valley Group, Inc.  
 HEDCO (Hughes Elec. Devices Corp.)  
 International Nuclear Corp.  
 Jerrold Div. General Instrument Corp.  
 Johnson Electronics Inc.  
 Larus Corp.  
 Marti Electronics  
 McMartin Industries, Inc.  
 Micro-Trak Corp.  
**Modular Audio Products Unit  
 of Modular Devices, Inc. ....219**  
**Modulation Sciences, Inc. ....199**  
 Monroe Electronics, Inc.  
 Opamp Labs, Inc.  
 Pacific Recorders & Eng. Corp.  
 ProTech Audio Corp.  
 Quad-Eight Electronics  
 RCA Cablevision Systems  
 RCI (Recording Consultants Inc.)  
**Ramko Research Inc. ....81**  
 Richmond Hill Labs Ltd.  
 Richmond Sound Design, Ltd.  
 ROH Corp.  
 Scantex Labs Inc.  
 Scientific Systems, Inc.  
 Sono-Mag Corp.  
 Spectra Sonics  
 Straight Wire Audio, Inc.  
 TM Systems, Inc.  
 TTC-Wilkinson Radio Div.  
 Technical Projects Ltd.

**See Adv. Page**

UREI Inc.  
 Valley People, Inc.  
 Video Masters, Inc.  
 Yamaha International Corp. Combo  
 Div.

**Amplifiers, Microwave**

ANT Telecommunications (Formerly  
 AEG-Telefunken)  
 Aydin Microwave Div.  
 Broadcast Microwave Services, Inc.  
 GEC McMichael Ltd.  
 Gould Inc. Dexcel Div.  
 HDS Inc.  
 Harris Corp. Broadcast Group  
 Hughes Aircraft Co. Microwave  
 Communications Products  
 MCL Inc.  
 Macom MPD Inc.  
 Microwave Assoc. Communications  
 The Narda Microwave Corp.  
 North Hills Electronics, Inc.  
 Nurad, Inc.  
 RHG Electronics Laboratory, Inc.  
 Radio-Research Instrument Co., Inc.  
 TEST/Tanner Electronics Systems  
 Technology, Inc.

**Amplifiers, Monitor**

AB Systems Design Inc.  
 ANT Telecommunications (Formerly  
 AEG-Telefunken)  
**ATI-Audio Technologies Inc. ....206**  
 Altec Lansing Int'l.  
 American Data, A Div. of Central  
 Dynamics Corp. See also Central  
 Dynamics Corp.  
 Arrakis Sytems Inc.  
 Ashly Audio  
 Atlantic Research Corp.  
 Audio + Design (Audio & Design  
 Recording, Inc.)  
 Audio Service Corp.  
 Audisar  
 Autogram Corp.  
 BGW Systems Inc.  
 Belar Electronics Lab., Inc.  
 Bogen Div. Lear Siegler, Inc.  
 Brabury Ltd.  
 Broadcast Audio Corp.  
 Broadcast Electronics, Inc.  
 Broadcast Technology, Inc.  
 Bryston Ltd.  
 Brystonvermont Ltd.  
 Crown International, Inc.  
 Datatek Corp.  
 Datatronix, Inc.  
 Di-Tech Inc.  
 DYMA Engineering, Inc.  
 Eddor Product Assurance Corp.  
 Fernseh Inc.  
 Fostex Corp. of America  
 HEDCO (Hughes Elec. Devices Corp.)  
 High Country Engineering  
 Image Video Ltd.  
**Logitek Electronic Systems,  
 Inc. ....222**  
 MRI Systems Ltd.  
 Marti Electronics  
 McMartin Industries, Inc.  
 Micro-Trak Corp.  
 Modular Audio Products Unit  
 of Modular Devices, Inc. ....219  
 Nagra Magnetic Recorders, Inc.  
 Panasonic Industrial Co. A-V Sys. Div.,  
 Pro Audio Sys.  
 ProTech Audio Corp.  
 QSC Audio Products Inc.  
 Quad-Eight Electronics  
**RTS Systems, Inc. ....147**  
 Raindirk Ltd.  
**Ramko Research Inc. ....81**  
 Richmond Sound Design, Ltd.  
 Roscor Corp.  
 Russco Electronics Mfg. Inc.  
 Scientific Systems, Inc.  
 Sescom, Inc.  
 Spectra Sonics  
 TM Systems, Inc.  
 TTC-Wilkinson Radio Div.  
 Tape-Athon Corp. Cavox Stereo  
 Productions  
**TEAC Corp. of America .....27**

**See Adv. Page**

Tweed Audio USA Inc.  
 Ultra Audio Pixtec  
 UREI Inc.  
 Ward-Beck Systems Ltd.  
 Westlake Audio Professional Products  
 Mfg. Group  
 World Video Inc.  
 Yamaha International Corp. Combo  
 Div.

**Amplifiers, Operational**

Aphex Systems Ltd.  
 Atlantic Research Corp.  
 Broadcast Technology, Inc.  
 Datatronix, Inc.  
 DYMA Engineering, Inc.  
**Jensen Transformers Inc. ....167**  
 Meret Inc.  
 Modular Audio Products Unit of  
 Modular Devices, Inc.  
 Motorola Semiconductor Products Inc.  
 Opamp Labs, Inc.  
 Pacific Recorders & Eng. Corp.  
 ProTech Audio Corp.  
 Quad-Eight Electronics  
 Richmond Sound Design, Ltd.  
 Spectra Sonics  
 Straight Wire Audio, Inc.  
 United Research Lab Corp.  
 Valley People, Inc.

**Amplifiers, Power, Audio**

AB Systems Design Inc.  
 ANT Telecommunications (Formerly  
 AEG-Telefunken)  
**ATI-Audio Technologies Inc. ....206**  
 Acrodyne Industries Inc.  
 Alphonat Elektroakustik  
 Altec Lansing Int'l.  
 American Data, A Div. of Central  
 Dynamics Corp. See also Central  
 Dynamics Corp.  
 Arrakis Systems Inc.  
 Ashly Audio  
 Atlantic Research Corp.  
 Audio + Design (Audio & Design  
 Recording, Inc.)  
 Audiotechniques Inc.  
 Audisar  
 BGW Systems Inc.  
 Belar Electronics Lab., Inc.  
 Bogen Div. Lear Siegler, Inc.  
 Broadcast Electronics, Inc.  
 Bryston Ltd.  
 Brystonvermont Ltd.  
 Calzone Case Co.  
 Clyde Electronics Ltd.  
 Connectronics Corp.  
 Continental Electronics Mfg. Co.  
 Crown International, Inc.  
 Datatronix, Inc.  
 Dukane Corp.  
 DYMA Engineering, Inc.  
 Electro-Voice Inc.  
 Enertec/Schlumberger Dept. Audio  
 Professionnel  
 Exact Electronics Div. of Dynatech  
 Nevada Inc.  
 Fostex Corp. of America  
 Hammond Industries Inc.  
 HEDCO (Hughes Elec. Devices Corp.)  
**Howe Audio Productions, Inc. ....135**  
 International Nuclear Corp.  
 Ivie Electronics, Inc.  
**Jensen Transformers Inc. ....167**  
 Johnson Electronics Inc.  
**Logitek Electronic Systems,  
 Inc. ....222**  
**M/A-Com Microwave Power  
 Devices ..... 91**  
 McMartin Industries, Inc.  
 Micro-Trak Corp.  
 Microwave Assoc. Communications  
 Modular Audio Products Unit of  
 Modular Devices, Inc.  
 Motorola Semiconductor Products Inc.  
 Nagra Magnetic Recorders, Inc.  
 Nurad, Inc.  
 Opamp Labs, Inc.  
 Panasonic Industrial Co. Audio Video  
 Systems Div.  
 Panasonic Industrial Co. A-V Sys. Div.,  
 Pro Audio Sys

**See Adv. Page**

ProTech Audio Corp.  
 QSC Audio Products Inc.  
 R.F. Technology, Inc.  
**RTS Systems, Inc. ....147**  
 Raindirk Ltd.  
**Ramko Research Inc. ....81**  
 Richmond Sound Design, Ltd.  
 ROH Corp.  
**Russco Electronics Mfg. Inc. ....264**  
 Sescom, Inc.  
 Spectra Sonics  
 Standard Communications Corp.  
 Struder Revox America  
 Studiomaster Inc.  
 Symetrix Inc.  
 TRW Semiconductors  
 TTC-Wilkinson Radio Div.  
 Tape-Athon Corp. Cavox Stereo  
 Productions  
**TEAC Corp. of America ..... 27**  
 Telectro Systems Corp.  
 Times One  
 Ultra Audio Pixtec  
 UREI Inc.  
 Varian Associates, Inc. Electron Device  
 Group  
 Ward-Beck Systems Ltd.  
 Yamaha International Corp. Combo  
 Div.

**Amplifiers, Power, RF**

Aydin Microwave Div.  
 Comark Communications, Inc.  
 Comprehensive Video Supply Corp.  
 HN Engineering Inc.  
 Harris Corp. GSSD PRD Instruments  
 Information Transmission Systems,  
 Corp.  
 Jerrold Div. General Instrument Corp.  
 MCL Inc.  
 Macom MPD Inc.  
 Meret Inc.  
 Motorola Semiconductor Products Inc.  
 Nurad, Inc.  
 Richardson Electronics Ltd.  
 TEST/Tanner Electronics Systems  
 Technology, Inc.  
 Townsend Associates, Inc.  
 Triple Crown Electronics, Inc.

**Amplifiers, Processing Audio**

AB Systems Design Inc.  
**ATI-Audio Technologies Inc. ....206**  
 Advancing Technology Corp.  
 All Mobile Video  
 Altec Lansing Int'l.  
 Aphex Systems Ltd.  
 Arrakis Sytems Inc.  
 Arunta Satellite Telecommunications  
**Audio + Design (Audio &  
 Design Recording, Inc.) .....165**  
 Audio Service Corp.  
 Audisar  
**Auditronics, Inc. ....68**  
 Broadcast Electronics, Inc.  
 Broadcast Technology, Inc.  
 Century 21 Programming Inc.  
**Circuit Research Labs, Inc. ..71, 239**  
**Comtech Data Corp. ....24**  
 dbx, Inc.  
 Delta Electronics Inc. (VA)  
 Dorrugh Electronics  
 DYMA Engineering, Inc.  
 Elcom-Bauer  
 Fernseh Inc.  
 Fostex Corp. of America  
 Gregg Laboratories  
 Grove Corp. Knox Video Products Div.  
**Inovonics Inc. ....224**  
 Kahn Communications, Inc.  
 Knox Video Products  
 McMartin Industries, Inc.  
 MICMIX Audio Products, Inc.  
 Modulation Associates Inc.  
**Modulation Sciences, Inc. ....199**  
 Moseley Associates, Inc.  
**Orban Associates Inc. ....87,173**  
 ProTech Audio Corp.  
**RTS Systems, Inc. ....147**  
 Solid State Logic  
 Spectra Sonics  
 Straight Wire Audio, Inc.  
 Symetrix Inc.

See Adv. Page

See Adv. Page

See Adv. Page

See Adv. Page

Telectro Systems Corp.  
Texar Inc.  
UREI Inc.  
Valley People, Inc.  
VIF International  
Yamaha International Corp. Combo Div.

**Amplifiers, Processing Video**

All Mobile Video  
American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp.  
Arunta Satellite Telecommunications  
Automation Techniques, Inc.  
Avitel Electronics Ltd.  
Robert Bosch GmbH  
Central Dynamics Corp. See also American Data  
Central Dynamics Ltd.  
Michael Cox Electronics Ltd.  
Crow of Reading Ltd.  
Electrocraft Consultants Ltd.  
Fernseh Inc.  
Grass Valley Group, Inc.  
Grove Corp. Knox Video Products Div.  
**Harris Video Systems** ..... 82, 83  
ICM Video  
Industrial Sciences, Inc. (ISI)  
International Nuclear Corp.  
Knox Video Products  
Leitch Video Ltd.  
Lenco Inc. Electronics Div.  
Marconi Electronics Inc. Broadcast & Communication Div.  
Pro-Bel Ltd.  
Richmond Hill Labs Ltd.  
Siegel Electronics  
Sigma Electronics, Inc.  
3M Co., Broadcast & Related Products Div.  
Video Masters, Inc.

**Amplifiers, RF General Purpose and Cavities**

Amplica, Inc.  
Avantek Inc.  
Broadcast Microwave Services, Inc.  
CSI Electronics, Inc.  
Comark Communications, Inc.  
Comprehensive Video Supply Corp.  
**Comtech Data Corp.** ..... 24  
Continental Electronics Mfg. Co.  
Electroline TV Equipment Inc.  
Harris Corp. GSSD PRD Instruments  
International Microwave Corp.  
**M/A-Com Microwave Power Devices** ..... 91  
MCL Inc.  
Magnavox CATV Systems, Inc.  
McMartin Industries, Inc.  
Motorola Semiconductor Products Inc.  
Mu-Del Electronics, Inc.  
Nautel Maine, Inc.  
Quick-Set Inc.  
RHG Electronics Laboratory, Inc.  
Scientific Radio Systems, Inc.  
Singer Broadcast Products, Inc.  
TRW Semiconductors  
TTC-Television Tech. Div.  
TTC-Wilkinson Radio Div.  
Tepco Corp.  
TEST/Tanner Electronics Systems Technology, Inc.  
Townsend Associates, Inc.  
**Varian Associates, Inc. Electron Device Group** ..... 241  
Wide Band Engineering Co., Inc.

**Amplifiers, RF Peak Limiting**

Advancing Technology Corp.  
Amplica, Inc.  
Avantek Inc.  
Elcom-Bauer  
Inovonics Inc.  
Kahn Communications, Inc.  
**M/A-Com Microwave Power Devices** ..... 91  
**Modulation Sciences, Inc.** ..... 199  
Orban Associates Inc.  
RHG Electronics Laboratory, Inc.

Thomson-CSF Broadcast, Inc

**Amplifiers, Stereo**

AB Systems Design Inc.  
ATI-Audio Technologies Inc.  
Alphaton Elektroakustik  
Altec Lansing Int'l.  
Arrakis Sytems Inc.  
Audisar  
Autogram Corp.  
BGW Systems Inc.  
Broadcast Electronics, Inc.  
Broadcast Technology, Inc.  
Bryston Ltd.  
Brystonvermont Ltd.  
Calzone Case Co.  
Crown International, Inc.  
DYMA Engineering, Inc.  
Electro-Voice Inc.  
Elektroimpex  
Excalibur Electronics, Inc.  
Fostex Corp. of America  
Inovonics Inc.  
Ivie Electronics, Inc.  
**Logitek Electronic Systems, Inc.** ..... 222  
MBI Broadcast Systems  
Micro-Trak Corp.  
Modular Audio Products Unit of Modular Devices, Inc.  
Opamp Labs, Inc.  
ProTech Audio Corp.  
QSC Audio Products Inc.  
Raindirk Ltd.  
**Ramko Research Inc.** ..... 81  
Richmond Sound Design, Ltd.  
Russco Electronics Mfg. Inc.  
Spectra Sonics  
Straight Wire Audio, Inc.  
Studer Revox America  
TTC-Wilkinson Radio Div.  
Taber Mfg. & Eng. Co.  
Telectro Systems Corp.  
Telex Communications, Inc.  
Texar Inc.  
UREI Inc.  
Video Aids of Colorado  
Yamaha International Corp. Combo Div.

**Amplifiers, Stereo Limiter**

ATI-Audio Technologies Inc.  
Advancing Technology Corp.  
Alphaton Elektroakustik  
Arrakis Sytems Inc.  
**Audio + Design (Audio & Design Recording, Inc.)** ..... 165  
Broadcast Electronics, Inc.  
Century 21 Programming Inc.  
**Circuit Research Labs, Inc.** ..... 239  
dbx, Inc.  
Dorrrough Electronics  
DYMA Engineering, Inc.  
EMT-FRANZ GMBH  
Elcom-Bauer  
Fostex Corp. of America  
Gotham Audio Corp.  
Gregg Laboratories  
**Inovonics Inc.** ..... 224  
LPB Inc.  
Modular Audio Products Unit of Modular Devices, Inc.  
Modulation Sciences, Inc.  
Moseley Associates, Inc.  
Rupert Neve Inc.  
**Orban Associates Inc.** ..... 173  
ProTech Audio Corp.  
Quad-Eight Electronics  
**Ramko Research Inc.** ..... 81  
Spectra Sonics  
TTC-Wilkinson Radio Div.  
Texar Inc.  
Thomson-CSF Broadcast, Inc.  
Tweed Audio USA Inc.  
UREI Inc.  
Valley People, Inc.

**Amplifiers, Audio System**

Acoustilog Inc.  
Alphaton Elektroakustik  
**Amber Electro Design Inc.** ..... 256  
Audisar

Bald Mountain Lab  
Crown International, Inc.  
DYMA Engineering, Inc.  
High Country Engineering  
Ivie Electronics, Inc.  
Klark-Teknik Electronics  
Leader Instruments Corp.  
Marconi Instruments Div. of Marconi Electronics Inc.  
Keith Monks Audio (USA) Inc.  
Neutrik Products  
Ortofon Instruments A/S  
Rohde & Schwarz Sales Co.  
**Sound Technology** ..... 129  
Technical Projects Ltd.  
Tektronix Inc.  
UREI Inc.

**Amplifiers, Distortion**

Alphaton Elektroakustik  
**Amber Electro Design Inc.** ..... 256  
Asaca/Shibasoku Corp.  
Bruel & Kjaer Instruments, Inc.  
Crown International, Inc.  
DYMA Engineering, Inc.  
Kay Elemetrics Corp.  
Leader Instruments Corp.  
Leasametric, Inc.  
Marconi Instruments Div. of Marconi Electronics Inc.  
Neutrik Products  
Ortofon Instruments A/S  
Polarad Electronics, Inc.  
**Potomac Instruments, Inc.** ..... 246  
Rohde & Schwarz Sales Co.  
**Sound Technology** ..... 129  
TM Systems, Inc.  
Technical Projects Ltd.  
Tektronix Inc.  
Triple Crown Electronics, Inc.

**Amplifiers, Insertion Signal**

Marconi Instruments Div. of Marconi Electronics Inc.  
**Philips Test & Measuring Instruments, Inc.** ..... 237  
Rohde & Schwarz Sales Co.

**Amplifiers, Power Line Disturbance**

Marconi Instruments Div. of Marconi Electronics Inc.  
The Superior Electric Co.

**Amplifiers, RF Network**

Asaca/Shibasoku Corp.  
Delta Electronics Inc. (VA)  
Leasametric, Inc.  
Marconi Instruments Div. of Marconi Electronics Inc.  
Polarad Electronics, Inc.  
Rohde & Schwarz Sales Co.  
Scientific-Atlanta, Inc.  
Soll, Inc.  
Tennaplex Systems Ltd.  
Wide Band Engineering Co., Inc.

**Amplifiers, Sideband**

Glentronix (1977) Ltd.  
Rohde & Schwarz Sales Co.  
Telemet Div. A Geotel, Co.  
Texscan Corp.

**Amplifiers, Spectrum AF**

Acoustilog Inc.  
**Amber Electro Design Inc.** ..... 256  
Bruel & Kjaer Instruments, Inc.  
Eventide Clockworks, Inc.  
Ivie Electronics, Inc.  
Kay Elemetrics Corp.  
Klark-Teknik Electronics  
Sound Technology  
Technical Projects Ltd.  
Tektronix Inc.

**Analyzers, Spectrum RF**

ComSonics, Inc.  
Kay Elemetrics Corp.  
North American Soar Corp.  
Polarad Electronics, Inc.  
Tektronix Inc.  
Telemet Div. A Geotel, Co.  
Texscan  
Tudscan Corp.  
Wavetek Indiana, Inc.

**Analyzers, Video**

Amtron Corp.  
**Asaca/Shibasoku Corp.** ..... 263  
Avitel Electronics Ltd.  
Colorado Video Inc.  
Comprehensive Video Supply Corp.  
Marconi Instruments Div. of Marconi Electronics Inc.  
Philips Test & Measuring Instruments, Inc.  
Rohde & Schwarz Sales Co.  
Telemet Div. A Geotel, Co.  
Video Aids of Colorado

**Animation Equipment**

Aurora Systems  
Colorgraphics Systems, Inc.  
Computer Graphics Lab, Inc.  
Convergence Corp.  
**Dubner Computer Systems, Inc.** ..... 253  
Alan Gordon Enterprises Inc.  
Interand Corp. Telestrator Div.  
International Video Corp.  
Kavouras Inc.  
MPB Technologies Inc.  
Neilson-Hordell Ltd.  
Oxberry Corp. Div. Of Richmark  
Camera Service, Inc.  
Precision Echo  
Redlake Corp.  
Warren R. Smith Co.  
Texscan  
UMC Electronics Co. Broadcast Products Div.  
VIA Video, Inc.  
Videomedia, Inc.  
Frank Woolley & Co.  
The Zei-Mark Corp.

**Antenna Alignment Systems, Microwave**

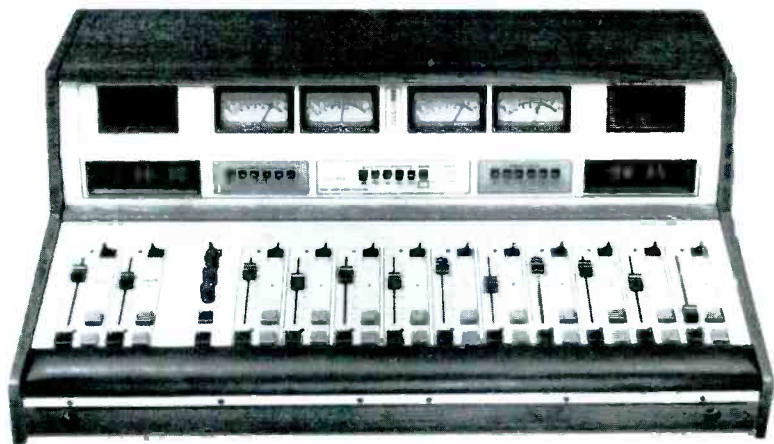
Advance Industries, Inc.  
Andrew Corp.  
Broadcast Microwave Services, Inc.  
E-N-G Corp. Electronic News Group  
Gabriel Electronics, Inc.  
Hero Communications Div. of Behar Enterprises, Inc.  
Innovative Television Equipment, Inc.  
Leasametric, Inc.  
LeBlanc & Royle Communications Inc.  
Lenzar Optics Corp.  
Microdyne Corp.  
Microwave Assoc. Communications  
The Narda Microwave Corp.  
Quick-Set Inc.  
Scientific-Atlanta, Inc.  
World Tower Co. Inc.

**Antenna and Tower Guys and Hardware**

Advance Industries, Inc.  
Andrew Corp.  
Atlas Tower Corp.  
Continental Electronics Mfg. Co.  
Cortland Cable Co.  
DHV, Inc.  
LeBlanc & Royle Communications Inc.  
Magnum Towers, Inc.  
Marconi Communication Systems Ltd.  
Microlect Co., Inc.  
Fred A. Nudd Corp.  
Allen Osborne Associates  
**Philadelphia Resins Corp.** ..... 38  
Polar Research, Inc.  
Quick-Set Inc.

- See Adv. Page**
- Racal-Decca Canada Inc.  
Insulators Div. .... 116
- Radiation Systems, Inc.  
Rohn  
Stainless, Inc.  
Swager Tower Corp.  
Tiner Communication Services, Inc.  
Utility Tower Co.  
VIF International  
World Tower Co. Inc.
- Antenna and Tower Installation and Services**
- Advance Industries, Inc.  
Andrew Corp.  
Atlas Tower Corp.  
Comark Communications, Inc.  
EMCEE Broadcast Products  
Fort Worth Tower Co.  
Gabriel Electronics, Inc.  
Kline Iron & Steel Co.  
LeBlanc & Royle Communications Inc.  
Magnum Towers, Inc.  
Marconi Communication Systems Ltd.  
Microdyne Corp.  
Microreflect Co., Inc.  
Microwave Assoc. Communications  
Fred A. Nudd Corp.  
Nurad, Inc.  
Radiation Systems, Inc.  
Rohn  
Soll, Inc.  
Stainless, Inc.  
Swager Tower Corp.  
Tennaplex Systems Ltd. .... 44
- Tiner Communication Services, Inc.  
Utility Tower Co.  
World Tower Co. Inc.
- Antenna Baluns, RF Dry**
- Cetec Antennas  
DHV, Inc.  
Dielectric Communications A Unit of  
General Signal  
Electro Impulse, Inc. .... 239  
North Hills Electronics, Inc. .... 230
- Phelps Dodge Communications Co.  
Potomac Instruments, Inc.  
RMS Electronics, Inc.  
TTC-Wilkinson Radio Div.
- Antenna Heater Systems**
- Andrew Corp.  
Cetec Antennas  
Microdyne Corp.  
Shively Laboratories Div. of Howell  
Labs, Inc.
- Antenna Ice Warning Systems**
- Cetec Antennas  
Shively Laboratories Div. of Howell  
Labs, Inc.
- Antenna Remote Indicators**
- Antenna Development & Mfg., Inc.  
Broadcast Microwave Services, Inc.  
Delta Electronics Inc. (VA)  
Gorman-Redlich Mfg. Co.  
Microdyne Corp.  
Microwave Assoc. Communications  
Nurad, Inc.  
Scientific-Atlanta, Inc.  
Shively Laboratories Div. of Howell  
Labs, Inc.
- Antenna RF Current Controllers**
- Delta Electronics Inc. (VA)  
Potomac Instruments, Inc.
- Antenna Sampling Systems**
- Andrew Corp.  
CSP Inc.  
Cablewave Systems Inc.  
Delta Electronics Inc. (VA)
- See Adv. Page**
- Antenna Tuning Units**
- Audiolab Electronics, Inc.  
CSI Electronics, Inc.  
CSP Inc.  
Continental Electronics Mfg. Co.  
Cosmin Electronics  
DHV, Inc.  
HN Engineering Inc.  
Micro Communications, Inc.  
Scientific Radio Systems, Inc.  
TTC-Wilkinson Radio Div.
- Antenna VSWR Indicators**
- Bird Electronic Corp.  
CSI Electronics, Inc.  
Comark Communications, Inc.  
DYMA Engineering, Inc.  
Micro Communications, Inc.  
Shively Laboratories Div. of Howell  
Labs, Inc.
- Antennas, Earth Station**
- Andrew Corp.  
Antenna Development & Mfg., Inc.  
Antenna Technology Corp. .... 52
- Arunta Satellite Telecommunications  
Blonder-Tongue Lab., Inc.  
Comtech Antenna Corp.  
Comtech Data Corp. .... 24
- Dalsat, Inc.  
Discom Satellite Systems, Inc.  
Fort Worth Tower Co.  
GEC McMichael Ltd.  
Gabriel Electronics, Inc.  
H & R Communications  
Harris Corp. Broadcast Group  
Harris Corp. Satellite Communications  
Div.  
Hero Communications Div. of Behar  
Enterprises, Inc.  
Jerrold Div. General Instrument Corp.  
Lang Video Systems Corp.  
M/A-Com Comm/Scope Marketing,  
Inc.  
Marconi Communication Systems Ltd.  
McCullough Satellite Equip., Inc.  
Microdyne Corp. .... 99
- Microwave Assoc. Communications  
Modulation Associates Inc.  
Pinzone Communications Products Inc.  
Radiation Systems, Inc.  
SatCom Technologies, Inc. An RSi Co.  
The Ken Schaffer Group, Inc.  
Standard Communications Corp.  
Townsend Associates, Inc. .... 65
- Antennas, Microwave**
- Alford Mfg. Co.  
Andrew Corp.  
Anixter Communications Mark  
Antenna Div.  
Antenna Development & Mfg., Inc.  
Arunta Satellite Telecommunications  
Broadcast Microwave Services, Inc.  
Cablewave Systems Inc.  
E-N-G Corp. Electronic News Group  
GEC McMichael Ltd.  
Gabriel Electronics, Inc.  
HDS Inc.  
Harris Corp. Broadcast Group  
Harris Corp. Broadcast Microwave  
Harris Corp. Satellite Communications  
Div.  
M/A-Com Comm/Scope Marketing,  
Inc.  
Marconi Communication Systems Ltd.  
Micro Communications, Inc.  
Microdyne Corp.  
Microwave Assoc. Communications  
Nurad, Inc.  
Polarad Electronics, Inc.  
Radio-Research Instrument Co., Inc.  
Scientific-Atlanta, Inc.  
TEST/Tanner Electronics Systems  
Technology, Inc.
- Antennas, Receiving FM**
- Belar Electronics Lab., Inc.  
Gorman-Redlich Mfg. Co.  
Johnson Electronics Inc.
- See Adv. Page**
- McMartin Industries, Inc.  
Nurad, Inc.  
Potomac Instruments, Inc.  
Rohde & Schwarz Sales Co.  
Scala Electronic Corp.  
Scientific-Atlanta, Inc.  
Tennaplex Systems Ltd.
- Antennas, Receiving LF/MF**
- Belar Electronics Lab., Inc.  
LeBlanc & Royle Communications Inc.  
Potomac Instruments, Inc.  
Rohde & Schwarz Sales Co.  
Stoner Communications Inc.
- Antennas, Receiving UHF/VHF**
- Anixter Communications Mark  
Antenna Div.  
Blonder-Tongue Lab., Inc.  
EMCEE Broadcast Products  
Gorman-Redlich Mfg. Co.  
Microdyne Corp.  
Moseley Associates, Inc.  
Nurad, Inc.  
Phelps Dodge Communications Co.  
Piher Electronica S. A.  
Potomac Instruments, Inc.  
Rohde & Schwarz Sales Co.  
Scala Electronic Corp.  
Scientific-Atlanta, Inc.  
Tennaplex Systems Ltd.
- Antennas, Remote Pickup**
- Anixter Communications Mark  
Antenna Div.  
Belar Electronics Lab., Inc.  
Gorman-Redlich Mfg. Co.  
HDS Inc.  
Harris Corp. Broadcast Microwave  
Marti Electronics  
McMartin Industries, Inc.  
Microwave Assoc. Communications  
Moseley Associates, Inc.  
Motorola Communications and  
Electronics Inc.  
Nurad, Inc.  
Phelps Dodge Communications Co.  
Scala Electronic Corp.  
Scientific-Atlanta, Inc.
- Antennas, Remote Transmitting, Radio**
- Gorman-Redlich Mfg. Co.  
LPB Inc.  
Microwave Assoc. Communications  
Moseley Associates, Inc.  
Nurad, Inc.  
Phelps Dodge Communications Co.  
Scala Electronic Corp.
- Antennas, STL**
- Andrew Corp.  
Anixter Communications Mark  
Antenna Div.  
Broadcast Microwave Services, Inc.  
Cablewave Systems Inc.  
Contel Mfg.  
Gabriel Electronics, Inc.  
Marti Electronics  
Microwave Assoc. Communications  
Moseley Associates, Inc.  
Nurad, Inc.  
Scala Electronic Corp.  
Tennaplex Systems Ltd.  
Utility Tower Co.
- Antennas, Transmitting AM**
- Continental Electronics Mfg. Co.  
DHV, Inc.  
HN Engineering Inc  
Harris Corp. Broadcast Group  
LeBlanc & Royle Communications Inc.  
Marconi Communication Systems Ltd.  
Marconi Electronics Inc. Broadcast &  
Communication Div.  
Fred A. Nudd Corp  
Stainless, Inc.
- See Adv. Page**
- Antennas, Transmitting FM**
- Alford Mfg. Co.  
Bogner Broadcast Equipment Corp.  
Cetec Antennas  
Comark Communications, Inc.  
Continental Electronics Mfg. Co.  
Dielectric Communications A Unit of  
General Signal  
Harris Corp. Broadcast Group  
Marconi Communication Systems Ltd.  
Marconi Electronics Inc. Broadcast &  
Communication Div.  
Micro Communications, Inc.  
Phelps Dodge Communications  
Co. .... 247
- RCA Broadcast Systems  
Scala Electronic Corp.  
Shively Laboratories Div. of  
Howell Labs, Inc. .... 118  
Tennaplex Systems Ltd. .... 44
- Antennas, Transmitting UHF/VHF**
- Acrodyne Industries Inc.  
Alford Mfg. Co.  
Anchor Systems, Inc.  
Andrew Corp. .... 75
- Anixter Communications Mark  
Antenna Div.  
Bogner Broadcast Equipment Corp.  
Cetec Antennas .... 90
- Comark Communications, Inc.  
Dielectric Communications A Unit of  
General Signal  
EMCEE Broadcast Products  
Harris Corp. Broadcast Group ..... 136
- Larcan Communications Equip. Inc.  
Marconi Communication Systems Ltd.  
Marconi Electronics Inc. Broadcast &  
Communication Div.  
Micro Communications, Inc.  
Nurad, Inc.  
Phelps Dodge Communications Co.  
Piher Electronica S. A.  
RCA Broadcast Systems  
Scala Electronic Corp.  
Shively Laboratories Div. of  
Howell Labs, Inc. .... 118  
Tennaplex Systems Ltd. .... 44  
Townsend Associates, Inc.
- Antennas, Transmitting UHF/VHF, Circularly Polarized**
- Acrodyne Industries Inc.  
Andrew Corp. .... 75
- Anixter Communications Mark  
Antenna Div.  
Bogner Broadcast Equipment Corp.  
Broadcast Systems, Inc.  
Cetec Antennas .... 90
- Comark Communications, Inc.  
Dielectric Communications A Unit of  
General Signal  
EMCEE Broadcast Products  
Harris Corp. Broadcast Group ..... 136
- Marconi Communication Systems Ltd.  
Micro Communications, Inc.  
Nurad, Inc.  
RCA Broadcast Systems  
Shively Laboratories Div. of  
Howell Labs, Inc. .... 118  
Tennaplex Systems Ltd. .... 44  
Townsend Associates, Inc.
- Attenuators, Audio**
- ADM Technology, Inc.  
Allen Avionics, Inc.  
Altec Lansing Int'l.  
Aphex Systems Ltd.  
Atlantic Research Corp.  
Audio Service Corp.  
Audio-Technica U.S., Inc.  
Auditronics, Inc.  
Datatronics, Inc.  
Duncan Electronics, Inc.  
DYMA Engineering, Inc.  
Enertec/Schlumberger Dept. Audio  
Professionnel  
Excalibur Electronics, Inc.  
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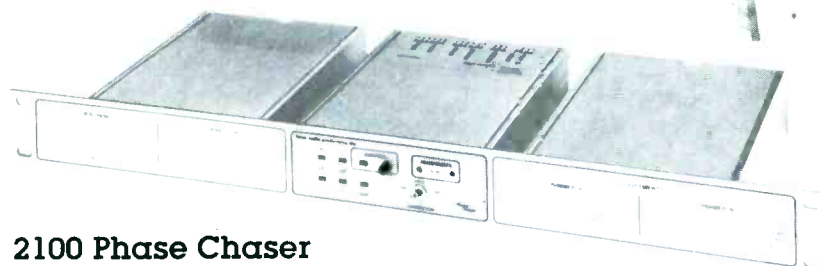
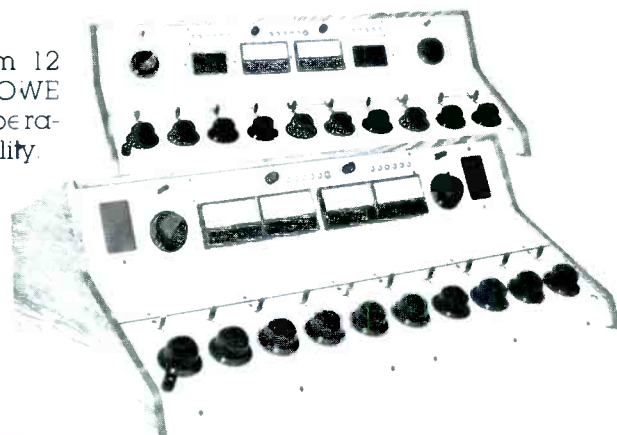
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The answer to phase errors common to stereo tape sources. This unit is an effective, low-cost solution that has been proven in many applications. Get your station in phase!

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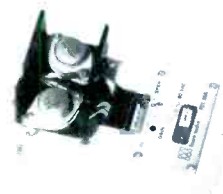


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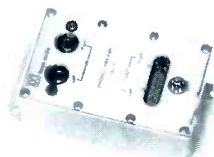
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New Harris Wavestar™...

# The most reliable UHF slot antenna ever designed... because it's waveguide!

The new Harris Wavestar is the only slotted waveguide UHF antenna now available...the ultimate in design simplicity. No center conductor. No couplers. No insulators. Fewer parts mean fewer problems. And that means less off-air time and lower maintenance costs.

Additional advantages of waveguide over coax antennas include higher power handling capabilities and greatly increased safety margins to prevent arcing.

The Wavestar pattern performance is excellent by any standard. Cardioid and peanut directional patterns are currently available, and a highly circular omnidirectional pattern will follow soon. All of these Wavestar configurations provide the smooth elevation patterns necessary for high signal strength and minimum ghosting over the entire coverage area.

The Wavestar is a low windload design for tower top or side mounting. High mechanical strength and rigidity minimize picture variations caused by wind sway.

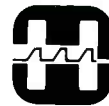
Every Harris antenna is completely assembled and tested at the Harris antenna test range...the largest, most comprehensive facility of its kind.

The range is located in an area far from the pattern-distorting clutter of urban development. Situated atop a 230-foot bluff, with test transmitters located up to 3 miles away on flat, unobstructed bottom lands, the range offers ideal conditions for testing, approaching the "free space" situation of an installed antenna.

Here, theoretical azimuth and elevation patterns are verified with the most accurate and sophisticated test instruments available—translating the theory of a calculated pattern into the reality of actual antenna performance.

You can depend on Wavestar for top reliability. And you can be confident that your Wavestar antenna will be thoroughly tested by Harris to meet your exact pattern requirements.

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- See Adv. Page**      **See Adv. Page**      **See Adv. Page**      **See Adv. Page**
- Kings Electronics Co., Inc.  
Klark-Teknik Electronics  
Larus Corp.  
Leader Instruments Corp.  
Marconi Instruments Div. of Marconi Electronics Inc.  
ProTech Audio Corp.  
Richmond Sound Design, Ltd.  
ROH Corp.  
Sescom, Inc.  
Shallco, Inc. ....120  
Shure Brothers Inc.  
Sonosax  
Spectra Sonics  
Tech Laboratories Inc. ....254  
Valley People, Inc.  
Vidaire Electronics Mfg. Corp.  
Waters Mfg. Inc.
- Attenuators, Fixed**  
Allen Avionics, Inc.  
Audisar  
AVA Electronics  
Avitel Electronics Ltd.  
Bird Electronic Corp.  
COMPAC  
Electro Impulse, Inc.  
Excalibur Electronics, Inc.  
Harris Corp. GSSD PRD Instruments  
HEDCO (Hughes Elec. Devices Corp.)  
Kay Elemetrics Corp.  
Kings Electronics Co., Inc.  
Larus Corp.  
Mu-Del Electronics, Inc.  
The Narda Microwave Corp.  
RMS Electronics, Inc.  
Shallco, Inc. ....120  
Tech Laboratories Inc. ....254  
Texscan  
Texscan Corp.  
Trompeter Electronics, Inc.
- Attenuators, Impedance Matching**  
Allen Avionics, Inc.  
Audisar  
Blonder-Tongue Lab., Inc.  
COMPAC  
Electro Impulse, Inc.  
HEDCO (Hughes Elec. Devices Corp.)  
Kay Elemetrics Corp.  
Mu-Del Electronics, Inc.  
The Narda Microwave Corp.  
Shallco, Inc. ....120  
Shure Brothers Inc.  
Tech Laboratories Inc. ....254  
Texscan  
Texscan Corp.  
Valley People, Inc.
- Attenuators, Microwave**  
Avantek Inc.  
Broadcast Microwave Services, Inc.  
Harris Corp. GSSD PRD Instruments  
Kay Elemetrics Corp.  
Kings Electronics Co., Inc.  
Microwave Assoc. Communications  
Mu-Del Electronics, Inc.  
The Narda Microwave Corp.  
Texscan  
Texscan Corp.  
Varian Associates, Inc. Electron Device Group
- Attenuators, RF**  
AVA Electronics  
Avantek Inc.  
Bird Electronic Corp.  
COMPAC  
ComSonics, Inc.  
Dielectric Communications A Unit of General Signal  
Electro Impulse, Inc. ....239  
Electroline TV Equipment Inc.  
Harris Corp. GSSD PRD Instruments  
HEDCO (Hughes Elec. Devices Corp.)  
Jerrold Div. General Instrument Corp.  
Kahn Communications, Inc.  
Kay Elemetrics Corp.  
Kings Electronics Co., Inc.
- Leasametric, Inc.  
Magnavox CATV Systems, Inc.  
Marconi Instruments Div. of Marconi Electronics Inc.  
Micro Communications, Inc.  
Microwave Assoc. Communications  
Mu-Del Electronics, Inc.  
RHG Electronics Laboratory, Inc.  
Rohde & Schwarz Sales Co.  
Tech Laboratories Inc. ....254  
Texscan  
Texscan Corp.  
Triple Crown Electronics, Inc.  
Trompeter Electronics, Inc.  
VIZ Mfg. Co.  
Wavetek Indiana, Inc.
- Audio Effects Systems**  
ADM Technology, Inc.  
ATI-Audio Technologies Inc. ....206  
Acoustilog Inc.  
Advanced Music Systems  
Alphaton Elektroakustik  
Aphex Systems Ltd.  
Audio + Design (Audio & Design Recording, Inc.) ....165  
Audio Kinetics, Inc. ....42  
Audiotechniques Inc.  
Broadcast Technology, Inc.  
Calzone Case Co.  
Connectronics Corp.  
dbx, Inc.  
Datatronix, Inc.  
Deltamod Corp.  
Dorrrough Electronics  
EXR Corp.  
Elcom-Bauer  
Electrocraft Consultants Ltd.  
Eventide Clockworks, Inc. ....60, 61  
Fostex Corp. of America  
Furman Sound, Inc.  
Gregg Laboratories  
Inovonics Inc. ....224  
Kahn Communications, Inc.  
King Instrument Corp.  
Klark-Teknik Electronics  
Knox Video Products  
MCI/Quantel  
McMartin Industries, Inc.  
Modulation Associates Inc.  
Moseley Associates, Inc.  
Phasecom Corp.  
Phoenix Audio Lab, Inc.  
RCA Broadcast Systems  
Richmond Sound Design, Ltd.  
Studio Technologies, Inc.  
Studiomaster Inc.  
Trident (USA) Inc.  
UREI Inc.  
URSA MAJOR, Inc.  
Valley People, Inc.  
Ward-Beck Systems Ltd.  
Yamaha International Corp. Combo Div.
- Audio Level Indicators**  
ADM Technology, Inc.  
ATI-Audio Technologies Inc.  
Accurate Sound Corp.  
Advancing Technology Corp.  
Arrakis Sytems Inc.  
Audio + Design (Audio & Design Recording, Inc.)  
Audio Technology  
Audisar  
Auditronics, Inc.  
Broadcast Technology, Inc.  
Clyde Electronics Ltd.  
Dorrrough Electronics  
ESE ..... 12-13  
Harrison Systems, Inc.  
High Country Engineering  
Inovonics Inc.  
Logitek Electronic Systems, Inc. ....222  
Modulation Sciences, Inc.  
Quad-Eight Electronics  
Ramko Research Inc. ....81  
The Real World Tech. Group, Inc.  
Technical Projects Ltd.  
Valley People, Inc.  
Ward-Beck Systems Ltd.
- Audio Systems, Stereo TV**  
Barco Industries Video & Communications N.V.  
Rohde & Schwarz Sales Co.
- Automated Testing Systems**  
A.D. Data Systems, Inc.  
Amber Electro Design Inc. ....256  
Asaca/Shibasoku Corp. ....263  
Datatron, Inc.  
Marconi Instruments Div. of Marconi Electronics Inc.  
The Narda Microwave Corp.  
Ortofon Instruments A/S  
Polarad Electronics, Inc.  
Rohde & Schwarz Sales Co.  
Sound Technology .....129  
Tektronix Inc.  
UREI Inc.
- Automated Transmission Systems (ATS)**  
CSP Inc.  
Delta Electronics Inc. (VA)  
DYMA Engineering, Inc.  
Dynamic Technology Ltd.  
Grumman Aerospace Corp.  
Hallikainen & Friends, Inc.  
Moseley Associates, Inc.  
Potomac Instruments, Inc.  
QEI Corp. ....265  
TFT Inc.
- Automation, Audio Production**  
Audio Kinetics, Inc. ....42  
Audio Kinetics (UK) Ltd.  
Central Dynamics Corp. See also American Data  
Century 21 Programming Inc.  
Clyde Electronics Ltd.  
Datatronix, Inc.  
Harrison Systems, Inc.  
King Instrument Corp.  
Kinotone Inc.  
Microprobe Electronics, Inc.  
Rupert Neve Inc.  
Quad-Eight Electronics  
Richmond Sound Design, Ltd.  
Solid State Logic  
Studio Systems Inc.  
Trident (USA) Inc.  
Valley People, Inc.
- Automation, Equipment Control, Radio**  
Autogram Corp.  
Broadcast Controls Div. Of Automated Broadcast Controls  
Broadcast Electronics, Inc.  
Century 21 Programming Inc.  
Cetec Broadcast Group  
Computer Concepts Corp.  
Evertz Microsystems Div. of Dynaquip Ltd.  
Hallikainen & Friends, Inc.  
IGM Communications  
Image Video Ltd.  
KAVCO, Inc.  
Lake Systems Corp. ....122  
Lindburg Enterprises, Inc.  
MRI Systems Ltd.  
The Management  
Microprobe Electronics, Inc.  
Misar Industries  
Modulation Associates Inc.  
Moseley Associates, Inc.  
Phoenix Systems, A Product of The Briner Chase Group  
ProTech Audio Corp.  
Solid State Logic  
Soll, Inc.  
Sono-Mag Corp.  
Studio Systems Inc.  
TFT Inc.  
Tape-Athon Corp. Cavox Stereo Productions  
VIF International
- Automation, Equipment Control, TV**  
Adams-Smith  
American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp.  
Anchor Systems, Inc.  
CMX/Orox Div. of Orox Corp.  
Central Dynamics Corp. See also American Data .....245  
Central Dynamics Ltd.  
Channematic, Inc.  
Control Video Corp.  
Michael Cox Electronics Ltd.  
Data Communications Corp. Broadcast Div.  
Datatron, Inc.  
DYMA Engineering, Inc.  
Dynamic Technology Ltd.  
The Engineering Lab, Inc.  
Evertz Microsystems Div. of Dynaquip Ltd.  
Fernseh Inc.  
Grass Valley Group, Inc.  
Image Video Ltd. ....121  
Industrial Sciences, Inc. (ISI)  
Interface Data Systems  
Kaitronics Corp.  
KAVCO, Inc.  
Lake Systems Corp. ....122  
Lindburg Enterprises, Inc.  
MRI Systems Ltd.  
Microtime, Inc.  
Microwave Assoc. Communications  
Misar Industries  
Moseley Associates, Inc.  
Phoenix Systems, A Product of The Briner Chase Group  
Portac Inc.  
Roscor Corp.  
Solid State Logic  
Soll, Inc.  
H. A. Solutec Ltd.  
Sono-Mag Corp.  
Studio Systems Inc.  
TFT Inc.  
Tele-Engineering Corp.  
Utah Scientific, Inc.  
Video Masters, Inc.  
Videomedia, Inc.  
Vital Industries Inc.
- Automation, Lighting Control**  
B-W Lighting Systems (formerly Panoak Lighting)  
Belden Communications, Inc.  
Colortran, Inc.  
Data Communications Corp. Broadcast Div.  
Design Line Inc.  
Dynamic Technology Ltd.  
Electro Controls  
Electronics Diversified, Inc.  
The Great American Market  
Kliegl Bros. Lighting  
Lindburg Enterprises, Inc.  
Skirpan Lighting Systems, Inc.  
Strand Century, Inc.  
Theatre Techniques Inc.
- Automation, Newsroom Systems**  
Beston Electronics Inc.  
Colorgraphics Systems, Inc.  
Computer Concepts Corp.  
Data Communications Corp. Broadcast Div.  
Harris Corp. Broadcast Group  
Integrated Technology, Inc. Div. of ColorGraphics Systems  
Interface Data Systems  
Kaman Sciences/KBS  
McInnis, Skinner & Associates  
Phoenix Systems, A Product of The Briner Chase Group  
Quanta Corp. ....40-41  
Studio Systems Inc.  
Telesource Communication Services .....259  
UMC Electronics Co. Broadcast Products Div.

- See Adv. Page**      **See Adv. Page**      **See Adv. Page**      **See Adv. Page**
- Automation, Program Control**
- American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp.  
 Autogram Corp.  
 Broadcast Controls Div. Of Automated Broadcast Controls  
 Broadcast Electronics, Inc.  
 Central Dynamics Corp. See also American Data ..... 29, 245  
 Central Dynamics Ltd.  
 Century 21 Programming Inc.  
 Cetec Broadcast Group  
 Channelmatic, Inc.  
 Computer Concepts Corp.  
 Control Video Corp.  
 Data Communications Corp. Broadcast Div.  
 Datatron, Inc.  
 D'San Corp.  
 The Engineering Lab, Inc.  
 Grass Valley Group, Inc.  
 Harris Corp. Broadcast Group  
 IGM Communications  
 Image Video Ltd. .... 121  
 Industrial Sciences, Inc. (ISI)  
 Interface Data Systems  
 Kaitronics Corp.  
 Kaman Sciences/KBS  
 Lake Systems Corp. .... 122  
 The Management  
 Microprobe Electronics, Inc.  
 Microtime, Inc.  
 Phoenix Systems, A Product of The Briner Chase Group  
 ProTech Audio Corp.  
 QEI Corp. .... 265  
 Quad-Eight Electronics  
 Roscor Corp.  
 Sono-Mag Corp.  
 Studio Systems Inc.  
 Tape-Athon Corp. Cavox Stereo Productions  
 Technical Projects Ltd.  
 Tele-Engineering Corp.  
 Telex Communications, Inc.  
 UMC Electronics Co. Broadcast Products Div.  
 Videomedia, Inc.  
 Vital Industries Inc.  
 Ward-Beck Systems Ltd.
- Automation, Program Logging**
- Autogram Corp.  
 Broadcast Controls Div. Of Automated Broadcast Controls  
 Broadcast Electronics, Inc.  
 CBSI-Custom Business Systems, Inc.  
 Central Dynamics Corp. See also American Data  
 Central Dynamics Ltd.  
 Cetec Broadcast Group  
 Computer Concepts Corp.  
 Data Communications Corp. Broadcast Div.  
 Datatron, Inc.  
 Dynamic Technology Ltd.  
 Grass Valley Group, Inc.  
 Groton Computer Inc.  
 Harris Corp. Broadcast Group  
 IGM Communications  
 Image Video Ltd.  
 Interface Data Systems  
 Kaman Sciences/KBS  
 Magnasync/Moviola Corp.  
 The Management  
 Microprobe Electronics, Inc.  
 Moseley Associates, Inc.  
 Panasonic Industrial Co. Audio Video Systems Div.  
 Phoenix Systems, A Product of The Briner Chase Group  
 QSI Systems Inc.  
 RadioCom  
 Roscor Corp.  
 Sono-Mag Corp.  
 Studer Revox America  
 Tele-Engineering Corp.  
 Telex Communications, Inc.  
 Utah Scientific, Inc.  
 Video Masters, Inc.  
 Vital Industries Inc.
- Automation, Projector**
- The BTX Corp.  
 Kaitronics Corp.  
 Kinotone Inc.  
 Laird Telemedia Inc.  
 Sauppe Media, Inc.  
 Vital Industries Inc.
- Automation, Switching**
- A.D. Data Systems, Inc.  
 American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp.  
 Broadcast Controls Div. Of Automated Broadcast Controls  
 CMX/Orrrox Div. of Orrrox Corp.  
 Central Dynamics Corp. See also American Data ..... 29  
 Central Dynamics Ltd.  
 Channelmatic, Inc.  
 Data Communications Corp. Broadcast Div.  
 Datatron, Inc.  
 Di-Tech Inc.  
 Dynamic Technology Ltd.  
 Fernseh Inc.  
 Grass Valley Group, Inc.  
 Grumman Aerospace Corp.  
 HEDCO (Hughes Elec. Devices Corp.)  
 IGM Communications  
 Image Video Ltd. .... 121  
 Industrial Sciences, Inc. (ISI)  
 Kaitronics Corp.  
 Kaman Sciences/KBS  
 KAVCO, Inc.  
 Lindburg Enterprises, Inc.  
 MRI Systems Ltd.  
 Microprobe Electronics, Inc.  
 Microwave Assoc. Communications  
 Panasonic Industrial Co. Audio Video Systems Div.  
 Richmond Sound Design, Ltd.  
 H. A. Solutec Ltd.  
 Sono-Mag Corp.  
 Technical Projects Ltd.  
 3M Co., Broadcast & Related Products Div.  
 UMC Electronics Co. Broadcast Products Div.  
 United Media, Inc. .... 191  
 Utah Scientific, Inc.  
 Videomedia, Inc.  
 Vital Industries Inc.  
 Wilk Power & Video Inc.
- Automation Systems, Business**
- Paul Adams & Associates  
 Anacomp, Inc. CMS Div.  
 CBSI-Custom Business Systems, Inc.  
 Central Dynamics Corp. See also American Data  
 Central Dynamics Ltd.  
 Cetec Broadcast Group  
 Computer Concepts Corp.  
 Data Communications Corp. Broadcast Div.  
 Datatron, Inc.  
 Gill Management Services  
 Groton Computer Inc.  
 Harris Corp. Broadcast Group  
 Harris Corp. Broadcast Group  
 Integrated Technology, Inc. Div. of ColorGraphics Systems  
 Kaman Sciences/KBS  
 MIS Div. WhiteDove Showsystems  
 MPB Technologies Inc.  
 The Management  
 Microprobe Electronics, Inc.  
 Phoenix Systems, A Product of The Briner Chase Group  
 RTI-Research Tech. Int'l.  
 Station Business Systems Div. Control Data Corp.  
 Video Masters, Inc.
- Automation, Tape Control, Cartridge**
- Audio Kinetics, Inc. .... 42  
 Broadcast Controls Div. Of Automated Broadcast Controls  
 Broadcast Electronics, Inc.  
 CMX/Orrrox Div. of Orrrox Corp.
- Central Dynamics Corp. See also American Data  
 Central Dynamics Ltd.  
 Century 21 Programming Inc.  
 Cetec Broadcast Group  
 Datum Inc.  
 Delta Electronics Inc. (NC)  
 Drummex Inc.  
 Dynamic Technology Ltd.  
 Evertz Microsystems Div. of Dynaquip Ltd.  
 Fidelipac Corp.  
 Harris Corp. Broadcast Group  
 IGM Communications  
 Interactive Systems Co. .... 220  
 Kaman Sciences/KBS  
 Merlin Engineering Works, Inc.  
 Microprobe Electronics, Inc.  
 ProTech Audio Corp.  
 Sono-Mag Corp.  
 Studer Revox America  
 Tele-Engineering Corp.  
 Telex Communications, Inc.  
 UMC Electronics Co. Broadcast Products Div.  
 VIF International  
 Vital Industries Inc.
- Automation, Tape Control, Reel**
- Adams-Smith  
 Audio Kinetics, Inc. .... 42  
 Audio Service Corp.  
 The BTX Corp.  
 Broadcast Controls Div. Of Automated Broadcast Controls  
 Broadcast Electronics, Inc.  
 Central Dynamics Corp. See also American Data  
 Central Dynamics Ltd.  
 Century 21 Programming Inc.  
 Cetec Broadcast Group  
 Datum Inc.  
 Design Line Inc.  
 Dynamic Technology Ltd.  
 Evertz Microsystems Div. of Dynaquip Ltd.  
 Harris Corp. Broadcast Group  
 IGM Communications  
 Interactive Systems Co. .... 220  
 Kaman Sciences/KBS  
 The Management  
 Microprobe Electronics, Inc.  
 Otari Corp.  
 ProTech Audio Corp.  
 Solid State Logic  
 Sono-Mag Corp.  
 Studer Revox America  
 Tape-Athon Corp. Cavox Stereo Productions  
 Telex Communications, Inc.  
 Videomedia, Inc.  
 VIF International  
 Vital Industries Inc.
- Automation, Transmitter Logging**
- Delta Electronics Inc. (VA)  
 Dynamic Technology Ltd.  
 Hallikainen & Friends, Inc.  
 Harris Corp. Broadcast Group  
 Marconi Instruments Div. of Marconi Electronics Inc.  
 Microwave Assoc. Communications  
 Moseley Associates, Inc.  
 Potomac Instruments, Inc.  
 QSI Systems Inc.  
 Soll, Inc.  
 Sono-Mag Corp.  
 TFT Inc.
- Automation, Video Display Terminals**
- Data Communications Corp. Broadcast Div.  
 Datatron, Inc.  
 Drummex Inc.  
 Florida Computer Graphics  
 MIS Div. WhiteDove Showsystems  
 The Management  
 Potomac Instruments, Inc.  
 Soll, Inc.  
 H. A. Solutec Ltd.
- Studio Systems Inc.  
 TFT Inc.  
 Teledac Inc.  
 Unitel  
 Video Masters, Inc.  
 Vital Industries Inc.
- Automation, Video Testing**
- A.D. Data Systems, Inc.  
 Asaca/Shibasoku Corp.  
 Grumman Aerospace Corp.  
 Rohde & Schwarz Sales Co.
- Automation, Videotape Machine**
- Adams-Smith  
 Ampex Corp.  
 Audio Kinetics, Inc. .... 42  
 Automation Techniques, Inc.  
 The BTX Corp.  
 Robert Bosch GmbH  
 CMX/Orrrox Div. of Orrrox Corp.  
 Central Dynamics Corp. See also American Data  
 Central Dynamics Ltd.  
 Channelmatic, Inc.  
 Control Video Corp.  
 Data Communications Corp. Broadcast Div.  
 Datatron, Inc.  
 Dynamic Technology Ltd.  
 Fernseh Inc.  
 Kaitronics Corp.  
 King Instrument Corp.  
 Lindburg Enterprises, Inc.  
 Media Concepts, Inc.  
 Merlin Engineering Works, Inc.  
 Monroe Electronics, Inc.  
 Phasecom Corp.  
 RCA Broadcast Systems  
 Roscor Corp.  
 H. A. Solutec Ltd.  
 Studio Systems Inc.  
 Tele-Engineering Corp.  
 Video Masters, Inc.  
 Videomedia, Inc.  
 Vital Industries Inc.
- Bar Code Systems**
- Digital Barcode Systems, Inc.
- Battery Packs and Chargers**
- Alexander Mfg. Co.  
 Anchor Systems, Inc.  
 Anton/Bauer, Inc. .... 171  
 B-W Lighting Systems (formerly Panoak Lighting)  
 Broadcast Microwave Services, Inc.  
 Calzone Case Co.  
 John Chiles, Inc.  
 Christie Electric Corp.  
 Cine 60, Inc.  
 Cinema Products Corp.  
 Colortran, Inc.  
 Comprehensive Video Supply Corp.  
 Cool Light Co., Inc.  
 Dynamote Corp.  
 Enerlite Products Corp.  
 Film/Video Equip. Service Co.  
 Frezzolini Electronics, Inc.  
 G & M Power Products Inc.  
 Alan Gordon Enterprises Inc.  
 Karl Heitz, Inc.  
 Ikegami Electronics (U.S.A.), Inc.  
 JVC Co. of America  
 Leedal, Inc.  
 Microwave Assoc. Communications  
 Mole-Richardson Co.  
 Multiplier Industries Corp.  
 Nagra Magnetic Recorders, Inc.  
 North Wind Power Co., Inc.  
 Panasonic Industrial Co. Audio Video Systems Div.  
 Perrott Eng. Labs, Inc. .... 94  
 Portable Energy Products, Inc.  
 Redlake Corp.  
 Smith-Victor Corp.  
 Sony Corp. of America  
 Tektronix Inc. .... 18-19  
 Telex Communications, Inc.

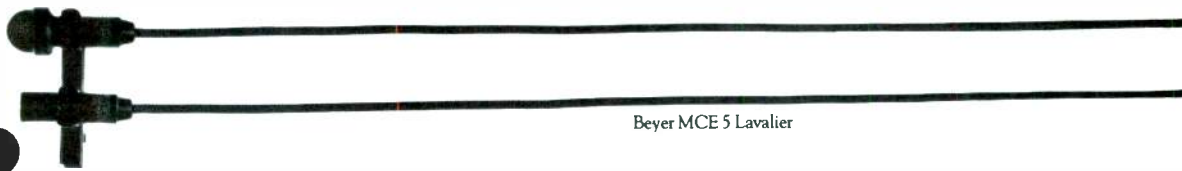
See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Tungstone Batteries Inc. Vanner, Inc. Yardney Battery Div.	Kustom Kraft, Inc. LPB Inc. Laird Telemedia Inc. <b>McCurdy Radio Ind. Inc.</b> ..... IBC Kenneth R. Meades Modular Sound Systems Inc. DBA-Bag End Neumade Industries, Inc. Pacific Recorders & Eng. Corp. Parsons Mfg. Corp. Phoenix Audio Lab, Inc. Quick-Set Inc. RTI-Research Tech. Int'l. <b>Racal-Decca Canada Inc.</b> Insulators Div. .... 116 Rack Techniques Corp. Ruslang Corp. Scientific-Atlanta, Inc. Shintron Co. Inc. <b>Stantron Div. Wyco Metal Products</b> ..... 252 Winsted Corp. .... 244	Connector Systems Div. of BIW Cable Systems, Inc. Fernseh Inc. GBC Closed Circuit TV Corp. G & M Power Products Inc. Harris Corp. Broadcast Group Karl Heitz, Inc. Ikegami Electronics (U.S.A.), Inc. JVC Co. of America Javelin Electronics M/A-Com Comm/Scope Marketing, Inc. Marshall Electronics Panasonic Industrial Co. Audio Video Systems Div.	Marshall Electronics Paladin Corp. RTI-Research Tech. Int'l. Trompeter Electronics, Inc. Valtec Subs. of U.S Philips Western Electronic Products Co.
<b>Blowers and Fans</b> Amco Engineering Co. Bud Industries, Inc. <b>Stantron Div. Wyco Metal Products</b> ..... 252 Winsted Corp. .... 244	<b>Books, Text and Reference</b> Command Productions Radio Broadcasting Services Comprehensive Video Supply Corp. Drummex Inc. Alan Gordon Enterprises Inc. <b>High Tech Marketing Co.</b> ..... 234 Opamp Labs, Inc. Phoenix Audio Lab, Inc. Howard W. Sams & Co., Inc. Smith Electronics, Inc. <b>Swiderski Electronics</b> ..... 230	<b>Cable, Coaxial and Audio</b> AKG Acoustics, Inc. Andrew Corp. Antenna Development & Mfg., Inc. Audio-Technica U.S., Inc. AVA Electronics BIW Cable Systems, Inc. Belden Elec. Wire & Cable Electronics Div. Brabury Ltd. Brand-Rex Co. Elec. & Industrial Cable Div. CSP Inc. Cablewave Systems Inc. <b>Canare Cable, Inc.</b> ..... 64 Center Video Center <b>Chester Cable</b> ..... 1C5 Clyde Electronics Ltd. Comark Communications, Inc. Comprehensive Video Supply Corp. Connectronics Corp. Consolidated Elec. Wire & Cable Corp. Discwasher EMT-FRANZ GMBH Fostex Corp. of America GBC Closed Circuit TV Corp. Gabriel Electronics, Inc. Hartley Products Corp. Javelin Electronics M/A-Com Comm/Scope Marketing, Inc. Marshall Electronics McCullough Satellite Equip., Inc. Media Concepts, Inc. Micro Communications, Inc. Nagra Magnetic Recorders, Inc. Nurad, Inc. Phelps Dodge Communications Co. Philatron Int'l. Reel-O-Matic Systems, Inc. <b>Shure Brothers Inc.</b> ..... 43 Siecor Corp. Times Fiber Communications Tiner Communication Services, Inc. Trompeter Electronics, Inc. Wireworks Corp.	<b>Calibration Service, Instrument</b> Bird Electronic Corp. Calzone Case Co. Delta Electronics Inc. (VA) Neal Ferrograph U.S.A., Inc. Photo Research Div. of Kollmorgen Corp. Potomac Instruments, Inc.
<b>Bridges</b> Biddle Instruments CSP Inc. Delta Electronics Inc. (VA) HEDCO (Hughes Elec. Devices Corp.) Larus Corp. Leader Instruments Corp. Soper Sound Music Library Soper Sound Media Music Texscan Wavetek Indiana, Inc.	<b>Cabinets, Equipment, Custom</b> A & S Case Co. Allied Broadcast Equipment Alpha Video & Electronics Co. Amco Engineering Co. Anvil Cases, Inc. Audiotechniques Inc. B-W Lighting Systems (formerly Panoak Lighting) Bretford Mfg. Co. Bud Industries, Inc. CSP Inc. Calzone Case Co. Center Video Center Centro Corp. Cosmin Electronics Delcom Corp. Drummex Inc. Equipto <b>Equipto Electronics Corp.</b> ..... 260 GKM Mfg. Corp. The Graphic Express Corp. Grumman Aerospace Corp. Hammond Industries Inc. House of Metal Enclosure Inc. Jamieson & Associates, Inc. Jenel Consultants Corp. Kustom Kraft, Inc. LPB Inc. Lakeside Associates Inc. Leedal, Inc. Lee-Ray Industries, Inc. <b>McCurdy Radio Ind. Inc.</b> ..... IBC Kenneth R. Meades Modular Sound Systems Inc. DBA-Bag End Neumade Industries, Inc. Pacific Recorders & Eng. Corp. Parsons Mfg. Corp. RCI (Recording Consultants Inc.) RTI-Research Tech. Int'l. Rack Techniques Corp. Raindirk Ltd. The Real World Tech. Group, Inc. Roscor Corp. Ruslang Corp. Studio Systems Inc. Vector Electronic Co., Inc. Video Masters, Inc. <b>Ward-Beck Systems Ltd.</b> ..... BC <b>Winsted Corp.</b> ..... 244	<b>Camera Dollies, Stands and Tripods</b> All Mobile Video Bardwell & McAlister, Inc. Belden Communications, Inc. Birns & Sawyer Inc. Bogen Photo Corp. Calzone Case Co. The Camera Mart, Inc. Century Precision Cine/Optics Cinema Products Corp. Comprehensive Video Supply Corp. ENG Helicopter Satellites, Ltd. Elektroimpex Feathercam Inc. GBC Closed Circuit TV Corp. Alan Gordon Enterprises Inc. Karl Heitz, Inc. Innovative Television Equipment, Inc. Javelin Electronics K B Systems Kobold of America Corp. Lee-Ray Industries, Inc. <b>Listec TV Equipment Corp.</b> ..... 28 Matthews Studio Equipment, Inc. Miller Professional Equipment, Inc. Neilson-Hordell Ltd. O'Connor Eng. Labs. Inc. Panasonic Industrial Co. Audio Video Systems Div. Peerless Sales Quick-Set Inc. RTI-Research Tech. Int'l. Redlake Corp. <b>Sachtler Corp. of America</b> ..... 203 <b>Sachtler GmbH</b> ..... 203 Smith-Victor Corp. Tiffen Mfg. Corp. VideoTeleCom W. Vinten Ltd. Wheelit, Inc.	<b>Camera Pan and Tilt Heads</b> All Mobile Video Arriflex Corp. Bogen Photo Corp. Calzone Case Co. Canon USA, Inc. Optics Div. Cohu, Inc. Electronics Div. Comprehensive Video Supply Corp. Elektroimpex Feathercam Inc. GBC Closed Circuit TV Corp. Alan Gordon Enterprises Inc. Karl Heitz, Inc. Innovative Television Equipment, Inc. Javelin Electronics K B Systems Listec TV Equipment Corp. Matthews Studio Equipment, Inc. Miller Professional Equipment, Inc. Mitchell Camera Corp. O'Connor Eng. Labs. Inc. Panasonic Industrial Co. Audio Video Systems Div. Peerless Sales Pioneer Marketing Corp. Quick-Set Inc.
<b>Buzz Tone Eliminators, Videotape Edit</b> Merlin Engineering Works, Inc.	<b>Cabinets, Cartridges and Records</b> Advance Products Co. Allied Broadcast Equipment Bretford Mfg. Co. Drummex Inc. Equipto Fidelipac Corp. Hammond Industries Inc. Keystone Metal Products, Inc. Kustom Kraft, Inc. Marathon Products Corp. Micro-Trak Corp. Neumade Industries, Inc. Old Dominion Broadcast Eng. Service Ortofon Instruments A/S RTI-Research Tech. Int'l. Ruslang Corp. Wallach & Associates Inc. <b>Winsted Corp.</b> ..... 244	<b>Cable Laying Equipment</b> Ditch Witch The Charles Machine Works, Inc. Dynamote Corp. Elephant Industries Inc. Reel-O-Matic Systems, Inc. Roll-A-Reel Co. Inc.	<b>Camera Dollies, Stands and Tripods</b> All Mobile Video Bardwell & McAlister, Inc. Belden Communications, Inc. Birns & Sawyer Inc. Bogen Photo Corp. Calzone Case Co. The Camera Mart, Inc. Century Precision Cine/Optics Cinema Products Corp. Comprehensive Video Supply Corp. ENG Helicopter Satellites, Ltd. Elektroimpex Feathercam Inc. GBC Closed Circuit TV Corp. Alan Gordon Enterprises Inc. Karl Heitz, Inc. Innovative Television Equipment, Inc. Javelin Electronics K B Systems Kobold of America Corp. Lee-Ray Industries, Inc. <b>Listec TV Equipment Corp.</b> ..... 28 Matthews Studio Equipment, Inc. Miller Professional Equipment, Inc. Neilson-Hordell Ltd. O'Connor Eng. Labs. Inc. Panasonic Industrial Co. Audio Video Systems Div. Peerless Sales Quick-Set Inc. RTI-Research Tech. Int'l. Redlake Corp. <b>Sachtler Corp. of America</b> ..... 203 <b>Sachtler GmbH</b> ..... 203 Smith-Victor Corp. Tiffen Mfg. Corp. VideoTeleCom W. Vinten Ltd. Wheelit, Inc.
<b>Cabinets, Consoles and Racks (Enclosures Only)</b> A & S Case Co. Advance Products Co. Amco Engineering Co. Anvil Cases, Inc. Audiotechniques Inc. B-W Lighting Systems (formerly Panoak Lighting) Brabury Ltd. Bud Industries, Inc. Calzone Case Co. Cases Inc. Comprehensive Video Supply Corp. Continental Electronics Mfg. Co. Cosmin Electronics Equipto <b>Equipto Electronics Corp.</b> ..... 260 Fiberbilt Cases GKM Mfg. Corp. Grumman Aerospace Corp. Hammond Industries Inc. House of Metal Enclosure Inc. Javelin Electronics Jenel Consultants Corp. Keystone Metal Products, Inc.	<b>Cable, Camera</b> Audio Service Corp. BIW Cable Systems, Inc. Belden Elec. Wire & Cable Electronics Div. Brand-Rex Co. Elec. & Industrial Cable Div. Calzone Case Co. <b>Chester Cable</b> ..... 105 Comprehensive Video Supply Corp.	<b>Cable Locators, Underground</b> Aqua-Tronics, Inc. Biddle Instruments DYMA Engineering, Inc. Hipotronics Inc. International Electro-Magnetics Radar Engineers Div. of Epic Corp. Rycom Instruments	<b>Calibration Service, Instrument</b> Bird Electronic Corp. Calzone Case Co. Delta Electronics Inc. (VA) Neal Ferrograph U.S.A., Inc. Photo Research Div. of Kollmorgen Corp. Potomac Instruments, Inc.
	<b>Cable Stripping Tools</b> Belden Elec. Wire & Cable Electronics Div. Cambridge Products Comprehensive Video Supply Corp. Connectronics Corp. Dynatech/U-Z, Inc. Glentronix (1977) Ltd. <b>Ben Hughes Communication Products Cc.</b> ..... 256		<b>Camera Pan and Tilt Heads</b> All Mobile Video Arriflex Corp. Bogen Photo Corp. Calzone Case Co. Canon USA, Inc. Optics Div. Cohu, Inc. Electronics Div. Comprehensive Video Supply Corp. Elektroimpex Feathercam Inc. GBC Closed Circuit TV Corp. Alan Gordon Enterprises Inc. Karl Heitz, Inc. Innovative Television Equipment, Inc. Javelin Electronics K B Systems Listec TV Equipment Corp. Matthews Studio Equipment, Inc. Miller Professional Equipment, Inc. Mitchell Camera Corp. O'Connor Eng. Labs. Inc. Panasonic Industrial Co. Audio Video Systems Div. Peerless Sales Pioneer Marketing Corp. Quick-Set Inc.

	See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
RTI-Research Tech. Int'l. Redlake Corp.				
Sachtler Corp. of America	203			
Sachtler GmbH	203			
Smith-Victor Corp. Warren R. Smith Co. Tele-Cine Corp. Div. of Schneider Corp. of America Telemetrics Inc. VideoTeleCom W. Vinten Ltd. Wheelit, Inc.				
<b>Camera Pickup Tubes and CCDs</b>				
A. F. Associates, Inc.	153			
Alpha Electronics, Inc.				
Amperex Electronic Corp.	55			
Avtech Electronics Inc. (formerly Team Electronics)				
EEV, Inc.	66-67			
English Electric Valve Co. Ltd. Fairchild Camera & Instrument Corp. CCD Imaging Div. Fernseh Inc.				
GBC Closed Circuit TV Corp. Ikegami Electronics (U.S.A.), Inc. NEC America, Inc. Broadcast Equip. Div. Panasonic Industrial Co. Audio Video Systems Div. RCA Distributor & Special Products Div. RCA Solid State Div. Tube Operations	249			
Westinghouse Electric Corp. Ind. & Gov't Tube Div.				
<b>Camera Remote Control Equipment</b>				
A. F. Associates, Inc. All Mobile Video Anton/Bauer, Inc. Robert Bosch GmbH Calzone Case Co. Cinema Products Corp. Cinematography Electronics Cohu, Inc. Electronics Div. Feathercam Inc. Fernseh Inc. Fibervision Div. of Math Associates GBC Closed Circuit TV Corp. Hitachi Denshi America, Ltd. Ikegami Electronics (U.S.A.), Inc. Innovative Television Equipment, Inc. JVC Co. of America Javelin Electronics Listec TV Equipment Corp. Marconi Electronics Inc. Broadcast & Communication Div. Matthews Studio Equipment, Inc. Misar Industries Panasonic Industrial Co. Audio Video Systems Div. Philips Television Systems, Inc. Pye TVT Ltd. Broadcast Co. of Philips Quick-Set Inc. RCA Broadcast Systems Studio Systems Inc. Tele-Cine Corp. Div. of Schneider Corp. of America Tele-Measurements Inc. Telemetrics Inc. VideoTeleCom W. Vinten Ltd.				
<b>Camera Stabilizers</b>				
Arriflex Corp. Cine 60, Inc. Cinema Products Corp. ENG Helicopter Satellites, Ltd. Alan Gordon Enterprises Inc. Lee-Ray Industries, Inc. Microwave Assoc. Communications Sony Corp. of America VideoTeleCom				
<b>Camera Tracks, Studio Perimeter</b>				
Belden Communications, Inc.				
<b>Cameras, CCD/Solid State</b>				
EEV, Inc. Hitachi Denshi America, Ltd. NEC America, Inc. Broadcast Equip. Div. Thomson-CSF Broadcast, Inc.				
<b>Cameras, Film Chain</b>				
A. F. Associates, Inc.	153			
Advanced Technology Div. Of TriTronics, Inc. Robert Bosch GmbH Fernseh Inc. Hitachi Denshi America, Ltd. Ikegami Electronics (U.S.A.), Inc. Marconi Communication Systems Ltd. Panavision Electronics Pye TVT Ltd. Broadcast Co. of Philips RCA Broadcast Systems Sharp Electronics Corp. Professional Products Div.				
<b>Cameras, Film Cine</b>				
Arriflex Corp. Canon USA, Inc. Optics Div. Century Precision Cine/Optics Cinema Products Corp. Cinematography Electronics Dunn Instruments, Inc. Feathercam Inc. Frezzolini Electronics, Inc. Alan Gordon Enterprises Inc. Karl Heitz, Inc. Mitchell Camera Corp. Neilson-Hordell Ltd. J. Osawa & Co., Ltd. Pioneer Marketing Corp. Redlake Corp. Zellan Enterprises, Ltd.				
<b>Cameras, Video, Camera/Recorder Systems</b>				
Robert Bosch GmbH Calzone Case Co. Dunn Instruments, Inc. Fernseh Inc.	103			
GBC Closed Circuit TV Corp. Hitachi Denshi America, Ltd. Ikegami Electronics (U.S.A.), Inc. Lenzar Optics Corp. NEC America, Inc. Broadcast Equip. Div. Panasonic Industrial Co. Audio Video Systems Div.	50-51			
RCA Broadcast Systems Redlake Corp. Sony Corp. of America	88-89			
Thomson-CSF Broadcast, Inc.				
<b>Cameras, Video Color ENG/EFP</b>				
All Mobile Video Ampex Corp. Asaca/Shibasoku Corp. Avtech Electronics Inc. (formerly Team Electronics) Robert Bosch GmbH Calzone Case Co. Cinema Products Corp. Crow of Reading Ltd. Fernseh Inc.	103			
Harris Corp. Broadcast Group Hitachi Denshi America, Ltd.	3			
Ikegami Electronics (U.S.A.), Inc.	35			
International Video Corp. JVC Co. of America	79			
Javelin Electronics Link Electronics Ltd. Marconi Communication Systems Ltd. Marconi Electronics Inc. Broadcast & Communication Div. Media Concepts, Inc. NEC America, Inc. Broadcast Equip. Div. One Pass Film & Video Panasonic Industrial Co. Audio Video Systems Div. Panavision Electronics				
<b>Cameras, Video Color Studio Broadcast</b>				
Ampex Corp. Robert Bosch GmbH Calzone Case Co. Crow of Reading Ltd. Fernseh Inc. Harris Corp. Broadcast Group Hitachi Denshi America, Ltd. Ikegami Electronics (U.S.A.), Inc.	85			
JVC Co. of America Link Electronics Ltd. Marconi Communication Systems Ltd. Marconi Electronics Inc. Broadcast & Communication Div. One Pass Film & Video Panasonic Industrial Co. Audio Video Systems Div. Panavision Electronics Philips Television Systems, Inc.	56-57			
RCA Broadcast Systems Sony Corp. of America Thomson-CSF Broadcast, Inc.				
<b>Capacitors, Transmuting, Mica and Vacuum</b>				
CSP Inc. EEV, Inc. English Electric Valve Co. Ltd. R. F. Gain, Ltd. ITT Jennings Richardson Electronics Ltd. Surcom Associates, Inc.	255			
<b>Captioning Systems</b>				
Robert Bosch GmbH EEG Enterprises, Inc. Fernseh Inc. MPB Technologies Inc. Nat'l. Captioning Institute, Inc. Quanta Corp.	40-41			
Unitel				
<b>Cartridge Machine Rebuilding Services</b>				
Audi-Cord Corp. Broadcast Electronics, Inc. Century 21 Programming Inc. DYMA Engineering, Inc. Merlin Engineering Works, Inc.				
<b>Cartridge Machines, Random Access</b>				
Audio Kinetics, Inc. Broadcast Controls Div. Of Automated Broadcast Controls Broadcast Electronics, Inc. Century 21 Programming Inc. Cetec Broadcast Group Control Video Corp. IGM Communications The Management McCurdy Radio Ind. Inc. Merlin Engineering Works, Inc. Sono-Mag Corp. Tele-Engineering Corp. Telex Communications, Inc. UMC Electronics Co. Broadcast Products Div.				
<b>Cartridge Reconditioning Services</b>				
Old Dominion Broadcast Eng. Service Professional Audio Services Re-Play Video Cartridge Service				
<b>Cartridge Recording Services</b>				
Media Concepts, Inc. Professional Audio Services Tape-Athon Corp. Cavox Stereo Productions				
<b>Cartridge Reloading Services, Audio</b>				
Aristocart Div., Western Int'l. Communications, Ltd. Marathon Products Corp. Neumade Industries, Inc. Professional Audio Services				
<b>Cartridge Reloading Services, Video</b>				
Audico, Inc. COARC	240			
Professional Audio Services Re-Play Video Cartridge Service				
<b>Cartridges, Phono</b>				
AKG Acoustics, Inc. Astatic Corp. Audio-Technica U.S., Inc. Bang & Olufsen of America Cetec Broadcast Group EMT-FRANZ GMBH Fidelipac Corp. Gotham Audio Corp. McCurdy Radio Ind. Inc. Micro-Trak Corp. Ortofon Instruments A/S Russco Electronics Mfg. Inc. Shure Brothers Inc. Sono-Mag Corp. Stanton Magnetics Inc.	195			
Vidaire Electronics Mfg. Corp. VIF International				
<b>Cartridges, Videotape</b>				
Audico, Inc. Calzone Case Co. Maxell Corp. of America Panasonic Industrial Co. Audio Video Systems Div. RCA Broadcast Systems Re-Play Video Cartridge Service Schuessler Case Co., Inc. Sony Corp. of America 3M Co. Magnetic A/V Products Div.				
<b>Carts, Equipment</b>				
A & S Case Co. Advance Products Co. Anvil Cases, Inc. Bretford Mfg. Co. Cases Inc. Comprehensive Video Supply Corp. Deltamod Corp. Kustom Kraft, Inc. Lee-Ray Industries, Inc. Neumade Industries, Inc. Parsons Mfg. Corp. Peerless Sales Quick-Set Inc. RTI-Research Tech. Int'l. Storeel Corp. Wheelit, Inc. Winsted Corp.	244			
<b>Cases, Equipment, Transport</b>				
Anvil Cases, Inc. Audio Service Corp. William Bal Corp. Calzone Case Co. Center Video Center Comprehensive Video Supply Corp. Excalibur Industries Fiberbilt Cases Alan Gordon Enterprises Inc. Hardigg Industries Inc.				

# Why Beyer mics represent a viable alternative to the usual choices in Broadcast.



Beyer MCM Condenser System



Beyer MCE 5 Lavalier



Beyer M 260

**Now there's another high-tech German condenser system.**



Until recently, film and broadcast engineers thought only Sennheiser and Neumann made high-quality condenser microphone systems. Now the Beyer MCM Series offers the same German excellence in design and construction, the same kinds of accessories (windscreens, pistol grips, shock mounts) and facilities for 12V and 48V "phantom" powering.

And since the MCM Series studio condenser mic is part of a system which combines power modules and different mic capsules (long shotgun, short shotgun, unidirectional, omnidirectional and figure eight), you get more microphone potential for dollar output.

Like all Beyer microphones, the MCM Series is a truly professional instrument system suited to the widest range of applications in Broadcast/Film and Video post-production.

**With lavalier mics, small is not enough.**



Electret condenser lavalier mics like SONY's ECM-50 have proven useful for on-camera miking situations because of their reduced size. And while many of these mics offer good performance in a compact size, the Beyer MCE5 also provides extended frequency response (20 to 20,000 Hz) and durability in an even smaller format (diameter: 7 mm / length: 23 mm).

To optimize its compatibility with a variety of broadcast and film applications, the tiny black MCE5 is available in different configurations for powering interface and includes a system with accessories like windscreens, expansion mounts etc.

At Beyer Dynamic's ultra-modern manufacturing facility in West Germany, we hand-build virtually all of our microphones in the most evolved state of fine German engineering.

**There's more than one way to bring out the warmth in an announcer's voice.**



Broadcast engineers choose the E-V RE20 for many vocal announcing situations because of its wide frequency response (45-18,000 Hz)\* and smooth sound. Beyer Dynamic's M 260 also provides the extended frequency response (50-18,000 Hz) and warmth required for critical vocal applications with one distinct advantage: its reduced size. Its compact and efficient ribbon element captures the warmth traditionally provided by this type of mic. And because it is considerably smaller than a mic with a large moving-coil diaphragm, the M 260 provides a natural, balanced sound image in a portable format that won't obscure copy or take up valuable space in the studio.

The Beyer M 260 has its own custom-designed ribbon element to optimize the mic's performance based on its Broadcast applications.

**The Dynamic Decision**

**beyerdynamic**

\*Extracted from competitive promotional literature or advertising.  
\*Documentation supporting specific comparative claims available upon request.

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Circle (120) on Reply Card

See Adv. Page

See Adv. Page

See Adv. Page

See Adv. Page

Karl Heitz, Inc.  
Innovative Television Equipment, Inc.  
Lowenthal Mfg. Co.  
Parsons Mfg. Corp.  
Star Case Mfg. Co. Inc.

### Cases, Film and Tape, Carrying and Shipping

A & S Case Co.  
Anvil Cases, Inc.  
William Bal Corp.  
Calzone Case Co.  
Cases Inc.  
Comprehensive Video Supply Corp.  
The Durafilm Co.  
Excalibur Industries  
Fiberbilt Cases  
Goldberg Brothers Inc.  
Alan Gordon Enterprises Inc.  
Hardigg Industries Inc.  
Innovative Television Equipment, Inc.  
K B Systems  
Lowenthal Mfg. Co.  
Maxell Corp. of America  
Neumade Industries, Inc.  
Parsons Mfg. Corp.  
Plastic Reel Corp. of America  
RTI-Research Tech. Int'l.  
Radmar, Inc.  
Reliance Plastics & Packaging Div.  
Schuessler Case Co., Inc.  
Star Case Mfg. Co. Inc.  
Thermodyne International Ltd.

### Cassette Duplication Machines

Accurate Sound Corp.  
Magnefax Int'l., Inc.  
Otari Corp.  
Panasonic Industrial Co. Audio Video Systems Div.  
Recortec, Inc.  
See Hear Industries Div. of RJA Inc.  
Sony Corp. of America  
Tandberg of America, Inc.  
Telectro Systems Corp.  
Telex Communications, Inc.

### Cassette Machines

Amilon Corp.  
Robert Bosch GmbH  
Fostex Corp. of America  
King Instrument Corp.  
Mineroff Electronics, Inc. Uher Products  
Neal Ferroglyph U.S.A., Inc.  
Panasonic Industrial Co. Audio Video Systems Div.  
Robins-Div. of Benjamin Electroproducts  
See Hear Industries Div. of RJA Inc.  
Tape-Athon Corp. Cavox Stereo Productions  
TEAC Corp. of America  
Telectro Systems Corp.  
Telex Communications, Inc.  
Tiffen Mfg. Corp.  
Yamaha International Corp. Combo Div.

### Character Generators

Adams-Smith  
All Mobile Video  
Ampex Corp.  
Amtek Systems Inc.  
Aurora Systems  
The BTX Corp.  
Beston Electronics Inc.  
Robert Bosch GmbH  
CMC Technology Corp.  
Calzone Case Co.  
Chyron Corp. Telesystems  
Cipher Digital  
Michael Cox Electronics Ltd.  
Datatron, Inc.  
Datum Inc.  
**Dubner Computer Systems, Inc.** .....253  
EECO Inc.  
EEG Enterprises, Inc.

**Evertz Microsystems Div. of Dynaquip Ltd.** .....108  
Fernseh Inc.  
For-A Corp. of America  
Glentronix (1977) Ltd.  
Grove Corp. Knox Video Products Div. H.E. Inc.  
Harris Corp. Broadcast Group  
Interand Corp. Telestrator Div.  
Kaitronics Corp.  
Knox Video Products  
**Laird Telemedia Inc.** .....22  
Lang Video Systems Corp.  
MCI/Quantel  
MPB Technologies Inc.  
MRI Systems Ltd.  
McInnis, Skinner & Associates  
Panasonic Industrial Co. Audio Video Systems Div.  
Piher Electronica S. A.  
Portac Inc.  
Pro-Bel Ltd.  
QSI Systems Inc.  
**Quanta Corp.** .....40-41  
Reynolds/Leteron Co.  
Shintron Co. Inc.  
Symtec Inc.  
Telcom Research  
Teledac Inc.  
Terminal Display Systems Ltd.  
Texscan Corp.  
Thomson-CSF Broadcast, Inc.  
3M Co., Broadcast & Related Products Div.  
Torpey Controls & Eng. Ltd.  
Unitel  
VIA Video, Inc.  
Video Associates Labs, Inc.  
Video Data Systems  
Videomedia, Inc.  
Wilk Power & Video Inc.

### Character Generators, Wire Service Memory System

Beston Electronics Inc.  
**Dubner Computer Systems, Inc.** .....253  
Integrated Technology, Inc. Div. of ColorGraphics Systems  
Portac Inc.  
**Quanta Corp.** .....40-41  
Teledac Inc.  
Telesource Communication Services  
Unitel  
Video Data Systems  
Wilk Power & Video Inc.

### Choppers

Feathercam Inc.

### Chroma Key Background Movement Devices

All Mobile Video  
B-W Lighting Systems (formerly Panoak Lighting)  
The Fantastic Animation Machine, Inc.  
NEC America, Inc. Broadcast Equip. Div.  
Panasonic Industrial Co. Audio Video Systems Div.

### Chroma Keyer Systems

American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp.  
Robert Bosch GmbH  
**Broadcast Video Systems, Ltd.** ....115  
**Central Dynamics Corp. See also American Data** .....29  
Central Dynamics Ltd.  
Michael Cox Electronics Ltd.  
**Crosspoint Latch Corp.** .....272  
Crow of Reading Ltd.  
ECHOlab, Inc.  
Electrocraft Consultants Ltd.  
Grass Valley Group, Inc.  
Industrial Sciences, Inc. (ISI)  
International Nuclear Corp.

Panasonic Industrial Co. Audio Video Systems Div.  
RCA Broadcast Systems  
Rosco Labs Inc.  
Shintron Co. Inc.  
Siegel Electronics  
Telemet Div. A Geotel, Co.  
Thomson-CSF Broadcast, Inc.  
ULTIMATE Corp. Vlahos-Gottschalk Research Corp.  
Vital Industries Inc.

### Circuit Breakers

Ercona Corp.  
Townsend Associates, Inc.

### Clocks and Chronographs

Beaveronics, Inc.  
Dukane Corp.  
**ESE** .....12-13  
Evertz Microsystems Div. of Dynaquip Ltd.  
**Feldmar Watch & Clock Center** .....234  
Glentronix (1977) Ltd.  
Leitch Video Ltd.  
Lindburg Enterprises, Inc.  
Pacific Recorders & Eng. Corp.  
Portac Inc.  
Jules Racine & Co., Inc.  
Sono-Mag Corp.  
Telectro Systems Corp.  
Torpey Controls & Eng. Ltd.

### Clocks, Digital and Digital Driver

Amtek Systems Inc.  
Arrakis Systems Inc.  
Beaveronics, Inc.  
**Broadcast Aids, Inc.** .....254  
Cipher Digital  
Datatron, Inc.  
Datum Inc.  
D'San Corp.  
Dukane Corp.  
EEV, Inc.  
**ESE** .....12-13  
Evertz Microsystems Div. of Dynaquip Ltd. ....108  
GEC McMichael Ltd.  
Glentronix (1977) Ltd.  
H.E. Inc.  
High Country Engineering  
Image Video Ltd.  
Kaitronics Corp.  
Leitch Video Ltd.  
QSI Systems Inc.  
Telectro Systems Corp.  
Torpey Controls & Eng. Ltd.

### Clocks, Station Master Control

Amtek Systems Inc.  
Beaveronics, Inc.  
Continental Electronics Mfg. Co.  
Datum Inc.  
Dukane Corp.  
**ESE** .....12-13  
Evertz Microsystems Div. of Dynaquip Ltd.  
Glentronix (1977) Ltd.  
Leitch Video Ltd.  
Lindburg Enterprises, Inc.  
QSI Systems Inc.  
Sono-Mag Corp.  
Torpey Controls & Eng. Ltd.  
Vital Industries Inc.

### Collimeters

Karl Heitz, Inc.

### Color Correction Equipment

Belden Communications, Inc.  
Robert Bosch GmbH  
**Broadcast Video Systems, Ltd.** ....115  
Michael Cox Electronics Ltd.  
Datatek Corp.  
Dubner Computer Systems, Inc.  
Electrocraft Consultants Ltd.  
Faroudja Labs, Inc.

Fernseh Inc.  
For-A Corp. of America  
**Fortel Inc.** .....93  
Grove Corp. Knox Video Products Div.  
Ikegami Electronics (U.S.A.), Inc.  
Image Transform, Inc.  
Marconi Communication Systems Ltd.  
Marconi Electronics Inc. Broadcast & Communication Div.  
Microtime, Inc.  
Photo Research Div. of Kollmorgen Corp.  
RCA Broadcast Systems  
Rank Cintel  
Rank Precision Industries Inc.  
Rosco Labs Inc.  
Siegel Electronics  
Television Equipment Associates  
Thomson-CSF Broadcast, Inc.

### Combiners, Power

Broadcast Microwave Services, Inc.  
CSP Inc.  
Cetec Antennas  
Comark Communications, Inc.  
Continental Electronics Mfg. Co.  
Dielectric Communications A Unit of General Signal  
Elcom-Bauer  
Jerrold Div. General Instrument Corp.  
Marconi Communication Systems Ltd.  
Marconi Electronics Inc. Broadcast & Communication Div.  
Micro Communications, Inc.  
Mu-Del Electronics, Inc.  
The Narda Microwave Corp.  
North Hills Electronics, Inc.  
**Shively Laboratories Div. of Howell Labs, Inc.** .....118  
Tennaplex Systems Ltd.  
Townsend Associates, Inc.

### Commercial Insertion Systems

Adams-Russell Co., Inc. Video Info. Systems Div.  
Automation Techniques, Inc.  
Beston Electronics Inc.  
R.W.Card & Associates  
Channelmatic, Inc.  
Jerry Conn Associates Inc.  
Control Video Corp.  
Falcone Int'l., Inc.  
KAVCO, Inc.  
Metrodata  
Microtime, Inc.  
Monroe Electronics, Inc.  
Portac Inc.  
Roscor Corp.  
H. A. Solutec Ltd.  
Tele-Engineering Corp.

### Common Point Bridges -- See Bridges

### Communication Systems, Land Mobile

Andrew Corp.  
Atlantic Research Corp.  
Bayly Engineering Ltd. Member of AEG-Telefunken Group  
Broadcast Microwave Services, Inc.  
Broadcast Technology, Inc.  
Calzone Case Co.  
Centro Corp.  
Compucon, Inc.  
Comsearch, Inc.  
DYMA Engineering, Inc.  
GEC McMichael Ltd.  
The Gerstenschlager Co.  
HM Electronics, Inc.  
HN Engineering Inc.  
International Microwave Corp.  
LPB Inc.  
Ledex Inc.  
M/A-Com Microwave Power Devices  
Marconi Communication Systems Ltd.  
Marconi Electronics Inc. Broadcast & Communication Div.  
**Marti Electronics** .....20  
Microwave Assoc. Communications

# The brightness you need to show it big

## General Electric Professional Large Screen Video Projection

With General Electric's exclusive sealed light valve and sealed Xenon lamp system, in both color and monochrome General Electric Professional Large Screen Video Projectors, you can depend on sharp pictures from 2 to 25 feet wide. New high brightness models allow the room lighting viewers need to take notes and refer to written material.

The color projectors reproduce every color accurately, with the convenience of inherent color registration. General Electric's exclusive single gun, single optical path light valve system eliminates the need for manual color convergence.

Portable and flexible, the projectors are being used for a wide variety of applications, including front and rear projection. Our applications experts will tell you whether yours can be added to the growing list, which includes:

**Education:** Medical, dental, engineering, computer science instruction.

**Business:** Sales meetings, industrial training, product presentations, real-time display of computer-generated data, teleconferences.

**Aerospace and Defense:** Situation displays, simulator training.

**Entertainment:** Theatre television, closed-circuit TV events, overflow crowds, special effects.

**Television Production:** Backgrounds for news programs, special effects, data display, program previewing.

Call or write: General Electric Company, Projection Display Products Operation, Electronics Park 6-206, Syracuse, NY 13221. Phone: (315) 456-2152. TWX 710-541-0498.



NEWS BACKGROUND at KBTW-TV, Denver, is displayed by General Electric PJ5055 Talaria projector.



SELL-OUT CROWDS at Fiske Planetarium, Boulder, watched live NASA transmission presented by General Electric projector.

## GE Professional Large Screen Television Projector Specifications

### COLOR PROJECTORS

Model	Light Output in Lumens			Resolution* in TV Lines per Picture Height		Input Power Req.		Scan Standards***	Video Input**
	Open Gate Min.	Modulated TV, Min.	Modulated TV, Typ.	Min. Horiz.	Min. Vert.	Max. Watts	Max. Volt-Amps		
PJ 5000	500	250	325	750	300	900	1350	525 li./60 fps; 625 li./50 fps	(1)
PJ 5050	1000	500	650	750	300	1100	1550	525 li./60 fps; 625 li./50 fps	(1)
PJ 5055Δ	2000	1000	1300	750	300	1750	2600	525 li./60 fps; 625 li./50 fps	(1)
PJ 5800	500	250	300	750	600	900	1350	875 lines/60 fps	(2)
PJ 5850	1000	500	600	750	600	1100	1550	875 lines/60 fps	(2)
PJ 5855Δ	2000	1000	1200	750	600	1750	2600	875 lines/60 fps	(2)
PJ 5100	500	250	300	750	650	900	1350	1023 lines/60 fps	(2)
PJ 5150	1000	500	600	750	650	1100	1550	1023 lines/60 fps	(2)
PJ 5155Δ	2000	1000	1200	750	650	1750	2600	1023 lines/60 fps	(2)

### MONOCHROME PROJECTORS

PJ 7000	900	600	750	800	400	900	1350	525 li./60 fps; 625 li./50 fps	(3)
PJ 7050	1500	1000	1250	800	400	900	1350	525 li./60 fps; 625 li./50 fps	(3)
PJ 7055	3000	2000	2400	800	475	1100	1550	525 li./60 fps; 625 li./50 fps	(3)
PJ 7800	900	600	750	800	650	900	1350	875 lines, 60 fps	(3)
PJ 7850	1500	1000	1250	800	650	900	1350	875 lines, 60 fps	(3)
PJ 7855	3000	2000	2400	800	650	1100	1550	875 lines, 60 fps	(3)
PJ 7100	900	600	750	800	750	900	1350	1023 lines, 60 fps	(3)
PJ 7150	1500	1000	1250	800	750	900	1350	1023 lines, 60 fps	(3)
PJ 7155	3000	2000	2400	800	750	1100	1550	1023 lines, 60 fps	(3)

\*Resolution measurements made with wide-band monochrome video input. \*\*Video Input Key (1) NTSC or RGB Standard, NTSC/PAL/SECAM Switchable as Option, (2) RGB, (3) Wide-Band monochrome. \*\*\*For use at other scanning rates, contact General Electric Projection Display Equipment Operation for special application/model information. Projector line voltage 105 to 132v or 190 to 260 volts 50/60 Hz except those marked (Δ) above, which are 190 to 260 volts 50/60 Hz only

**GENERAL ELECTRIC**

Circle (121) on Reply Card

See Adv. Page

See Adv. Page

See Adv. Page

See Adv. Page

Motorola Communications and Electronics Inc.  
Multiplier Industries Corp.  
Nady Systems Inc.  
Phelps Dodge Communications Co.  
Solid Electronics Labs  
Sonar Radio Corp.  
Standard Communications Corp.  
Studio Systems Inc.  
Technical Projects Ltd.  
Tele-Measurements Inc.  
Telex Communications, Inc.  
Texscan

### Communication Systems, Microwave

ANT Telecommunications (Formerly AEG-Telefunken)  
Andrew Corp.  
Atlantic Research Corp.  
Avantek Inc.  
Aydin Microwave Div.  
Bayly Engineering Ltd. Member of AEG-Telefunken Group  
Broadcast Microwave Services, Inc.  
Cablewave Systems Inc.  
California Microwave  
Compucon, Inc.  
Comsearch, Inc.  
Datum Inc.  
DYMA Engineering, Inc.  
**EMCEE Broadcast Products** .....218  
ENG Helicopter Satellites, Ltd.  
GEC McMichael Ltd.  
Gabriel Electronics, Inc.  
General TV Network  
HDS Inc.  
HN Engineering Inc.  
Hughes Aircraft Co. Microwave Communications Products  
International Microwave Corp.  
LNR Communications, Inc.  
M/A-Com Microwave Power Devices  
MCL Inc.  
Marconi Communication Systems Ltd.  
**Marti Electronics** .....20  
Microwave Assoc. Communications  
Moseley Associates, Inc.  
Motorola Communications and Electronics Inc.  
NEC America, Inc. Broadcast Equip. Div.  
Nurad, Inc.  
R.F. Technology, Inc.  
RHG Electronics Laboratory, Inc.  
Radio-Research Instrument Co., Inc.  
Rockwell Int'l. Commercial Elec. Operations  
SED Systems Inc.  
Studio Systems Inc.  
TFT Inc.  
Tepco Corp.  
Varian Associates, Inc. Electron Device Group

### Communication Systems, Multiplex

ANT Telecommunications (Formerly AEG-Telefunken)  
American Photonics Inc.  
Artel Communications Corp.  
Atlantic Research Corp.  
Aydin Microwave Div.  
Bayly Engineering Ltd. Member of AEG-Telefunken Group  
Brabury Ltd.  
Broadcast Microwave Services, Inc.  
Coastcom  
Dukane Corp.  
HDS Inc.  
HN Engineering Inc.  
International Microwave Corp.  
Johnson Electronics Inc.  
Kaitronics Corp.  
M/A-Com DCC, Inc.  
Marconi Communication Systems Ltd.  
Marconi Electronics Inc. Broadcast & Communication Div.  
Meret Inc.  
Microwave Assoc. Communications  
Modulation Associates Inc.  
Moseley Associates, Inc.

Motorola Communications and Electronics Inc.  
Rockwell Int'l. Commercial Elec. Operations  
C.N. Rood B.V. Broadcasting Div.  
Television Equipment Associates  
Ward-Beck Systems Ltd.

### Communication Systems, Teleprinter

ANT Telecommunications (Formerly AEG-Telefunken)  
HN Engineering Inc.  
Johnson Electronics Inc.  
Modulation Associates Inc.

### Comparators, Video

Robert Bosch GmbH  
ESE  
Meret Inc.  
Porta-Pattern Inc.  
Television Equipment Associates  
VMI-Visual Methods Inc.  
Wavetek Indiana, Inc.

### Compensators, Dropout

A. F. Associates, Inc.  
Robert Bosch GmbH  
Marconi Electronics Inc. Broadcast & Communication Div.  
Merlin Engineering Works, Inc.  
RCA Broadcast Systems  
Siegel Electronics

### Computer Software

Paul Adams & Associates  
Anacom, Inc. CMS Div.  
**Audio Kinetics, Inc.** .....42  
Audiotechniques Inc.  
CBSI-Custom Business Systems, Inc.  
CMX/Orox Div. of Orox Corp.  
Cetec Broadcast Group  
Cox Data Services  
Data Communications Corp. Broadcast Div.  
**Datatron, Inc.** .....48  
The Fantastic Animation Machine, Inc.  
Gill Management Services  
H.E. Inc.  
**Jensen Transformers Inc.** .....167  
Libra Programming Inc.  
MIS Div. Whitdove Showsystems The Management  
Kenneth R. Meades  
Noumenon Corp.  
Phoenix Systems, A Product of The Briner Chase Group  
**Quanta Corp.** .....40-41  
Roscor Corp.  
Ross-American Logic Systems Inc.  
Howard W. Sams & Co., Inc.  
Soll, Inc.  
H. A. Solutec Ltd.  
Soper Sound Music Library Soper Sound Media Music  
**TFT Inc.** .....104  
Technical Projects Ltd.

### Connector Interface

Audio + Design (Audio & Design Recording, Inc.)

### Connectors, Cable

ADC Magnetic Controls  
AMP Inc.  
Advanced Technology Div. of TriTronics, Inc.  
All Mobile Video  
Alphaton Elektroakustik  
Andrew Corp.  
Audio Service Corp.  
AVA Electronics  
Avtech Electronics Inc. (formerly Team Electronics)  
BIW Cable Systems, Inc.  
Belden Communications, Inc.  
Belden Elec. Wire & Cable Electronics Div.

Cambridge Products  
Comprehensive Video Supply Corp.  
Connectronics Corp.  
Ercona Corp.  
Gabriel Electronics, Inc.  
Javelin Electronics  
Jerrold Div. General Instrument Corp.  
Lemo USA Inc.  
Magnavox CATV Systems, Inc.  
Marshall Electronics  
Meret Inc.  
Micro Communications, Inc.  
Neutrik Products  
Paladin Corp.  
Phelps Dodge Communications Co.  
RMS Electronics, Inc.  
RTI-Research Tech. Int'l.  
Rex Rheostat & Co., Inc.  
Robins-Div. of Benjamin Electroproducts  
Semiconductor Supermarket  
Siecor Corp.  
Sono-Mag Corp.  
Switchcraft Inc.  
Trompeter Electronics, Inc.  
Union Connector Co., Inc.  
Vector Electronic Co., Inc.

### Consoles, Audio Portable

ANT Telecommunications (Formerly AEG-Telefunken)  
ATI-Audio Technologies Inc.  
Acoustilog Inc.  
Alice (Stancoil Ltd.)  
Altec Lansing Int'l.  
Amco Engineering Co.  
**Amek Consoles Inc.** .....260  
Amek Systems & Controls Ltd.  
Arrakis Systems Inc.  
Audio Developments  
Audio Metrics By Radio Systems  
Audio-Technica U.S., Inc.  
Audioarts Engineering Div. of Wheatstone Corp.  
Audiocom Electronics Inc.  
Audiotechniques Inc.  
Audisar  
**Auditronics, Inc.** .....68  
**BSM Systems** .....187  
Broadcast Audio Corp.  
Broadcast Electronics, Inc.  
Broadcast Technology, Inc.  
Bud Industries, Inc.  
Calzone Case Co.  
Central Dynamics Corp. See also American Data  
Century 21 Programming Inc.  
Cetec Broadcast Group  
Coherent Communications  
Comrex Corp.  
Datatronix, Inc.  
**Digital Entertainment Corp.** .....17  
DYMA Engineering, Inc.  
EMT-FRANZ GMBH  
EELA Audio, c/o Audio + Design Recording, Inc.  
Electro-Voice Inc.  
Elektroimpex  
Enertec/Schlumberger Dept. Audio Professionnel  
Farrtronics Ltd.  
Finntek Ltd.  
Fostex Corp. of America  
Furman Sound, Inc.  
Hallikainen & Friends, Inc.  
Harris Corp. Broadcast Group  
Harrison Systems, Inc.  
Hoppmann Corp.  
**Howe Audio Productions, Inc.** .....135  
Industrial Research Products  
Integrated Sound Systems Inc.  
Interface Electronics  
J.C. Audio Distributors  
**LPB Inc.** .....230  
LTM Corp. of America  
Lang Video Systems Corp.  
Listec TV Equipment Corp.  
**Logitek Electronic Systems, Inc.** .....222  
MBI Broadcast Systems  
MCI, Div. of Sony Corp. of America  
**McCurdy Radio Ind. Inc.** .....IBC  
McMartin Industries, Inc.  
Micro-Trak Corp.

Midas Audio Systems Ltd.  
**Modular Audio Products Unit of Modular Devices, Inc.** .....219  
**Rupert Neve Inc.** .....11  
Opamp Labs, Inc.  
Panasonic Industrial Co. Audio Video Systems Div.  
Panasonic Industrial Co. A-V Sys. Div., Pro Audio Sys.  
**Quad-Eight Electronics** .....107  
**Quantum Audio Labs, Inc.** .....240  
RCI (Recording Consultants Inc.)  
RTS Systems, Inc.  
Raindirk Ltd.  
Ramko Research Inc.  
Richmond Sound Design, Ltd.  
Roscor Corp.  
**Russco Electronics Mfg. Inc.** .....264  
SATT Electronics AB Communications Div.  
Shure Brothers Inc.  
Solid State Logic  
Sonosax  
Sony Professional Audio  
Sound Workshop Pro. Audio Products  
**Soundcraft Inc.** .....233  
Spectra Sonics  
Studer Revox America  
Studiomaster Inc.  
**TEAC Corp. of America** .....27  
Telfax Communications  
Transist-O-Sound Inc.  
Trident (USA) Inc.  
Tweed Audio USA Inc.  
UMC Electronics Co. Broadcast Products Div.  
Ultra Audio Pixtec  
**UREI Inc.** .....123  
**Ward-Beck Systems Ltd.** .....BC  
**Winsted Corp.** .....244  
**Yamaha International Corp. Combo Div.** .....113, 114

### Consoles, Audio Studio

**ADM Technology, Inc.** .....IFC  
ANT Telecommunications (Formerly AEG-Telefunken)  
ATI-Audio Technologies Inc.  
Acoustilog Inc.  
Alice (Stancoil Ltd.)  
Altec Lansing Int'l.  
Amco Engineering Co.  
**Amek Consoles Inc.** .....260  
Amek Systems & Controls Ltd.  
Ampro/Scully Div. Ram Mfg. Inc.  
Arrakis Systems Inc.  
Atlantic Research Corp.  
Audio Developments  
Audio Kinetics, Inc.  
Audioarts Engineering Div. of Wheatstone Corp.  
Audiotechniques Inc.  
**Auditronics, Inc.** .....68  
Autogram Corp.  
AVAB America Inc.  
Broadcast Audio Corp.  
Broadcast Electronics, Inc.  
Bud Industries, Inc.  
Calzone Case Co.  
Century 21 Programming Inc.  
Cetec Broadcast Group  
Coherent Communications  
Michael Cox Electronics Ltd.  
Datatronix, Inc.  
**Digital Entertainment Corp.** .....17  
DYMA Engineering, Inc.  
EMT-FRANZ GMBH  
EELA Audio, c/o Audio + Design Recording, Inc.  
Electro-Voice Inc.  
Elektroimpex  
Enertec/Schlumberger Dept. Audio Professionnel  
Excalibur Electronics, Inc.  
Farrtronics Ltd.  
Finntek Ltd.  
**Graham-Patten Systems, Inc.** .....110  
Gregg Laboratories  
Hallikainen & Friends, Inc.  
Harris Corp. Broadcast Group  
Harrison Systems, Inc.  
Hoppmann Corp.  
**Howe Audio Productions, Inc.** .....135  
Integrated Sound Systems Inc.



See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Interface Electronics J.C. Audio Distributors Jamieson & Associates, Inc. LPB Inc. .... 230 Logitek Electronic Systems, Inc. .... 222	<b>Controllers, Sequence</b> Century 21 Programming Inc. Cetec Broadcast Group Channelmatic, Inc. Control Video Corp. Convergence Corp. Foundation Elec. Instruments Inc. HEDCO (Hughes Elec. Devices Corp.) KAVCO, Inc. Lindburg Enterprises, Inc. Microprobe Electronics, Inc. H. A. Solutec Ltd.	Phoenix Audio Lab, Inc. Scientific-Atlanta, Inc. Sencore Inc. Technical Projects Ltd. Tektronix Inc. Texscan VIZ Mfg. Co.	B-W Lighting Systems (formerly Panoak Lighting) Walter S. Brewer Co., Inc. CFA-Media Specialties, Inc. Comprehensive Video Supply Corp. Electro Controls Janson Industries Packaged Lighting Systems Rosco Labs Inc. Theatre Service & Supply Corp. Theatrical Services Inc.
MBI Broadcast Systems MCI, Div. of Sony Corp. of America .... 228-229 The Management McCurdy Radio Ind. Inc. .... IBC McMartin Industries, Inc. Micro-Trak Corp. Midas Audio Systems Ltd. Rupert Neve Inc. .... 11 Opamp Labs, Inc. Pacific Recorders & Eng. Corp. .... 111 Panasonic Industrial Co. Audio Video Systems Div. Panasonic Industrial Co. A-V Sys. Div., Pro Audio Sys. Quad-Eight Electronics .... 107 Quantum Audio Labs, Inc. .... 240 RCA Broadcast Systems RCI (Recording Consultants Inc.) Raindirk Ltd. Ramko Research Inc. .... 81 Richmond Sound Design, Ltd. Roscor Corp. Russco Electronics Mfg. Inc. .... 264 Scantex Labs Inc. Solid State Logic Sonosax Sony Professional Audio Sound Workshop Pro. Audio Products Soundcraft Inc. .... 233 Spectra Sonics Studer Revox America Studiomaster Inc. TEAC Corp. of America .... 27 Technical Projects Ltd. Trident (USA) Inc. UMC Electronics Co. Broadcast Products Div. UREI Inc. .... 123 Ward-Beck Systems Ltd. .... BC Westrex Div. Litton Industries Yamaha International Corp. Combo Div. .... 113, 114	<b>Converters, A/D and D/A</b> Apert-Herzog Corp. Datel-Intersil Inc. Johnson Electronics Inc. Leitch Video Ltd. MCI/Quantel Motorola Semiconductor Products Inc. TRW, LSI Products	<b>Couplers, Hybrid</b> Comrex Corp. .... 220 Dielectric Communications A Unit of General Signal Gregg Laboratories Harris Corp. GSSD PRD Instruments Micro Communications, Inc. Monroe Electronics, Inc. The Narda Microwave Corp. North Hills Electronics, Inc. PHELPS Dodge Communications Co. RHG Electronics Laboratory, Inc. Shively Laboratories Div. of Howell Labs, Inc. Townsend Associates, Inc. Varian Associates, Inc. Electron Device Group Wide Band Engineering Co., Inc.	<b>Data Receivers</b> American Photonics Inc. Broadcast Microwave Services, Inc. Catel/Tomco Divs. of United Scientific Corp. Communitronics Ltd. Comtech Data Corp. Datum Inc. Dynamic Technology Ltd. Electrohome Ltd. GFC McMichael Ltd. Johnson Electronics Inc. Lightwave Communications, Inc. A Subs. of Harbor Electronics Meret Inc. Microdyne Corp. Microwave Assoc. Communications Modulation Associates Inc. Modulation Sciences, Inc. TFT Inc. Valtec Subs. of U.S Philips
<b>Contactors, Vacuum</b> ITT Jennings Townsend Associates, Inc. .... 65	<b>Converters, Frequency</b> California Instruments Div. of Amstar Tech. Products Co., Inc. California Microwave Catel/Tomco Divs. of United Scientific Corp. Jerrold Div. General Instrument Corp. LNR Communications, Inc. Magnavox CATV Systems, Inc. Marconi Electronics Inc. Broadcast & Communication Div. Mu-Del Electronics, Inc. Oak Communications Inc. Powermark RHG Electronics Laboratory, Inc. Synchronous Communications, Inc. Telemet Div. A Geotel, Co. Townsend Associates, Inc. Triple Crown Electronics, Inc. Vanner, Inc. Varian Associates, Inc. Electron Device Group	<b>Crystals, Quartz</b> Eidson Electronic Co. Marconi Communication Systems Ltd. Motorola Communications and Electronics Inc. Rohde & Schwarz Sales Co.	<b>Data Transmitters</b> American Photonics Inc. Artel Communications Corp. Broadcast Microwave Services, Inc. Catel/Tomco Divs. of United Scientific Corp. Communitronics Ltd. Datum Inc. Dynamic Technology Ltd. GEC McMichael Ltd. Jerrold Div. General Instrument Corp. Lightwave Communications, Inc. A Subs. of Harbor Electronics Meret Inc. Microdyne Corp. Modulation Associates Inc. Modulation Sciences, Inc. Nautel Maine, Inc. Rockwell Int'l. Commercial Elec. Operations TFT Inc. Telectro Systems Corp. Valtec Subs. of U.S Philips Varian Associates, Inc. Electron Device Group
<b>Control Panels</b> Acoustilog Inc. Auburn Instruments B-W Lighting Systems (formerly Panoak Lighting) CSP Inc. Centro Corp. Convergence Corp. Datatek Corp. .... 217 DYMA Engineering, Inc. Fernseh Inc. Ghielmetti Inc. Switches & Data Devices Grass Valley Group, Inc. Harrison Systems Ltd. Hoppmann Corp. Image Video Ltd. .... 121 Jamieson & Associates, Inc. Jenel Consultants Corp. Microtime, Inc. .... 223 Moseley Associates, Inc. .... 226 ProTech Audio Corp. Skirpan Lighting Systems, Inc. Soll, Inc.	<b>Converters, Phase --See Phase Converters</b>	<b>Custom Control Systems</b> American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp. Audio Kinetics, Inc. .... 42 B-W Lighting Systems (formerly Panoak Lighting) CAE Inc. CSP Inc. Central Dynamics Corp. See also American Data .... 59 Central Dynamics Ltd. Centro Corp. Channelmatic, Inc. Delta Electronics Inc. (VA) Dubner Computer Systems, Inc. DYMA Engineering, Inc. Dynamic Technology Ltd. The Engineering Lab, Inc. Glentronix (1977) Ltd. Grass Valley Group, Inc. HN Engineering Inc. Harrison Systems Ltd. HEDCO (Hughes Elec. Devices Corp.) High Country Engineering Image Video Ltd. .... 121 Industrial Sciences, Inc. (ISI) Interactive Systems Co. .... 220 Jenel Consultants Corp. KAVCO, Inc. Lake Systems Corp. .... 122 Lakeside Associates Inc. Lang Video Systems Corp. MRI Systems Ltd. MATCO-Mfg. & Test Co., Inc. McCurdy Radio Ind. Inc. Modulation Associates Inc. Moseley Associates, Inc. .... 226 Rupert Neve Inc. Portech Inc. ProTech Audio Corp. Quad-Eight Electronics Richmond Sound Design, Ltd. Ross-American Logic Systems Inc. Ruslang Corp. Soll, Inc. Studio Systems Inc. Technical Projects Ltd. Telemetrics Inc. Torpey Controls & Eng. Ltd. Tweed Audio USA Inc. Video Masters, Inc.	<b>Decoders, Tone</b> Barco Industries Video & Communications N.V. Bayly Engineering Ltd. Member of AEG-Telefunken Group Broadcast Controls Div. Of Automated Broadcast Controls Catel/Tomco Divs. of United Scientific Corp. Cetec Vega Channelmatic, Inc. Di-Tech Inc. Gorman-Redlich Mfg. Co. Ledex Inc. Modulation Associates Inc. Monroe Electronics, Inc. TFT Inc. Teltone Corp. UMC Electronics Co. Broadcast Products Div.
<b>Controllers, Equipment, Network Tone Activated</b> Andrew Corp. Cetec Broadcast Group Channelmatic, Inc. Control Video Corp. Harris Corp. Broadcast Group Kaitronics Corp. KAVCO, Inc.	<b>Counter-Timers</b> Audico, Inc. Broadcast Aids, Inc. Cosmin Electronics D'San Corp. ESE .... 12-13 John Fluke Mfg. Co., Inc. For-A Corp. of America Glentronix (1977) Ltd. Global Specialties Corp. Gotham Audio Corp. Gregg Laboratories H.E. Inc. High Country Engineering Kaitronics Corp. Leader Instruments Corp. Lectrotech Inc. Logitek Electronic Systems, Inc. .... 222 Motorola Semiconductor Products Inc. Pacific Recorders & Eng. Corp. Philips Test & Measuring Instruments, Inc. QSI Systems Inc. Recortec, Inc. Tektronix Inc. Torpey Controls & Eng. Ltd. Video Masters, Inc.	<b>Cyclorama, Studio Drapery</b> Arben Design Automatic Devices Co.	<b>Deflection Coils</b> Amperex Electronic Corp.
	<b>Counters, Frequency</b> B & K Precision Dynascan Corp. EIP Microwave, Inc. .... 206 John Fluke Mfg. Co., Inc. Global Specialties Corp. Leader Instruments Corp. Leasametric, Inc. Motorola Communications and Electronics Inc. North American Soar Corp. Philips Test & Measuring Instruments, Inc.		<b>Delay Cartridges, Audio</b> Comex Systems Fidelipac Corp. International Tapetronics Corp./3M .... 100-101

- See Adv. Page**
- Marathon Products Corp.
- Delay Lines, Audio, Digital**
- AKG Acoustics, Inc.  
Advanced Music Systems  
Allen Avionics, Inc. .... 34  
Altec Lansing Int'l.  
Andersen Labs, Inc.  
Calzone Case Co.  
Central Dynamics Corp. See also  
American Data  
Comex Systems ..... 250  
EMT-FRANZ GMBH  
ESC Electronics Corp.  
Eventide Clockworks, Inc. .... 61  
Fostex Corp. of America  
Gotham Audio Corp.  
Industrial Research Products  
Ivie Electronics, Inc.  
Klark-Teknik Electronics  
Lexicon Inc.  
MCI/Quantel  
Phoenix Audio Lab, Inc.  
Quad-Eight Electronics  
The Ken Schaffer Group, Inc.  
Spectra Sonics  
Trident (USA) Inc.  
Unicord  
URSA MAJOR, Inc.  
Yamaha International Corp. Combo  
Div.
- Delay Measuring Sets, Envelope**
- Asaca/Shibasoku Corp.  
Datatek Corp.  
Rohde & Schwarz Sales Co.  
Telemet Div. A Geotel, Co.  
Wavetek Indiana, Inc.
- Delay Units, Video**
- Allen Avionics, Inc. .... 34  
American Data, A Div. of Central  
Dynamics Corp. See also Central  
Dynamics Corp.  
Anders Inc.  
Andersen Labs, Inc.  
Avitel Electronics Ltd.  
Robert Bosch GmbH  
Broadcast Video Systems, Ltd.  
Central Dynamics Corp. See also  
American Data  
Central Dynamics Ltd.  
Michael Cox Electronics Ltd.  
ESC Electronics Corp.  
Fairchild Camera & Instrument Corp.  
CCD Imaging Div.  
Fernseh Inc.  
Grass Valley Group, Inc.  
HEDCO (Hughes Elec. Devices Corp.)  
Leitch Video Ltd.  
Lenco Inc. Electronics Div.  
Piher Electronica S. A.  
Television Equipment Associates
- Demagnetizers, Bulk Tape**
- R. B. Annis, Co.  
Audiolab Electronics, Inc.  
CMC Technology Corp.  
Christie Electric Corp. .... 246  
Comprehensive Video Supply Corp.  
Fidelipac Corp.  
Garner Industries ..... 84  
Glentronix (1977) Ltd.  
International Tapetronics Corp./3M  
Magnasync/Moviola Corp.  
Magnetfax Int'l., Inc.  
Nortronics Co., Inc. Recorder Care Div.  
RTI-Research Tech. Int'l.  
Robins-Div. of Benjamin  
Electroproducts  
See Hear Industries Div. of RJA Inc.  
Sonar Radio Corp.  
SoundScriber Magnetic Recording Co.,  
Inc.  
Taber Mfg. & Eng. Co.  
TEAC Corp. of America  
UMC Electronics Co. Broadcast  
Products Div.  
Wide Range Electronics
- See Adv. Page**
- Demagnetizers, Head, Audio/Video**
- R. B. Annis, Co.  
Discwasher  
Marathon Products Corp.  
RTI-Research Tech. Int'l.  
Robins-Div. of Benjamin  
Electroproducts  
Tandberg of America, Inc.  
Wide Range Electronics
- Demodulators, Optical**
- American Photonics Inc.  
Artel Communications Corp.  
Catal/Tomco Divs. of United Scientific  
Corp.  
Telemet Div. A Geotel, Co. .... 258
- Demodulators, Video**
- Artel Communications Corp.  
Barco Industries Video &  
Communications N.V.  
Blonder-Tongue Lab., Inc.  
Broadcast Microwave Services, Inc.  
Catal/Tomco Divs. of United Scientific  
Corp.  
Comark Communications, Inc.  
Crow of Reading Ltd.  
EEG Enterprises, Inc.  
Elector USA, Inc.  
GEC McMichael Ltd.  
HDS Inc.  
Harris Corp. Satellite Communications  
Div.  
Javelin Electronics  
LNR Communications, Inc.  
Lang Video Systems Corp.  
Lenco Inc. Electronics Div.  
Nurad, Inc.  
Phasecom Corp.  
Philips Test & Measuring Instruments,  
Inc.  
QSI Systems Inc.  
RCA Cablevision Systems  
Rohde & Schwarz Sales Co.  
Scientific-Atlanta, Inc.  
Telemet Div. A Geotel, Co. .... 258  
Townsend Associates, Inc.  
Triple Crown Electronics, Inc.  
VIA Video, Inc.  
Videotek, Inc.
- Detectors, Microwave**
- Alford Mfg. Co.  
Avantek Inc.  
General Microwave Corp.  
HDS Inc.  
Harris Corp. GSSD PRD Instruments  
Leasametric, Inc.  
The Narda Microwave Corp.  
Radio-Research Instrument Co., Inc.  
Wavetek Indiana, Inc.
- Detectors, RF**
- Alford Mfg. Co.  
Avantek Inc.  
Bird Electronic Corp.  
Comark Communications, Inc.  
ComSonics, Inc.  
Delta Electronics Inc. (VA)  
Harris Corp. GSSD PRD Instruments  
Leasametric, Inc.  
Micro Communications, Inc.  
The Narda Microwave Corp.  
Potomac Instruments, Inc.  
Radio-Research Instrument Co., Inc.  
Shively Laboratories Div. of Howell  
Labs, Inc.  
TTC-Television Tech. Div.  
Telemet Div. A Geotel, Co.  
Texscan  
Texscan Corp.  
Townsend Associates, Inc.  
Wavetek Indiana, Inc.  
Wide Band Engineering Co., Inc.
- Detectors, Standing Wave**
- Bird Electronic Corp.
- See Adv. Page**
- Delta Electronics Inc. (VA)  
Harris Corp. GSSD PRD Instruments  
Micro Communications, Inc.
- Detectors, Video Presence**
- Channelmatic, Inc.  
Colorado Video Inc.  
Di-Tech Inc.  
HEDCO (Hughes Elec. Devices Corp.)  
Javelin Electronics  
Portac Inc.  
Telemet Div. A Geotel, Co.
- Diagnostic Systems, Digital Logic**
- Apert-Herzog Corp.  
Global Specialties Corp.  
Microwave Assoc. Communications  
Pinzone Communications Products Inc.  
Rohde & Schwarz Sales Co.
- Differential Phase/Gain Measuring Sets**
- Asaca/Shibasoku Corp.  
Leader Instruments Corp.  
Leasametric, Inc.  
Link Electronics Ltd.  
Marconi Instruments Div. of Marconi  
Electronics Inc.  
Polarad Electronics, Inc.  
Potomac Instruments, Inc. .... 246  
Rohde & Schwarz Sales Co.  
Telemet Div. A Geotel, Co.
- Digital Audio Disc Players**
- Sharp Electronics Corp. Professional  
Products Div.  
Sony Professional Audio
- Digitizers, Color Video**
- Aurora Systems  
Aydin Controls  
Central Dynamics Corp. See also  
American Data  
Colorgraphics Systems, Inc.  
Florida Computer Graphics  
H.E. Inc.  
Leitch Video Ltd.  
M/A-Com DCC, Inc.  
MPB Technologies Inc.  
TRW, LSI Products  
Terminal Display Systems Ltd.
- Diplexers**
- Alford Mfg. Co.  
Avantek Inc.  
CSP Inc.  
Cetec Antennas  
Coastcom  
Comark Communications, Inc.  
Continental Electronics Mfg. Co.  
Dielectric Communications A Unit of  
General Signal  
Harris Corp. Broadcast Group  
Laird Telemedia Inc.  
Micro Communications, Inc.  
Microwave Filter Co., Inc. .... 258  
Modulation Associates Inc.  
Mu-Del Electronics, Inc.  
North Hills Electronics, Inc.  
Nurad, Inc.  
Phelps Dodge Communications Co.  
Piher Electronica S. A.  
RCA Cablevision Systems  
Shively Laboratories Div. of  
Howell Labs, Inc. .... 118  
TTC-Wilkinson Radio Div.  
Townsend Associates, Inc.  
UTE Microwave, Inc.  
Varian Associates, Inc. Electron Device  
Group  
Wide Band Engineering Co., Inc.  
The Zei-Mark Corp.
- Display Equipment, Titling**
- Apis Corp.  
Chyron Corp. Telesystems
- See Adv. Page**
- Comprehensive Video Supply Corp.  
Fernseh Inc.  
For-A Corp. of America  
Interand Corp. Telestrator Div.  
MPB Technologies Inc.  
McInnis, Skinner & Associates  
Portac Inc.  
Reynolds/Leteron Co.  
Television Equipment Associates  
Thomson-CSF Broadcast, Inc.  
Unitel  
Video Data Systems  
Wilk Power & Video Inc.
- Display Units, Digital**
- The BTX Corp.  
Delta Electronics Inc. (VA)  
D'San Corp.  
EEV, Inc.  
ESE  
Electrohome Ltd.  
For-A Corp. of America  
Kaitronics Corp.  
Leitch Video Ltd.  
Logitek Electronic Systems,  
Inc. .... 222  
MPB Technologies Inc.  
QSI Systems Inc.  
Ross-American Logic Systems Inc.  
Scientific-Atlanta, Inc.  
Video Data Systems  
Wavetek Indiana, Inc.  
Wilk Power & Video Inc.
- Display Units, Time-Temperature-ID**
- Apis Corp.  
Datum Inc.  
EEV, Inc.  
Evertz Microsystems Div. of  
Dynaquip Ltd. .... 108  
For-A Corp. of America  
Glentronix (1977) Ltd.  
Javelin Electronics  
Laird Telemedia Inc.  
Portac Inc.  
QSI Systems Inc.  
Torpey Controls & Eng. Ltd.  
Video Data Systems  
Wilk Power & Video Inc.
- Dividers, Frequency**
- AB Systems Design Inc.  
Motorola Semiconductor Products Inc.  
RHG Electronics Laboratory, Inc.
- Dividers, Power**
- Alford Mfg. Co.  
Antenna Development & Mfg., Inc.  
Avantek Inc.  
Bird Electronic Corp.  
Cetec Antennas  
Comark Communications, Inc.  
Dielectric Communications A Unit of  
General Signal  
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Harris Corp. Satellite Communications  
Div.  
McCullough Satellite Equip., Inc.  
Micro Communications, Inc.  
Mu-Del Electronics, Inc.  
The Narda Microwave Corp.  
North Hills Electronics, Inc.  
Phelps Dodge Communications Co.  
RHG Electronics Laboratory, Inc.  
Scala Electronic Corp.  
Shively Laboratories Div. of Howell  
Labs, Inc.  
Trompeter Electronics, Inc.  
Wide Band Engineering Co., Inc.
- Dividers, Voltage**
- Antenna Development & Mfg., Inc.  
Broadcast Microwave Services, Inc.  
Electroline TV Equipment Inc.  
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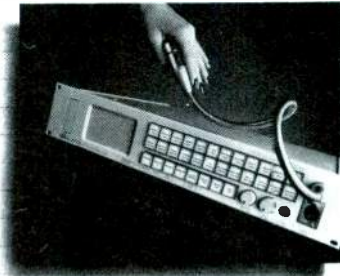
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**TW INTERCOM SYSTEM**

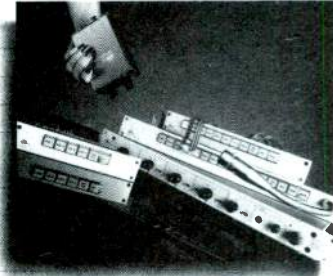
**A** high performance conference-line communications system featuring over 25 different components and accessories that allow an almost infinite variety of system configurations. It's universally designed for demanding applications in teleproduction and broadcast as well as industrial and commercial installations.

Standard TW features include: up to 75 user stations on line with minimum loading, powerful headphone amplification, carbon/dynamic headset capability, mic-level limiting, and two-channel operation on standard microphone cable. Sophisticated circuitry permits 12-volt power operation, two-, three-, and four-wire line operation. A series of versatile options are also available to meet virtually all special requirements.



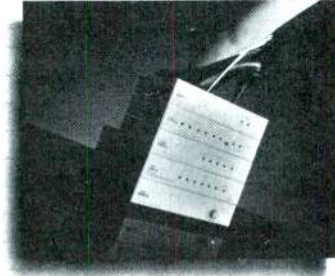
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**T**he 802 Master Station is a unique micro-processor-assisted communications network providing 22 independent signal paths operating in up to six modes. It offers an impressive array of features including intercom, squawk, IFB/SA, station iso, and signalling. An intelligent combination of hardware and software programmability allows the user to conveniently structure an individualized operating format. Since the 802 is completely self-contained, it does not require space-consuming central electronics. Currently used in teleproduction, broadcast, theatre, security, aerospace and other industries, the 802 is both powerful and versatile enough to meet almost every communications requirement.



**SERIES 4000 IFB SYSTEM**

**A** one-way communications system created especially to meet the critical requirements of the television broadcast industry. This "program interrupt" system is used primarily to cue on-air talent. It provides program source material to the person on camera that can be interrupted with messages from the producer or director. Its modular building-block design allows the user to configure a system to meet specific requirements. A typical system combines User Stations, Central Electronics, and Control Stations. An essential broadcast tool.



**SERIES 400 AMPLIFIERS**

**A**pplication, performance, and reliability have all been carefully designed into the Series 400. The results: outstanding sound and unique versatility.

**MODEL 405 PROFESSIONAL PHONO PREAMPLIFIER:** High performance for broadcast stations and high-quality commercial installations.

**MODEL 410 10-WATT MONITOR AMPLIFIER:** A compact unit designed to power loudspeakers and headphones.

**MODEL 424 DISTRIBUTION AMPLIFIER:** High performance 1x4 audio D.A. with balanced input and four individually amplified transformer balanced outputs.

**MODEL 416 DISTRIBUTION AMPLIFIER:** Expanded version of the 424 with six outputs.

**MODEL 444 DUAL TWO-CHANNEL BUFFER AMPLIFIER:** Provides the necessary electronic interface between +8dBm balanced and -10dBv unbalanced circuits.

**MODEL 465 MICROPHONE PREAMPLIFIER:** A single-channel wideband preamp with transformer-balanced input and output.

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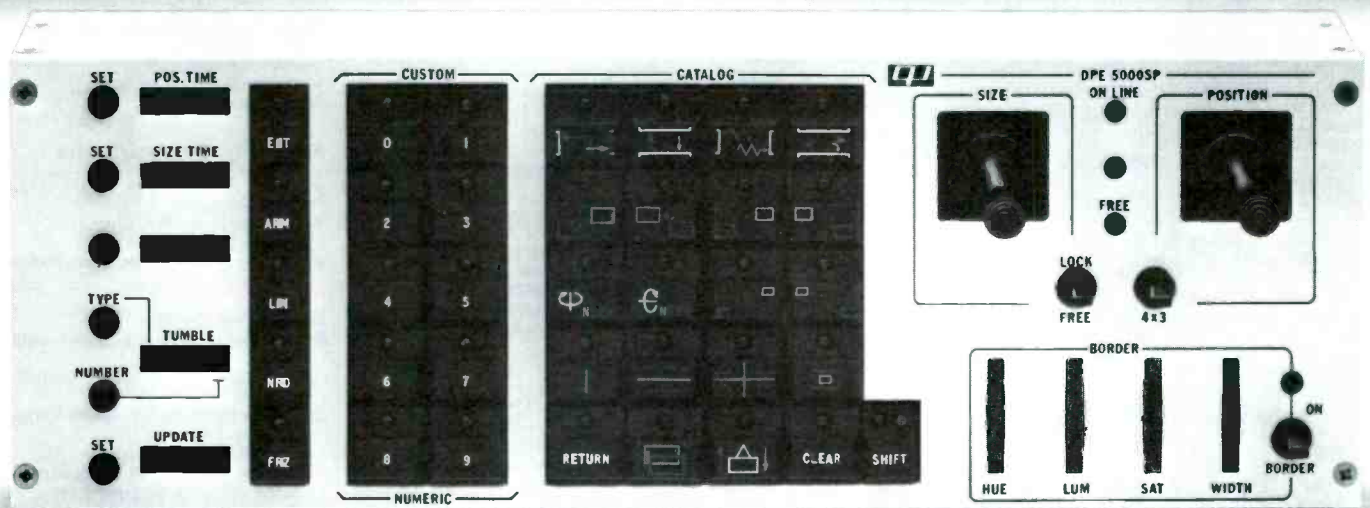
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Circle (122) on Reply Card

- See Adv. Page**
- Earth Station Antennas --See Antennas, Earth Station**
- Earth Stations, Down Terminal**
- Alpha Video & Electronics Co.  
Andrew Corp.  
Anixter Communications Mark Antenna Div.  
Antenna Development & Mfg., Inc.  
**Antenna Technology Corp.** ..... 52  
Automation Techniques, Inc.  
Avantek Inc.  
Aydin Microwave Div.  
Broadcast Microwave Services, Inc.  
California Microwave Coastcom  
Compucon, Inc.  
Comtech Antenna Corp.  
**Comtech Data Corp.** ..... 24  
Dalsat, Inc.  
Discom Satellite Systems, Inc.  
GEC McMichael Ltd.  
Gillaspie & Associates Inc.  
Gould Inc. Dexcel Div.  
HN Engineering Inc.  
H & R Communications  
Harris Corp. Broadcast Group  
Harris Corp. Satellite Communications Div.  
ICM Video  
M/A-Com DCC, Inc.  
Microdyne Corp.  
Microwave Assoc. Communications Modulation Associates Inc.  
NEC America, Inc. Broadcast Equip. Div.  
Pinzone Communications Products Inc.  
Radio-Research Instrument Co., Inc.  
Rockwell Int'l. Commercial Elec. Operations  
SatCom Technologies, Inc. An RSi Co.  
The Ken Schaffer Group, Inc.  
Scientific-Atlanta, Inc.  
SED Systems Inc.  
**Townsend Associates, Inc.** ..... 65  
Varian Associates, Inc. Electron Device Group
- Earth Stations, Up Terminal**
- Alpha Video & Electronics Co.  
Andrew Corp.  
Anixter Communications Mark Antenna Div.  
Aydin Microwave Div.  
California Microwave Coastcom  
Compucon, Inc.  
**Comtech Data Corp.** ..... 24  
Dalsat, Inc.  
GEC McMichael Ltd.  
HN Engineering Inc.  
Harris Corp. Broadcast Group  
Harris Corp. Satellite Communications Div.  
M/A-Com DCC, Inc.  
**MCL Inc.** ..... 232  
Microdyne Corp.  
Microwave Assoc. Communications  
Pinzone Communications Products Inc.  
Rockwell Int'l. Commercial Elec. Operations  
SatCom Technologies, Inc. An RSi Co.  
Satellite Transmission Systems, Inc. A CA Microwave, Inc. Subsidiary  
Scientific-Atlanta, Inc.  
SED Systems Inc.  
Varian Associates, Inc. Electron Device Group
- Edit Code Generators/Receivers**
- Adams-Smith  
**Amtel Systems Inc.** ..... 238  
Apis Corp.  
**Audio Kinetics, Inc.** ..... 42  
Avitel Electronics Ltd.  
The BTX Corp.  
Barco Industries Video & Communications N.V.  
Robert Bosch GmbH  
CMX/Orox Div. of Orox Corp.
- See Adv. Page**
- Central Dynamics Corp. See also American Data  
Cipher Digital  
Control Video Corp.  
Convergence Corp.  
Datatron, Inc.  
EECO Inc.  
**ESE** ..... 12-13  
**Evertz Microsystems Div. of Dynaquip Ltd.** ..... 108  
For-A Corp. of America  
**Gray Engineering Labs, Inc.** ..... 54  
Grumman Aerospace Corp.  
International Video Corp.  
JATEX, Inc.  
Kaitronics Corp.  
Media Concepts, Inc.  
Multi-Track Magnetics, Inc.  
Shintron Co. Inc.  
Skotel Corp.  
Telcom Research  
United Media, Inc.
- Editing Facilities**
- All Mobile Video  
Alpha Video & Electronics Co.  
Atlantic Satellite Communications, Inc.  
Robert Bosch GmbH  
Center Video Center  
Centro Corp.  
Devlin Productions, Inc.  
DYMA Engineering, Inc.  
General TV Network  
Integrated Technology, Inc. Div. of ColorGraphics Systems  
International Video Corp.  
Jamieson & Associates, Inc.  
Leedal, Inc.  
One Pass Film & Video  
The Real World Tech. Group, Inc.  
Studio Systems Inc.  
Turner Engineering  
Unitel
- Editors, Audiotape**
- Adams-Smith  
American Video Products  
Audio Kinetics, Inc.  
Automated Studio Technologies  
The BTX Corp.  
CMX/Orox Div. of Orox Corp.  
Convergence Corp.  
**Datatron, Inc.** ..... 48  
EECO Inc.  
Interactive Systems Co.  
JATEX, Inc.  
Sony Professional Audio  
**United Media, Inc.** ..... 191
- Editors, Videotape**
- Acquis Ltd.  
All Mobile Video  
American Video Products  
Ampex Corp.  
Automated Studio Technologies  
Robert Bosch GmbH  
CMX/Orox Div. of Orox Corp.  
Central Dynamics Corp. See also American Data  
Control Video Corp.  
Convergence Corp.  
**Datatron, Inc.** ..... 48  
Delcom Corp.  
EECO Inc.  
**Fernseh Inc.** ..... 103  
Glentronix (1977) Ltd.  
Interactive Systems Co.  
International Video Corp.  
JVC Co. of America  
JATEX, Inc.  
Kaitronics Corp.  
KAVCO, Inc.  
MM Editing Systems, Inc.  
J. Osawa & Co., Ltd.  
**Panasonic Industrial Co. Audio Video Systems Div.** ..... 50-51  
RCA Broadcast Systems  
RTI-Research Tech. Int'l.  
Sony Corp. of America  
**United Media, Inc.** ..... 191  
Videomedia, Inc.
- Educational Courses, Broadcasting/Electronics**
- Robert Bosch GmbH  
CMX/Orox Div. of Orox Corp.  
Cleveland Institute of Elec., Inc.  
Convergence Corp.  
Jenel Consultants Corp.  
Pace, Inc.  
Radiotechniques Consulting Engineers  
Schoeps/Posthorn Recordings
- Electronic Graphics Systems**
- All Mobile Video  
Apis Corp.  
Aurora Systems  
Robert Bosch GmbH  
British Videotex & Teletext  
Colorgraphics Systems, Inc.  
Comprehensive Video Supply Corp.  
Computer Graphics Lab, Inc.  
**Dubner Computer Systems, Inc.** ..... 253  
Dunn Instruments, Inc.  
The Fantastic Animation Machine, Inc.  
Florida Computer Graphics  
For-A Corp. of America  
Interand Corp. Telestrator Div.  
Kavouras Inc.  
**MCI/Quantel** ..... 149  
MPB Technologies Inc.  
McInnis, Skinner & Associates  
**Quanta Corp.** ..... 40-41  
Warren R. Smith Co.  
Soll, Inc.  
Symtec Inc.  
Technical Projects Ltd.  
Thomson-CSF Broadcast, Inc.  
Unitel  
Video Associates Labs, Inc.
- Encoders, Color Video**
- Amtron Corp.  
Asaca/Shibasoku Corp.  
Robert Bosch GmbH  
**Broadcast Video Systems, Ltd.** ..... 115  
Chyron Corp. Telesystems  
Michael Cox Electronics Ltd.  
Crow of Reading Ltd.  
Faroudja Labs, Inc.  
Fernseh Inc.  
For-A Corp. of America  
GEC McMichael Ltd.  
Ikegami Electronics (U.S.A.), Inc.  
Industrial Sciences, Inc. (ISI)  
Lenco Inc. Electronics Div.  
M/A-Com DCC, Inc.  
MPB Technologies Inc.  
Marconi Electronics Inc. Broadcast & Communication Div.  
**J. Osawa & Co., Ltd.** ..... 260  
Panasonic Industrial Co. Audio Video Systems Div.  
Pihler Electronica S. A.  
RCA Cablevision Systems  
RMS Electronics, Inc.  
Sony Corp. of America  
Thomson-CSF Broadcast, Inc.  
VIA Video, Inc.
- Encoders, EBS**
- Gorman-Redlich Mfg. Co.  
Johnson Electronics Inc.  
Steenbeck, Inc.  
TFT Inc.
- Encoders, Tone**
- Bayly Engineering Ltd. Member of AEG-Telefunken Group  
Cetec Vega  
Channelmatic, Inc.  
Comex Systems  
Deltamod Corp.  
Di-Tech Inc.  
Gorman-Redlich Mfg. Co.  
Johnson Electronics Inc.  
Ledex Inc.  
The Management  
Monroe Electronics, Inc.  
Teltone Corp.
- See Adv. Page**
- ENG/EJ Systems**
- A. F. Associates, Inc.** ..... 126  
Robert Bosch GmbH  
Centro Corp.  
Connector Systems Div. of BIW Cable Systems, Inc.  
EELA Audio, c/o Audio + Design Recording, Inc.  
General TV Network  
HDS Inc.  
Microwave Assoc. Communications  
Nurad, Inc.  
Peirce-Phelps Inc. Video Systems Div.  
Roscor Corp.  
Rosner TV Systems, Inc.  
Video Masters, Inc.
- Engineering Consulting, Design Services**
- A. F. Associates, Inc.** ..... 126  
Advanced Designs Corp.  
Alpha Video & Electronics Co.  
Arben Design  
Atlantic Research Corp.  
Audio Kinetics, Inc.  
**Avtec Industries, Inc.** ..... 251  
B-W Lighting Systems (formerly Panoak Lighting)  
Robert Bosch GmbH  
Walter S. Brewer Co., Inc.  
Broadcast Aids, Inc.  
**Broadcast Systems, Inc.** ..... 23  
Candex Pacific, Inc.  
Central Dynamics Corp. See also American Data  
Central Dynamics Ltd.  
Centro Corp.  
Compucon, Inc.  
Comsearch, Inc.  
Cosmin Electronics  
Dalsat, Inc.  
Datatek Corp.  
Dataworld Inc.  
Delcom Corp.  
DYMA Engineering, Inc.  
Dynamic Technology Ltd.  
**EMCEE Broadcast Products** ..... 218  
Elektroimpex  
Foundation Elec. Instruments Inc.  
General TV Network  
Grumman Aerospace Corp.  
HN Engineering Inc.  
High Country Engineering  
Hoppmann Corp.  
**Hughey & Phillips Inc.** ..... 252  
Jamieson & Associates, Inc.  
Jenel Consultants Corp.  
KAVCO, Inc.  
MPB Technologies Inc.  
**Magna-Tech Electronic Co., Inc.** ..... 185  
Kenneth R. Meades  
Micro Communications, Inc.  
Microwave Assoc. Communications  
L. E. Nelson Corp.  
Fred A. Nudd Corp.  
Peirce-Phelps Inc. Video Systems Div.  
Project Packaging Inc. CATV Div.  
QSI Systems Inc.  
Quad-Eight Electronics  
Quick-Set Inc.  
RCA Cablevision Systems  
RCA Solid State Div. Tube Operations  
The Real World Tech. Group, Inc.  
Rees Associates, Inc.  
Rosner TV Systems, Inc.  
Rustlang Corp.  
Scantex Labs Inc.  
Schoeps/Posthorn Recordings  
Shively Laboratories Div. of Howell Labs, Inc.  
Soll, Inc.  
Spectrum Planning Inc.  
**Stainless, Inc.** ..... 242  
Studio Systems Inc.  
**Tennaplex Systems Ltd.** ..... 44  
TEST/Tanner Electronics Systems Technology, Inc.  
**Townsend Associates, Inc.** ..... 65  
Tri-Tronics Prof. Elec., Inc.  
Turner Engineering  
Valley People, Inc.  
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Circle (123) on Reply Card

- Enhancers, Stereo Phase**  
 Acoustilog Inc.  
 Deltamod Corp.  
 EXR Corp.  
 Howe Audio Productions, Inc. .... 135  
 Ramko Research Inc. .... 81  
 URSA MAJOR, Inc.
- Enhancers, TV Image**  
 Asaca/Shibasoku Corp.  
 Faroudja Labs, Inc.  
 For-A Corp. of America  
 Fortel Inc. .... 93  
 Grove Corp. Knox Video Products Div.  
 ICM Video  
 Ikegami Electronics (U.S.A.), Inc.  
 Knox Video Products  
 Lenzar Optics Corp.  
 Microtime, Inc.  
 Panasonic Industrial Co. Audio Video Systems Div.  
 Piclear, Inc.  
 Rank Cintel  
 Rank Precision Industries Inc.  
 Siegel Electronics  
 SIMTEE  
 Telemet Div. A Geotel, Co.  
 Thomson-CSF Broadcast, Inc.
- Equalizers, Audio Emphasis**  
 ADM Technology, Inc.  
 ATI-Audio Technologies Inc.  
 Acoustilog Inc.  
 Advancing Technology Corp.  
 Altec Lansing Int'l.  
 Aphex Systems Ltd.  
 Arrakis Sytems Inc.  
 Ashly Audio  
 Atlantic Research Corp.  
 Audio + Design (Audio & Design Recording, Inc.)  
 Audioarts Engineering Div. of Wheatstone Corp.  
 Audisar  
 Auditronics, Inc. .... 68  
 Bogen Div. Lear Siegler, Inc.  
 Broadcast Technology, Inc.  
 Cetec Broadcast Group  
 Coherent Communications  
 Continental Electronics Mfg. Co.  
 Crown International, Inc.  
 dbx, Inc.  
 Datatronix, Inc.  
 Electro-Voice Inc.  
 Excalibur Electronics, Inc.  
 Fostex Corp. of America  
 Furman Sound, Inc.  
 Gotham Audio Corp.  
 Hammond Industries Inc.  
 Harrison Systems, Inc.  
 Integrated Sound Systems Inc.  
 International Electro-Magnetics  
 Ivie Electronics, Inc.  
 Kahn Communications, Inc.  
 Klark-Teknik Electronics  
 McCurdy Radio Ind. Inc.  
 Micro-Trak Corp.  
 Modular Audio Products Unit of Modular Devices, Inc.  
 Opamp Labs, Inc.  
 Orban Associates Inc.  
 Panasonic Co. Technics  
 Panasonic Industrial Co. Audio Video Systems Div.  
 Phoenix Audio Lab, Inc.  
 Quad-Eight Electronics  
 Raindirk Ltd.  
 Redwood Marketing  
 Richmond Sound Design, Ltd.  
 Russco Electronics Mfg. Inc. .... 264  
 Sescom, Inc.  
 Solid State Logic  
 Sonosax  
 Spectra Sonics  
 Symetrix Inc.  
 Thomson-CSF Broadcast, Inc.  
 Tweed Audio USA Inc.  
 UREI Inc.  
 Valley People, Inc.  
 VIF International  
 Ward-Beck Systems Ltd.
- Equalizers, Vertical Aperture**  
 Robert Bosch GmbH  
 Electrocraft Consultants Ltd.  
 Siegel Electronics  
 Thomson-CSF Broadcast, Inc.
- Equalizers, Video**  
 Allen Avionics, Inc.  
 American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp.  
 Avitel Electronics Ltd.  
 Robert Bosch GmbH  
 CMC Technology Corp.  
 Central Dynamics Corp. See also American Data  
 Central Dynamics Ltd.  
 Cohu, Inc. Electronics Div.  
 Comark Communications, Inc. .... 69  
 Datatek Corp.  
 Di-Tech Inc.  
 Dynair Electronics, Inc.  
 ESC Electronics Corp.  
 Electrocraft Consultants Ltd.  
 Graham-Patten Systems, Inc. .... 110  
 Grass Valley Group, Inc.  
 HEDCO (Hughes Elec. Devices Corp.)  
 Industrial Sciences, Inc. (ISI)  
 International Nuclear Corp.  
 Leitch Video Ltd. .... 243  
 Lenco Inc. Electronics Div.  
 Link Electronics Ltd.  
 MRI Systems Ltd.  
 Marconi Communication Systems Ltd.  
 Marconi Electronics Inc. Broadcast & Communication Div.  
 Piher Electronica S. A.  
 Pro-Bel Ltd.  
 RCA Cablevision Systems  
 Siegel Electronics  
 Sigma Electronics, Inc.  
 Telemet Div. A Geotel, Co.  
 Television Equipment Associates  
 Video Masters, Inc.
- Equipment Reconditioning and Rebuilding**  
 Accurate Sound Corp.  
 Acoustilog Inc.  
 B-W Lighting Systems (formerly Panoak Lighting)  
 Broadcast Int'l. Inc.  
 CSP Inc.  
 Center Video Center  
 Century 21 Programming Inc.  
 ComSonics, Inc.  
 DYMA Engineering, Inc.  
 Alan Gordon Enterprises Inc.  
 Merlin Engineering Works, Inc.  
 Pinzone Communications Products Inc.  
 Turner Engineering  
 Video Masters, Inc.
- Equipment, Used and Reconditioned**  
 Accurate Sound Corp.  
 Acoustilog Inc.  
 Ampex Corp.  
 Broadcast Int'l. Inc.  
 Center Video Center  
 Century 21 Programming Inc.  
 ComSonics, Inc.  
 Alan Gordon Enterprises Inc.  
 Harris Corp. Broadcast Group  
 Leasametric, Inc.  
 Merlin Engineering Works, Inc.  
 Microtime, Inc.  
 Microwave Assoc. Communications  
 Old Dominion Broadcast Eng. Service  
 Plastic Reel Corp. of America  
 Radio-Research Instrument Co., Inc.  
 Rank Cintel  
 Rank Precision Industries Inc.  
 Roscor Corp.  
 Townsend Associates, Inc.
- Exciters, AM**  
 CSI Electronics, Inc.  
 Continental Electronics Mfg. Co.  
 Elcom-Bauer  
 Harris Corp. Broadcast Group  
 Kahn Communications, Inc.  
 LPB Inc.  
 Marconi Communication Systems Ltd.  
 Singer Broadcast Products, Inc.  
 Sintronic Corp.  
 TFT Inc. .... 118  
 TTC-Wilkinson Radio Div.
- Exciters, FM**  
 Bayly Engineering Ltd. Member of AEG-Telefunken Group  
 Broadcast Electronics, Inc.  
 CSI Electronics, Inc.  
 Continental Electronics Mfg. Co. .... 10  
 Elcom-Bauer  
 Harris Corp. Broadcast Group ..... 49  
 LNR Communications, Inc.  
 Marconi Communication Systems Ltd.  
 McMartin Industries, Inc.  
 NEC America, Inc. Broadcast Equip. Div.  
 Power Pak Systems, Inc.  
 QEI Corp. .... 265  
 RCA Broadcast Systems  
 Rohde & Schwarz Sales Co.  
 C.N. Rood B.V. Broadcasting Div.  
 Singer Broadcast Products, Inc.  
 Sintronic Corp.  
 Solid Electronics Labs  
 TFT Inc. .... 118  
 TTC-Wilkinson Radio Div.
- Exciters, SCA**  
 BBL Industries, Inc.  
 CSI Electronics, Inc.  
 Circuit Research Labs, Inc. .... 239  
 Comark Communications, Inc.  
 Elcom-Bauer  
 Harris Corp. Broadcast Group  
 McMartin Industries, Inc.  
 Modulation Sciences, Inc. .... 199  
 Moseley Associates, Inc.  
 QEI Corp.  
 C.N. Rood B.V. Broadcasting Div.  
 Solid Electronics Labs  
 TTC-Wilkinson Radio Div.
- Exciters, TV**  
 Barco Industries Video & Communications N.V.  
 Comark Communications, Inc. .... 69  
 Harris Corp. Broadcast Group  
 Information Transmission Systems, Corp.  
 Pye TVT Ltd. Broadcast Co. of Philips SED Systems Inc.  
 Townsend Associates, Inc. .... 65
- Faders, Audio/Video**  
 Ampro/Scully Div. Ram Mfg. Inc.  
 Audio Kinetics, Inc.  
 Audioarts Engineering Div. of Wheatstone Corp.  
 Auditronics, Inc. .... 68  
 Crosspoint Latch Corp.  
 Duncan Electronics, Inc.  
 EECO Inc.  
 International Video Corp.  
 L. E. Nelson Corp.  
 Penny & Giles ..... 54  
 Sescom, Inc.  
 Shallco, Inc. .... 120  
 UREI Inc. .... 123
- Faders, Studio Lighting Control**  
 B-W Lighting Systems (formerly Panoak Lighting)  
 Colortran, Inc.  
 Datatronix, Inc.  
 Design Line Inc.  
 Duncan Electronics, Inc.  
 Electro Controls  
 Electronics Diversified, Inc.  
 Kliegl Bros. Lighting  
 Lumitrol, Ltd.  
 L. E. Nelson Corp.  
 Packaged Lighting Systems  
 Skirpan Lighting Systems, Inc.  
 Strand Century, Inc.  
 Theatre Techniques Inc.  
 Theatrical Services Inc.  
 Waters Mfg. Inc.
- Fiber Optic Systems/Cables**  
 American Photonics Inc.  
 Andrew Corp.  
 Artel Communications Corp.  
 BIW Cable Systems, Inc.  
 Belden Elec. Wire & Cable Electronics Div.  
 Belden, Fiber Optics ..... 63  
 Robert Bosch GmbH  
 Brand-Rex Co. Elec. & Industrial Cable Div.  
 Catel/Tomco Divs. of United Scientific Corp.  
 Connector Systems Div. of BIW Cable Systems, Inc.  
 Fernseh Inc.  
 Fibervision Div. of Math Associates  
 Foundation Elec. Instruments Inc.  
 GEC McMichael Ltd.  
 Grass Valley Group, Inc.  
 Harris Corp. Broadcast Group  
 Lightwave Communications, Inc. A Subs. of Harbor Electronics  
 M/A-Com DCC, Inc.  
 Meret Inc.  
 Rockwell Int'l. Commercial Elec. Operations  
 Secor Corp.  
 Telemet Div. A Geotel, Co.  
 Times Fiber Communications  
 Valtec Subs. of U.S. Philips
- Film Chain Light Level Controls**  
 Beston Electronics Inc.  
 Laird Telemedia Inc.  
 The Zei-Mark Corp.
- Film Chain Systems**  
 A. F. Associates, Inc. .... 153  
 Advanced Technology Div. Of TriTronics, Inc.  
 Robert Bosch GmbH  
 Fernseh Inc.  
 General TV Network  
 Kalart Victor Corp.  
 L-W International  
 Laird Telemedia Inc.  
 Magnasync/Moviola Corp.  
 Marconi Communication Systems Ltd.  
 Marconi Electronics Inc. Broadcast & Communication Div.  
 Multi-Track Magnetics, Inc.  
 Panasonic Industrial Co. Audio Video Systems Div.  
 RCA Broadcast Systems  
 Radmar, Inc.  
 Rank Cintel  
 Rank Precision Industries Inc.  
 Sony Corp. of America  
 The Zei-Mark Corp.
- Film Inspection and Cleaning Equipment/Services**  
 Cumming Corp.  
 The Durafilm Co.  
 Goldberg Brothers Inc.  
 Alan Gordon Enterprises Inc.  
 Lipsner-Smith Co. Subsidiary of RTI  
 Neumade Industries, Inc.  
 Piclear, Inc.

See Adv. Page

See Adv. Page

See Adv. Page

See Adv. Page

RTI-Research Tech. Int'l.  
Schuessler Case Co., Inc.  
Starex, Inc.

**Film Sound Transfer Equipment**

Audio Kinetics, Inc.  
Audio Service Corp.  
Dolby Laboratories, Inc.  
Alan Gordon Enterprises Inc.  
K B Systems  
**Magna-Tech Electronic Co., Inc.** .....185  
Multi-Track Magnetics, Inc.  
Quad-Eight Electronics  
RCA Broadcast Systems  
Rank Cintel  
Rank Precision Industries Inc.  
Steenbeck, Inc.  
Straight Wire Audio, Inc.  
Westrex Div. Litton Industries  
Wide Range Electronics

**Film-to-Tape Transfer Equipment**

A. F. Associates, Inc.  
Audio Kinetics, Inc.  
Robert Bosch GmbH  
Cinematography Electronics  
Cumming Corp.  
Fernseh Inc.  
Image Transform, Inc.  
JVC Co. of America  
Lipsner-Smith Co. Subsidiary of RTI  
MM Editing Systems, Inc.  
**Magna-Tech Electronic Co., Inc.** .....185  
Magnasync/Moviola Corp.  
Multi-Track Magnetics, Inc.  
One Pass Film & Video  
J. Osawa & Co., Ltd.  
Piclear, Inc.  
Rank Cintel  
Rank Precision Industries Inc.  
Warren R. Smith Co.  
Steenbeck, Inc.  
Westrex Div. Litton Industries  
The Zei-Mark Corp.

**Filters, Antenna**

Allen Avionics, Inc.  
Audiolab Electronics, Inc.  
Bird Electronic Corp.  
Broadcast Microwave Services, Inc.  
Cetec Antennas  
Continental Electronics Mfg. Co.  
Electroline TV Equipment Inc.  
HN Engineering Inc.  
LEA, Inc. A Dynatech Co. (Formerly Lightning Elimination Assoc.)  
Mu-Del Electronics, Inc.  
Nurad, Inc.  
Phelps Dodge Communications Co.  
**Shively Laboratories Div. of Howell Labs, Inc.** .....118  
T T E, Inc.  
Tennaplex Systems Ltd.  
Tepco Corp.  
Wide Band Engineering Co., Inc.

**Filters, Audio**

ADM Technology, Inc.  
Acoustilog Inc.  
Allen Avionics, Inc.  
Alphaton Elektroakustik  
Altec Lansing Int'l.  
Amber Electro Design Inc.  
Amek Consoles Inc.  
Amek Systems & Controls Ltd.  
Aphex Systems Ltd.  
Ashly Audio  
Audico, Inc.  
Audio + Design (Audio & Design Recording, Inc.)  
Audisar  
Bayly Engineering Ltd. Member of AEG-Telefunken Group  
Broadcast Controls Div. Of Automated Broadcast Controls  
Clyde Electronics Ltd.  
Coastcom

Coherent Communications  
Crown International, Inc.  
Datatronix, Inc.  
DYMA Engineering, Inc.  
EMT-FRANZ GMBH  
ESC Electronics Corp.  
Furman Sound, Inc.  
Gotham Audio Corp.  
HDS Inc.  
Inovonics Inc.  
Ivie Electronics, Inc.  
Micro-Trak Corp.  
Modulation Associates Inc.  
Monroe Electronics, Inc.  
Rupert Neve Inc.  
Panasonic Industrial Co. Audio Video Systems Div.  
QEI Corp.  
Quad-Eight Electronics  
Raindirk Ltd.  
Richmond Sound Design, Ltd.  
C.N. Rood B.V. Broadcasting Div.  
Sescom, Inc.  
Shure Brothers Inc.  
Solid State Logic  
Spectra Sonics  
T T E, Inc.  
Technical Projects Ltd.  
UREI Inc.  
Valley People, Inc.  
VIF International  
Ward-Beck Systems Ltd.

**Filters, Microwave**

Antenna Development & Mfg., Inc.  
Arunta Satellite Telecommunications  
Bird Electronic Corp.  
Broadcast Microwave Services, Inc.  
HDS Inc.  
Microdyne Corp.  
Microwave Assoc. Communications  
**Microwave Filter Co., Inc.** .....258  
Mu-Del Electronics, Inc.  
North Hills Electronics, Inc.  
Nurad, Inc.  
Standard Communications Corp.  
Television Equipment Associates  
Tepco Corp.  
Texscan Corp.  
UTE Microwave, Inc.  
Wavetek Indiana, Inc.

**Filters, Noise**

Alphaton Elektroakustik  
Arunta Satellite Telecommunications  
Ashly Audio  
Audio + Design (Audio & Design Recording, Inc.)  
Robert Bosch GmbH  
Broadcast Video Systems, Ltd.  
EMT-FRANZ GMBH  
Enertec/Schlumberger Dept. Audio Professionnel  
Fernseh Inc.  
Gotham Audio Corp.  
HDS Inc.  
HN Engineering Inc.  
Industrial Acoustics  
McCullough Satellite Equip., Inc.  
Panasonic Industrial Co. Audio Video Systems Div.  
H. A. Solutec Ltd.  
Spectra Sonics  
T T E, Inc.  
Technical Projects Ltd.  
Topaz  
UREI Inc.  
Vidaire Electronics Mfg. Corp.

**Filters, Optical**

Bogen Photo Corp.  
Lee Filters Ltd.  
**Tiffen Mfg. Corp.** .....106

**Filters, Passive**

Allen Avionics, Inc.  
Alphaton Elektroakustik  
Andersen Labs, Inc.  
Audisar  
Broadcast Video Systems, Ltd.

Coastcom  
COMPAC  
Datel-Intersil Inc.  
ESC Electronics Corp.  
Electroline TV Equipment Inc.  
Jerrold Div. General Instrument Corp.  
LEA, Inc. A Dynatech Co. (Formerly Lightning Elimination Assoc.)  
**Microwave Filter Co., Inc.** .....258  
Modulation Associates Inc.  
Mu-Del Electronics, Inc.  
North Hills Electronics, Inc.  
Panasonic Industrial Co. Audio Video Systems Div.  
QEI Corp.  
Quad-Eight Electronics  
C.N. Rood B.V. Broadcasting Div.  
T T E, Inc.  
Television Equipment Associates  
Tepco Corp.  
TEST/Tanner Electronics Systems Technology, Inc.  
Varian Associates, Inc. Electron Device Group  
Wavetek Indiana, Inc.  
Wide Band Engineering Co., Inc.

**Filters, Variable and Fixed Tuned**

Alphaton Elektroakustik  
Amber Electro Design Inc.  
Andersen Labs, Inc.  
Aphex Systems Ltd.  
Audio + Design (Audio & Design Recording, Inc.)  
Audisar  
BGW Systems Inc.  
Blonder-Tongue Lab., Inc.  
Datatronix, Inc.  
Furman Sound, Inc.  
Gotham Audio Corp.  
North Hills Electronics, Inc.  
Potomac Instruments, Inc.  
Quad-Eight Electronics  
T T E, Inc.  
Technical Projects Ltd.  
Tepco Corp.  
Texscan  
Texscan Corp.  
UTE Microwave, Inc.  
UREI Inc.  
Valley People, Inc.  
Varian Associates, Inc. Electron Device Group  
Wavetek Indiana, Inc.

**Filters, Video**

Allen Avionics, Inc.  
Andersen Labs, Inc.  
Broadcast Video Systems, Ltd.  
Catel/Tomco Divs. of United Scientific Corp.  
Coastcom  
Datatek Corp.  
ESC Electronics Corp.  
Faroudja Labs, Inc.  
Fernseh Inc.  
Modulation Associates Inc.  
North Hills Electronics, Inc.  
Nurad, Inc.  
Panasonic Industrial Co. Audio Video Systems Div.  
Rosco Labs Inc.  
H. A. Solutec Ltd.  
TRW, LSI Products  
T T E, Inc.  
Television Equipment Associates  
Tiffen Mfg. Corp.

**Frame/Field Storers, Digital**

**Abekas Video Systems, Inc.** .....95  
ADDA Corp.  
Ampex Corp.  
Apert-Herzog Corp.  
Asaca/Shibasoku Corp.  
Aydin Controls  
Robert Bosch GmbH  
Colorado Video Inc.  
Digital Video Systems Corp.  
Eigen Video  
Fernseh Inc.  
For-A Corp. of America  
Fortel Inc.

H.E. Inc.  
Harris Corp. Broadcast Group  
Harris Video Systems  
**MCI/Quantel** .....149  
Marconi Communication Systems Ltd.  
Merlin Engineering Works, Inc.  
Microtime, Inc.  
NTI America, Inc.  
Rank Cintel  
Rank Precision Industries Inc.  
Sony Corp. of America

**Frame/Field Storers, Floppy Disc**

Asaca/Shibasoku Corp.  
Aydin Controls  
Dubner Computer Systems, Inc.  
Eigen Video  
**MCI/Quantel** .....149  
Precision Echo  
Rank Cintel  
Rank Precision Industries Inc.

**Frame Synchronizers**

Apert-Herzog Corp.  
Digital Video Systems Corp.  
Fortel Inc.  
GEC McMichael Ltd.  
Harris Corp. Broadcast Group  
**Harris Video Systems** .....82, 83  
MCI/Quantel  
Merlin Engineering Works, Inc.  
Microtime, Inc.  
NEC America, Inc. Broadcast Equip. Div.  
Shintron Co. Inc.

**Framers, Color**

Central Dynamics Corp. See also American Data  
Rosco Labs Inc.

**Frequency Standards**

John Fluke Mfg. Co., Inc.  
Global Specialties Corp.  
Rohde & Schwarz Sales Co.  
Tracor Inc. Industrial Instruments Div.

**Gauges, Head/Tip Projection**

Tentel

**Generators, Audio Signal**

Amber Electro Design Inc  
Audisar  
Autogram Corp.  
B & K Precision Dynascan Corp.  
Bald Mountain Lab  
Broadcast Electronics, Inc.  
Bruehl & Kjaer Instruments, Inc.  
Comex Systems  
Datatronix, Inc.  
Delta Electronics Inc. (NC)  
DYMA Engineering, Inc.  
Exact Electronics Div. of Dynatech Nevada Inc.  
Global Specialties Corp.  
High Country Engineering  
Ivie Electronics, Inc.  
Leader Instruments Corp.  
Leasametric, Inc.  
Marconi Instruments Div. of Marconi Electronics Inc.  
Modular Audio Products Unit of Modular Devices, Inc.  
Opamp Labs, Inc.  
Polarad Electronics, Inc.  
**Potomac Instruments, Inc.** .....246  
Quad-Eight Electronics  
Raindirk Ltd.  
Rohde & Schwarz Sales Co.  
Sescom, Inc.  
Shure Brothers Inc.  
**Sound Technology** .....129  
Spectra Sonics  
Technical Projects Ltd.  
Tektronix Inc.  
UREI Inc.  
VIZ Mfg. Co.

See Adv. Page

See Adv. Page

See Adv. Page

See Adv. Page

**Generators, Background Color**

American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp.  
 Apis Corp.  
 Automation Techniques, Inc.  
 Beaveronics, Inc.  
 Robert Bosch GmbH  
 Central Dynamics Corp. See also American Data  
 Central Dynamics Ltd.  
 Michael Cox Electronics Ltd.  
 Crosspoint Latch Corp.  
 Dubner Computer Systems, Inc.  
 Fernseh Inc.  
 For-A Corp. of America  
 Grass Valley Group, Inc.  
 Grove Corp. Knox Video Products Div.  
 Industrial Sciences, Inc. (ISI)  
 Lang Video Systems Corp.  
 Leader Instruments Corp.  
 Lenco Inc. Electronics Div.  
 Marconi Electronics Inc. Broadcast & Communication Div.  
 Philips Test & Measuring Instruments, Inc.  
 QSI Systems Inc.  
 Shintron Co. Inc.  
 Unitel  
 Video Data Systems  
 Wilk Power & Video Inc.

**Generators, Burst**

Amber Electro Design Inc.  
 Automation Techniques, Inc.  
 Robert Bosch GmbH  
 Central Dynamics Corp. See also American Data  
 Central Dynamics Ltd.  
 Michael Cox Electronics Ltd.  
 Datatek Corp.  
 Exact Electronics Div. of Dynatech Nevada Inc.  
 Fernseh Inc.  
 For-A Corp. of America  
 Grass Valley Group, Inc.  
 Industrial Sciences, Inc. (ISI)  
 International Nuclear Corp.  
 JATEX, Inc.  
 Lang Video Systems Corp.  
 Leader Instruments Corp.  
 Leitch Video Ltd.  
 Lenco Inc. Electronics Div.  
 Marconi Electronics Inc. Broadcast & Communication Div.  
 Philips Test & Measuring Instruments, Inc.  
 Pihler Electronica S. A.  
 Rohde & Schwarz Sales Co.  
 Sigma Electronics, Inc.  
 Telemet Div. A Geotel, Co.  
 Video Aids of Colorado  
 VIZ Mfg. Co.  
 Wilk Power & Video Inc.

**Generators, Cross Pulse**

Amtron Corp.  
 Asaca/Shibasoku Corp.  
 ECHOlab, Inc.  
 Electrocraft Consultants Ltd.  
 Grass Valley Group, Inc.  
 Rohde & Schwarz Sales Co.  
 Siegel Electronics  
 Telemet Div. A Geotel, Co.  
 3M Co., Broadcast & Related Products Div.  
 Video Aids of Colorado

**Generators, Digital Metronome**

Skotel Corp.  
 UREI Inc.

**Generators, Digital Video Effect**

ADDA Corp.  
 All Mobile Video  
 American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp.  
 Apis Corp.  
 Aydin Controls

Robert Bosch GmbH  
 Central Dynamics Corp. See also American Data ..... 29  
 Colorgraphics Systems, Inc.  
 Dubner Computer Systems, Inc.  
 Fernseh Inc.  
 Grass Valley Group, Inc.  
 Grove Corp. Knox Video Products Div.  
 Harris Video Systems ..... 82, 83  
 Industrial Sciences, Inc. (ISI)  
 Interand Corp. Telestrator Div.  
 Lang Video Systems Corp.  
 MCI/Quantel  
 MPB Technologies Inc.  
 Microtime, Inc. .... 221, 223  
 NEC America, Inc. Broadcast Equip. Div. .... 36  
 NTI America, Inc.  
 Vital Industries Inc.

**Generators, FM/SCA**

BBL Industries, Inc.  
 Broadcast Electronics, Inc.  
 CCA Electronics Corp.  
 CSI Electronics, Inc.  
 Circuit Research Labs, Inc. .... 239  
 Harris Corp. Broadcast Group  
 Leader Instruments Corp.  
 Marti Electronics  
 McMartin Industries, Inc.  
 Modulation Associates Inc.  
 Modulation Sciences, Inc. .... 199  
 Moseley Associates, Inc.  
 Orban Associates Inc. .... 87  
 Power Pak Systems, Inc.  
 QEI Corp.  
 Rohde & Schwarz Sales Co.  
 C.N. Rood B.V. Broadcasting Div.  
 Singer Broadcast Products, Inc.  
 Sintronic Corp.  
 Solid Electronics Labs  
 TFT Inc.  
 TTC-Wilkinson Radio Div.

**Generators, Power, Converters/Inverters**

E-N-G Corp. Electronic News Group  
 Vanner, Inc.

**Generators, Power (Engine)**

Belden Communications, Inc.  
 Centro Corp.  
 E-N-G Corp. Electronic News Group

**Generators, Power (Motor)**

North Wind Power Co., Inc.

**Generators, Power (Solar)**

North Wind Power Co., Inc.  
 Teledyne Energy Systems

**Generators, Power (Wind)**

North Wind Power Co., Inc.

**Generators, Safe Area**

Amtel Systems Inc.  
 Amtron Corp.  
 Apis Corp.  
 Asaca/Shibasoku Corp.  
 Barco Industries Video & Communications N.V.  
 Broadcast Video Systems, Ltd.  
 CMC Technology Corp.  
 Gray Engineering Labs, Inc. .... 54  
 Leitch Video Ltd.  
 Maric Industries Ltd.  
 Teledyne Energy Systems  
 Vica Associates

**Generators, Signal Marker**

Asaca/Shibasoku Corp. .... 266  
 Audio Service Corp.  
 Lectrotech Inc.  
 Polarad Electronics, Inc.  
 VIZ Mfg. Co.

Wavetek Indiana, Inc.

**Generators, Signal Pulse**

B & K Precision Dynascan Corp.  
 Robert Bosch GmbH  
 Exact Electronics Div. of Dynatech Nevada Inc.  
 Kay Elemetrics Corp.  
 Leitch Video Ltd.  
 Lenco Inc. Electronics Div.  
 MCL Inc.  
 Marconi Electronics Inc. Broadcast & Communication Div.  
 North American Soar Corp.  
 Philips Test & Measuring Instruments, Inc.  
 TM Systems, Inc.

**Generators, Signal RF**

B & K Precision Dynascan Corp.  
 Boonton Electronics Corp.  
 Delta Electronics Inc. (VA)  
 John Fluke Mfg. Co., Inc.  
 Global Specialties Corp.  
 Harris Corp. GSSD PRD Instruments  
 Jerrold Div. General Instrument Corp.  
 Lang Video Systems Corp.  
 Leader Instruments Corp.  
 Leasametric, Inc.  
 MCL Inc.  
 Marconi Instruments Div. of Marconi Electronics Inc.  
 Microdyne Corp.  
 Motorola Communications and Electronics Inc.  
 Philips Test & Measuring Instruments, Inc.  
 Polarad Electronics, Inc.  
 Potomac Instruments, Inc. .... 246  
 Radio-Research Instrument Co., Inc.  
 Rohde & Schwarz Sales Co.  
 Scientific-Atlanta, Inc.  
 Sound Technology  
 Texscan  
 Texscan Corp.  
 VIZ Mfg. Co.  
 Wavetek Indiana, Inc.

**Generators, Special Effect**

All Mobile Video  
 American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp.  
 Apis Corp.  
 Beaveronics, Inc.  
 Robert Bosch GmbH  
 Broadcast Video Systems, Ltd.  
 Central Dynamics Corp. See also American Data ..... 29  
 Central Dynamics Ltd.  
 Colorado Video Inc.  
 Convergence Corp.  
 Michael Cox Electronics Ltd.  
 Crosspoint Latch Corp. .... 272  
 Dubner Computer Systems, Inc.  
 Electrocraft Consultants Ltd.  
 Grass Valley Group, Inc.  
 Hammond Industries Inc.  
 Harris Video Systems ..... 82, 83  
 Image Video Ltd. .... 121  
 Industrial Sciences, Inc. (ISI)  
 Interand Corp. Telestrator Div.  
 International Nuclear Corp.  
 MCI/Quantel  
 Marconi Communication Systems Ltd.  
 NEC America, Inc. Broadcast Equip. Div. .... 36  
 Panasonic Industrial Co. Audio Video Systems Div.  
 Shintron Co. Inc.  
 Video Rentals, Inc.  
 Viscount Industries Ltd.  
 Vital Industries Inc.

**Generators, Staircase**

Asaca/Shibasoku Corp.  
 Robert Bosch GmbH  
 Electrocraft Consultants Ltd.  
 Lang Video Systems Corp.  
 Leader Instruments Corp. .... 5

Leasametric, Inc.  
 Leitch Video Ltd.  
 Link Electronics Ltd.  
 Philips Test & Measuring Instruments, Inc.  
 Rohde & Schwarz Sales Co.  
 Telemet Div. A Geotel, Co.

**Generators, Stereo**

Boonton Electronics Corp.  
 Broadcast Electronics, Inc.  
 CCA Electronics Corp.  
 CSI Electronics, Inc.  
 Catel/Tomco Divs. of United Scientific Corp.  
 Circuit Research Labs, Inc.  
 Continental Electronics Mfg. Co.  
 Kahn Communications, Inc.  
 Leader Instruments Corp.  
 Marcom  
 McMartin Industries, Inc.  
 Moseley Associates, Inc.  
 Orban Associates Inc. .... 87  
 Power Pak Systems, Inc.  
 QEI Corp.  
 Rohde & Schwarz Sales Co.  
 C.N. Rood B.V. Broadcasting Div.  
 C. N. Rood, c/o Audio + Design Recording, Inc.  
 Singer Broadcast Products, Inc.  
 Sintronic Corp.  
 Solid Electronics Labs  
 Sound Technology  
 TTC-Wilkinson Radio Div.

**Generators, Subcarrier**

BBL Industries, Inc.  
 Robert Bosch GmbH  
 Broadcast Electronics, Inc.  
 Broadcast Microwave Services, Inc.  
 CSI Electronics, Inc.  
 Circuit Research Labs, Inc. .... 239  
 Coastcom  
 Crosspoint Latch Corp.  
 Fernseh Inc.  
 Grass Valley Group, Inc. .... 7  
 Industrial Sciences, Inc. (ISI)  
 Leader Instruments Corp.  
 Leitch Video Ltd.  
 Link Electronics Ltd.  
 Marti Electronics  
 McMartin Industries, Inc.  
 Modulation Associates Inc.  
 Modulation Sciences, Inc.  
 Moseley Associates, Inc.  
 Philips Test & Measuring Instruments, Inc.  
 C.N. Rood B.V. Broadcasting Div.  
 Shintron Co. Inc.  
 Sigma Electronics, Inc.  
 Solid Electronics Labs  
 Telemet Div. A Geotel, Co.

**Generators, Sync Pulse**

All Mobile Video  
 Asaca/Shibasoku Corp. .... 266  
 Robert Bosch GmbH  
 Central Dynamics Corp. See also American Data  
 Colorado Video Inc.  
 Crosspoint Latch Corp.  
 Fernseh Inc.  
 For-A Corp. of America  
 Grass Valley Group, Inc. .... 7  
 Industrial Sciences, Inc. (ISI)  
 Lang Video Systems Corp.  
 Leader Instruments Corp. .... 5  
 Leasametric, Inc.  
 Leitch Video Ltd.  
 Lenco Inc. Electronics Div.  
 Link Electronics Ltd.  
 Marconi Communication Systems Ltd.  
 Marconi Electronics Inc. Broadcast & Communication Div.  
 Nagra Magnetic Recorders, Inc.  
 Omicron Video ..... 206  
 J. Osawa & Co., Ltd. .... 260  
 Panasonic Industrial Co. Audio Video Systems Div.  
 Philips Television Systems, Inc.  
 Philips Test & Measuring Instruments, Inc. .... 237



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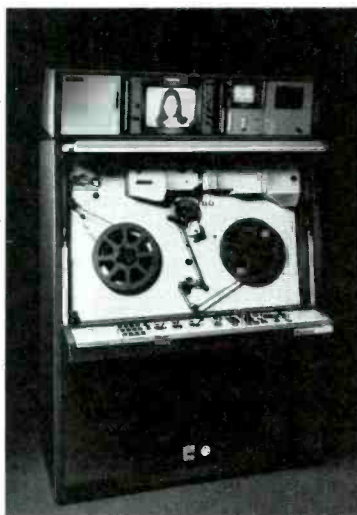
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Circle (124) on Reply Card

## See Adv. Page

Piher Electronica S. A.  
Pye TVT Ltd. Broadcast Co. of Philips  
Rohde & Schwarz Sales Co.  
Shintron Co. Inc.  
Siegel Electronics  
Sigma Electronics, Inc.  
Telaudio Centre  
Telemet Div. A Geotel, Co.  
Video Aids of Colorado

**Generators, Thermoelectric**

Teledyne Energy Systems

**Generators, Tone**

ANT Telecommunications (Formerly  
AEG-Telefunken)  
Alphaton Elektroakustik  
Altec Lansing Int'l.  
Amber Electro Design Inc.  
Audisar  
Autogram Corp.  
Bald Mountain Lab  
Bayly Engineering Ltd. Member of  
AEG-Telefunken Group  
Bogen Div. Lear Siegler, Inc.  
Broadcast Controls Div. Of Automated  
Broadcast Controls  
Broadcast Electronics, Inc.  
Century 21 Programming Inc.  
Cetec Vega  
Channelmatic, Inc.  
Comex Systems  
Di-Tech Inc.  
Exact Electronics Div. of Dynatech  
Nevada Inc.  
Gorman-Redlich Mfg. Co.  
High Country Engineering  
Motorola Communications and  
Electronics Inc.  
Opamp Labs, Inc.  
QSI Systems Inc.  
Shure Brothers Inc.  
Spectra Sonics  
Technical Projects Ltd.  
UREI Inc.  
VIF International

**Generators, Tone, EBS**

Bald Mountain Lab  
ESE ..... 12-13  
Gorman-Redlich Mfg. Co.  
High Country Engineering  
International Nuclear Corp.  
McMartin Industries, Inc.  
TFT Inc.  
Technical Projects Ltd.

**Generators, Video Carrier**

Leader Instruments Corp.  
Philips Test & Measuring Instruments,  
Inc.

**Generators, Video Signal Test  
Pattern**

All Mobile Video  
Asaca/Shibasoku Corp. ....266  
Automation Techniques, Inc.  
Robert Bosch GmbH  
CMC Technology Corp.  
Colorado Video Inc.  
Michael Cox Electronics Ltd.  
Electrocraft Consultants Ltd.  
Fernseh Inc.  
For-A Corp. of America  
Grass Valley Group, Inc.  
Industrial Sciences, Inc. (ISI)  
Kaitronics Corp.  
Lang Video Systems Corp.  
Leader Instruments Corp. .... 5  
Leasametric, Inc.  
Lectrotech Inc.  
Leitch Video Ltd.  
Lenco Inc. Electronics Div.  
Link Electronics Ltd.  
MRI Systems Ltd.  
Marconi Communication Systems Ltd.  
Marconi Electronics Inc. Broadcast &  
Communication Div.

## See Adv. Page

Marconi Instruments Div. of Marconi  
Electronics Inc.  
J. Osawa & Co., Ltd. ....260  
Panasonic Industrial Co. Audio Video  
Systems Div.  
Philips Test & Measuring  
Instruments, Inc. ....237  
Piher Electronica S. A.  
Porta-Pattern Inc.  
QSI Systems Inc.  
Rohde & Schwarz Sales Co.  
Sigma Electronics, Inc.  
Telaudio Centre  
Telemet Div. A Geotel, Co.  
Unitel  
VIZ Mfg. Co.

**Generators, Video Sweep**

Asaca/Shibasoku Corp. ....266  
Datatek Corp.  
Leader Instruments Corp.  
Lectrotech Inc.  
Lenco Inc. Electronics Div.  
Link Electronics Ltd.  
Marconi Instruments Div. of Marconi  
Electronics Inc.  
J. Osawa & Co., Ltd. ....260  
Philips Test & Measuring Instruments,  
Inc.  
Rohde & Schwarz Sales Co.  
Telemet Div. A Geotel, Co.  
Texscan  
Texscan Corp.  
VIZ Mfg. Co.  
Wavetek Indiana, Inc.

**Generators, VITS Inserter**

Robert Bosch GmbH  
Control Video Corp.  
Michael Cox Electronics Ltd.  
Electrocraft Consultants Ltd.  
Grumman Aerospace Corp.  
Leitch Video Ltd.  
Link Electronics Ltd.  
Marconi Instruments Div. of Marconi  
Electronics Inc.  
Philips Test & Measuring Instruments,  
Inc.  
Rohde & Schwarz Sales Co.  
Telemet Div. A Geotel, Co.

**Hand Trucks, ENG Equipment**

All Mobile Video  
Coherent Communications  
E-N-G Corp. Electronic News Group  
Lee-Ray Industries, Inc.  
Roscor Corp.  
Thermodyne International Ltd.  
Wheelit, Inc.

**Head Alignment Gauges**

Crow of Reading Ltd.  
Fidelipac Corp.  
Merlin Engineering Works, Inc.  
Multi-Track Magnetics, Inc.  
Nagra Magnetic Recorders, Inc.  
Nortronics Co., Inc. Recorder Care Div.  
UMC Electronics Co. Broadcast  
Products Div.

**Head Cleaning Products, Audio**

Allsop, Inc.  
Audio Service Corp.  
Comprehensive Video Supply Corp.  
Discwasher  
Fostex Corp. of America  
Marathon Products Corp.  
Minneapolis Magnetics, Inc.  
Nortronics Co., Inc. Recorder Care Div.  
RTI-Research Tech. Int'l.  
Robins-Div. of Benjamin  
Electroproducts  
Sono-Mag Corp.  
Tandberg of America, Inc.  
Telectro Systems Corp.  
UREI Inc.

## See Adv. Page

**Head Cleaning Products, Video**

Allsop, Inc.  
Comprehensive Video Supply Corp.  
Discwasher  
Nortronics Co., Inc. Recorder Care Div.  
RTI-Research Tech. Int'l.  
Robins-Div. of Benjamin  
Electroproducts  
Sony Corp. of America  
3M Co. Magnetic A/V Products Div.

**Head Refurbishing or Services  
for Audio or VTR**

Ampex Corp.  
Robert Bosch GmbH  
Brush Magnetic Heads Div.  
CMC Technology Corp.  
Glentronix (1977) Ltd.  
International Electro-Magnetics  
JRF Magnetic Sciences Inc.  
Merlin Engineering Works, Inc.  
Minneapolis Magnetics, Inc.  
R. K. Morrison Co.  
RCA Broadcast Systems  
Re: DB Co. A Div. of Pierce Industries  
Inc.  
Restoration .....244  
Saki Magnetics, Inc.  
Spin Physics, Eastman Kodak  
Taber Mfg. & Eng. Co.  
Turner Engineering  
Videomagnetics, Inc.

**Headphones**

AKG Acoustics, Inc.  
All Mobile Video  
Astatic Corp.  
Audio Service Corp.  
Audio-Technica U.S., Inc.  
Bell & Howell Audio Visual Div.  
Beyer Dynamic, Inc.  
Clear-Com Intercom Systems  
Comprehensive Video Supply Corp.  
Electro-Voice Inc.  
Elektroimpex  
Ercona Corp.  
Fidelipac Corp.  
Fostex Corp. of America  
Glentronix (1977) Ltd.  
Alan Gordon Enterprises Inc.  
Integrated Sound Systems Inc.  
Marshall Electronics  
Micro-Trak Corp.  
Miles Air Products Ltd.  
Nagra Magnetic Recorders, Inc.  
Panasonic Industrial Co. Audio Video  
Systems Div.  
R-Columbia Products Co., Inc.  
See Hear Industries Div. of RJA Inc.  
Sennheiser Electronic Corp.  
Satcom Corp.  
Stanton Magnetics Inc. ....195  
Studer Revox America  
System Wireless Ltd.  
Tandberg of America, Inc.  
TEAC Corp. of America  
Television Equipment Associates  
Telex Communications, Inc.  
Vidaire Electronics Mfg. Corp.

**Headphones with Announcers  
Microphone**

AKG Acoustics, Inc.  
All Mobile Video  
Beyer Dynamic, Inc.  
Clear-Com Intercom Systems  
Comprehensive Video Supply Corp.  
DYMA Engineering, Inc.  
Ercona Corp.  
Fostex Corp. of America  
Alan Gordon Enterprises Inc.  
Hammond Industries Inc.  
Marshall Electronics  
Micro-Trak Corp.  
Miles Air Products Ltd.  
R-Columbia Products Co., Inc.  
Sennheiser Electronic Corp.  
Shure Brothers Inc.  
Swintek Enterprises, Inc.  
System Wireless Ltd.  
Tandberg of America, Inc.

## See Adv. Page

Technical Projects Ltd.  
Television Equipment Associates  
Telex Communications, Inc.

**Heads, Audio Stack**

Brush Magnetic Heads Div.  
Glentronix (1977) Ltd.  
International Electro-Magnetics  
JRF Magnetic Sciences Inc.  
Nortronics Co., Inc. Recorder Care Div.  
Re: DB Co. A Div. of Pierce Industries  
Inc.  
Saki Magnetics, Inc.  
Taber Mfg. & Eng. Co.  
VIF International

**Heads, Contactor**

Brush Magnetic Heads Div.  
Nortronics Co., Inc. Recorder Care Div.

**Heads, Erase Magnetic**

Brush Magnetic Heads Div.  
Elektroimpex  
Enertec/Schlumberger Dept. Audio  
Professionnel  
International Electro-Magnetics  
JRF Magnetic Sciences Inc.  
Magna-Tech Electronic Co., Inc.  
Marathon Products Corp.  
Minneapolis Magnetics, Inc.  
Multi-Track Magnetics, Inc.  
Nortronics Co., Inc. Recorder Care Div.  
Re: DB Co. A Div. of Pierce Industries  
Inc.  
Saki Magnetics, Inc.  
Taber Mfg. & Eng. Co.

**Heads, Film Stripe**

Brush Magnetic Heads Div.  
International Electro-Magnetics  
JRF Magnetic Sciences Inc.  
Magna-Tech Electronic Co., Inc.  
Minneapolis Magnetics, Inc.  
Multi-Track Magnetics, Inc.  
Nortronics Co., Inc. Recorder Care Div.  
Saki Magnetics, Inc.  
Westrex Div. Litton Industries

**Heads, Recording Magnetic**

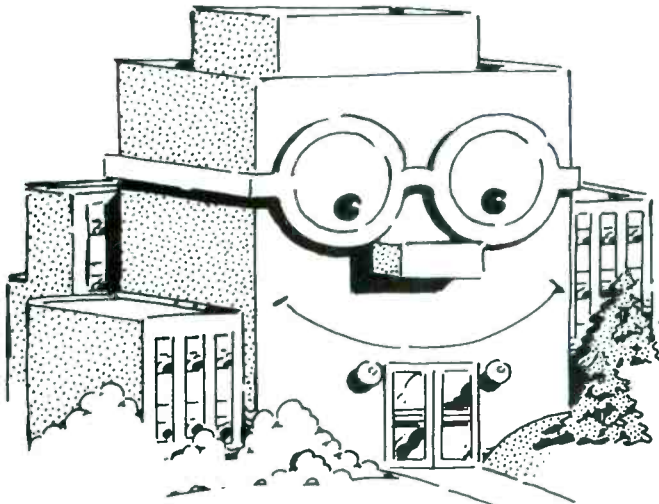
Ampex Corp.  
Brush Magnetic Heads Div.  
Elektroimpex  
Enertec/Schlumberger Dept. Audio  
Professionnel  
Glentronix (1977) Ltd.  
International Electro-Magnetics  
JRF Magnetic Sciences Inc.  
Magna-Tech Electronic Co., Inc.  
Minneapolis Magnetics, Inc.  
Multi-Track Magnetics, Inc.  
Nagra Magnetic Recorders, Inc.  
Nortronics Co., Inc. Recorder Care Div.  
Ramko Research Inc.  
Re: DB Co. A Div. of Pierce Industries  
Inc.  
Saki Magnetics, Inc.  
Spin Physics, Eastman Kodak  
UMC Electronics Co. Broadcast  
Products Div.  
Videomagnetics, Inc.  
VIF International

**Heads, Video Recorder**

Ampex Corp.  
CMC Technology Corp.  
Glentronix (1977) Ltd.  
International Electro-Magnetics  
Javelin Electronics  
Minneapolis Magnetics, Inc.  
RCA Broadcast Systems  
Saki Magnetics, Inc.  
Spin Physics, Eastman Kodak  
Taber Mfg. & Eng. Co.  
Videomagnetics, Inc.

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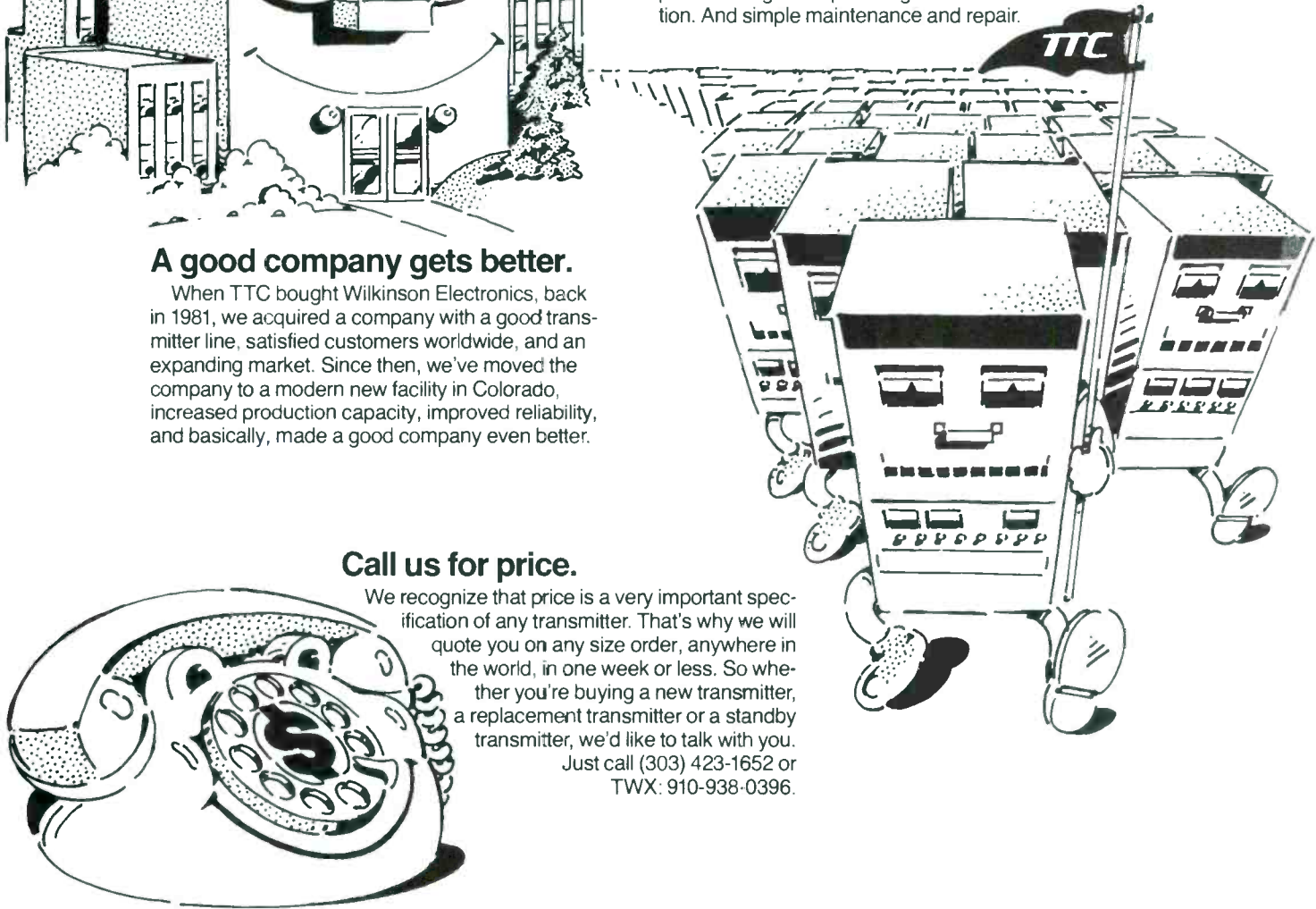
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See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
<b>Heat Exchangers</b>			
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<b>Helicopters</b>			
Broadcast Microwave Services, Inc. ENG Helicopter Satellites, Ltd. Feathercam Inc. MBB Helicopter Corp.	<b>Isolators, Electro-Optical</b> Meret Inc. Motorola Semiconductor Products Inc. Semiconductor Supermarket Video Aids of Colorado Video Masters, Inc.	Comprehensive Video Supply Corp. Fidelipac Corp. Marathon Products Corp. Patch Bay Designation See Hear Industries Div. of RJJ Inc.	Jos. Schneider Optische Werke Kreuznach GmbH & Co. KG Smith-Victor Corp. Warren R. Smith Co. Tamron Co., Ltd. Tele-Cine Corp. Div. of Schneider Corp. of America <b>Tiffen Mfg. Corp. ....106</b> VMI-Visual Methods Inc. The Zei-Mark Corp.
<b>Hum Stop Coils, Video</b>			
<b>Audio-Video Engineering Co. ....234</b> Broadcast Video Systems, Ltd. Fernseh Inc. International Nuclear Corp. <b>North Hills Electronics, Inc. ....230</b> Video Aids of Colorado Video Masters, Inc.	<b>ITFS Systems</b> Andrew Corp. <b>EMCEE Broadcast Products ....218</b> Information Transmission Systems, Corp. Nurad, Inc. <b>Townsend Associates, Inc. ....65</b>	<b>Lamps, Console, Gooseneck</b> CAE Inc. Osram Sales Corp. Shure Brothers Inc. <b>Winsted Corp. ....244</b>	<b>Lenses, Optical Fixed</b> Angenieux Corp. of America Arriflex Corp. Avtech Electronics Inc. (formerly Team Electronics) <b>Canon USA, Inc. Optics Div. ....97</b> Century Precision Cine/Optics Cinema Products Corp. D.O. Industries, Inc. Ercona Corp. Frezzolini Electronics, Inc. Fujinon Inc. GBC Closed Circuit TV Corp. Alan Gordon Enterprises Inc. Karl Heitz, Inc. Ikegami Electronics (U.S.A.), Inc. Javelin Electronics Lenzar Optics Corp. Panasonic Industrial Co. Audio Video Systems Div. RTI-Research Tech. Int'l. Jos. Schneider Optische Werke Kreuznach GmbH & Co. KG Warren R. Smith Co. Tamron Co., Ltd. Tele-Cine Corp. Div. of Schneider Corp. of America VMI-Visual Methods Inc. The Zei-Mark Corp. Zellan Enterprises, Ltd.
<b>Image Repositioners, Video</b>			
Grass Valley Group, Inc. Harris Video Systems MCI/Quantel NEC America, Inc. Broadcast Equip. Div. Precision Echo	<b>Jack Panel Assemblies</b> ADC Magnetic Controls ADM Technology, Inc. A. F. Associates, Inc. ATI-Audio Technologies Inc. Altec Lansing Int'l. Atlantic Research Corp. Audio Accessories, Inc. <b>Broadcast Systems, Inc. ....23, 219</b> Bud Industries, Inc. Connectronics Corp. Continental Electronics Mfg. Co. Cosmin Electronics Datatronic, Inc. DYMA Engineering, Inc. Dynamic Technology Ltd. <b>Dynatech Data Systems ....62</b> Image Video Ltd. Jenel Consultants Corp. McCurdy Radio Ind. Inc. Modular Audio Products Unit of Modular Devices, Inc. Potomac Instruments, Inc. Rex Rheostat & Co., Inc. Switchcraft Inc. Symetrix Inc. Trompeter Electronics, Inc. Union Connector Co., Inc. <b>Ward-Beck Systems Ltd. ....BC</b>	<b>Lamps, Stage and Studio Replacement</b> Bardwell & McAlister, Inc. Belden Communications, Inc. CFA-Media Specialties, Inc. Colortran, Inc. Electronics Diversified, Inc. Alan Gordon Enterprises Inc. Kliegl Bros. Lighting L. E. Nelson Corp. Osram Sales Corp. Smith-Victor Corp. Strand Century, Inc. Sylvania Light/GTE	<b>Lenses, Optical Zoom</b> Advanced Technology Div. Of TriTronics, Inc. <b>Angenieux Corp. of America ....206</b> Arriflex Corp. Avtech Electronics Inc. (formerly Team Electronics) <b>Canon USA, Inc. Optics Div. ....97</b> Century Precision Cine/Optics Cinema Products Corp. D.O. Industries, Inc. Ercona Corp. Frezzolini Electronics, Inc. Fujinon Inc. ....235 GBC Closed Circuit TV Corp. Alan Gordon Enterprises Inc. Karl Heitz, Inc. Ikegami Electronics (U.S.A.), Inc. JVC Co. of America Javelin Electronics Lenzar Optics Corp. Panasonic Industrial Co. Audio Video Systems Div. Quick-Set Inc. RTI-Research Tech. Int'l. Jos. Schneider Optische Werke Kreuznach GmbH & Co. KG Tamron Co., Ltd. <b>Tele-Cine Corp. Div. of Schneider Corp. of America ....106</b> VMI-Visual Methods Inc. Zellan Enterprises, Ltd.
<b>Insulators, Antenna Base</b>			
Continental Electronics Mfg. Co. Fred A. Nudd Corp. <b>Racal-Decca Canada Inc.</b> <b>Insulators Div. ....116</b> Utility Tower Co. World Tower Co. Inc.	<b>Intercom Systems</b> A. F. Associates, Inc. Altec Lansing Int'l. Atlantic Research Corp. Bogen Div. Lear Siegler, Inc. British Videotex & Teletext Broadcast Technology, Inc. Cetec Vega Clear-Com Intercom Systems Comprehensive Video Supply Corp. Datatronic, Inc. Dukane Corp. ENG Helicopter Satellites, Ltd. Farrtronics Ltd. Feathercam Inc. Alan Gordon Enterprises Inc. <b>HM Electronics, Inc. ....58</b> Nady Systems Inc. Old Dominion Broadcast Eng. Service Pacific Recorders & Eng. Corp. Piher Electronica S. A. ProTech Audio Corp. R-Columbia Products Co., Inc. <b>RTS Systems, Inc. ....147</b> ROH Corp. The Ken Schaffer Group, Inc. Sescom, Inc. Setcom Corp. <b>Swintek Enterprises, Inc. ....112</b> System Wireless Ltd. Technical Projects Ltd. Television Equipment Associates Telex Communications, Inc. Vidaire Electronics Mfg. Corp. Video Aids of Colorado Ward-Beck Systems Ltd.	<b>Leased Broadcast Equipment</b> All Mobile Video Angenieux Corp. of America Atlas Tower Corp. CSI Electronics, Inc. International Tapetronics Corp./3M Leasametric, Inc. <b>Logitek Electronic Systems, Inc. ....222</b> McMartin Industries, Inc. Merlin Engineering Works, Inc. Old Dominion Broadcast Eng. Service Ramko Research Inc. Roscor Corp. Soll, Inc. Tele-Cine Corp. Div. of Schneider Corp. of America Tele-Measurements Inc. Turner Engineering UMC Electronics Co. Broadcast Products Div. U.S. Instrument Rentals, Inc. Varian Associates, Inc. Electron Device Group Video Masters, Inc.	<b>Light Masking</b> <b>The Great American Market ....32</b>
<b>Insulators, Guy Strain</b>			
Andrew Corp. Continental Electronics Mfg. Co. Fred A. Nudd Corp. <b>Racal-Decca Canada Inc.</b> <b>Insulators Div. ....116</b> Utility Tower Co. World Tower Co. Inc.	<b>Jacks, Meter Line</b> AVA Electronics CSP Inc. Delta Electronics Inc. (VA)	<b>Lens Repair Services</b> <b>Angenieux Corp. of America ....206</b> Arriflex Corp. Birns & Sawyer Inc. Canon USA, Inc. Optics Div. Century Precision Cine/Optics Ercona Corp. Film/Video Equip. Service Co. <b>Fujinon Inc. ....235</b> Alan Gordon Enterprises Inc. Jos. Schneider Optische Werke Kreuznach GmbH & Co. KG Tele-Cine Corp. Div. of Schneider Corp. of America Zellan Enterprises, Ltd.	<b>Lighting Hangers, Studio</b> Automatic Devices Co. AVAB America Inc. B-W Lighting Systems (formerly Panoak Lighting) Birns & Sawyer Inc. Bogen Photo Corp. <b>Canon USA, Inc. Optics Div. ....97</b> Century Precision Cine/Optics D.O. Industries, Inc. Ercona Corp. <b>Fujinon Inc. ....235</b> Alan Gordon Enterprises Inc. JVC Co. of America Lee Filters Ltd. RTI-Research Tech. Int'l.
<b>Insulators, Antenna Base</b>			
Continental Electronics Mfg. Co. Fred A. Nudd Corp. <b>Racal-Decca Canada Inc.</b> <b>Insulators Div. ....116</b> Utility Tower Co. World Tower Co. Inc.	<b>Keysers, Video Insert</b> American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp. Beaveronics, Inc. Broadcast Video Systems, Ltd. <b>Central Dynamics Corp. See also American Data ....29, 245</b> Central Dynamics Ltd. Chyron Corp. Telesystems Control Video Corp. Michael Cox Electronics Ltd. <b>Crosspoint Latch Corp. ....272</b> For-A Corp. of America Glentronix (1977) Ltd. <b>Graham-Patten Systems, Inc. ....110</b> Grass Valley Group, Inc. <b>Harris Video Systems ....82, 83</b> <b>Image Video Ltd. ....121</b> Panasonic Industrial Co. Audio Video Systems Div. Thomson-CSF Broadcast, Inc. 3M Co., Broadcast & Related Products Div. Torpey Controls & Eng. Ltd. Video Associates Labs, Inc.	<b>Lenses, Adaptor and Extenders</b> <b>Angenieux Corp. of America ....206</b> Avtech Electronics Inc. (formerly Team Electronics) B-W Lighting Systems (formerly Panoak Lighting) Birns & Sawyer Inc. Bogen Photo Corp. <b>Canon USA, Inc. Optics Div. ....97</b> Century Precision Cine/Optics D.O. Industries, Inc. Ercona Corp. <b>Fujinon Inc. ....235</b> Alan Gordon Enterprises Inc. JVC Co. of America Lee Filters Ltd. RTI-Research Tech. Int'l.	<b>Lighting Hangers, Studio</b> Automatic Devices Co. AVAB America Inc. B-W Lighting Systems (formerly Panoak Lighting) Birns & Sawyer Inc. Belden Communications, Inc. Bogen Photo Corp. Walter S. Brewer Co., Inc. Colortran, Inc. Design Line Inc. Electro Controls
<b>Intercom Systems</b>			
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<b>Isocouplers</b>			
CSP Inc.			

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Gagnon LaForest Inc. Janson Industries Kliegl Bros. Lighting LTM Corp. of America Lowel-Light Mfg., Inc. Matthews Studio Equipment, Inc. Mole-Richardson Co. L. E. Nelson Corp. Packaged Lighting Systems Smith-Victor Corp. Strand Century, Inc. Theatrical Services Inc.	<b>Lighting Transformers</b> AVAB America Inc. Hughes & Phillips Inc. LTM Corp. of America Packaged Lighting Systems Skirpan Lighting Systems, Inc. The Superior Electric Co.	G & M Power Products Inc. Alan Gordon Enterprises Inc. The Great American Market <b>Kliegl Bros. Lighting</b> ..... 78 Kobold of America Corp. LTM Corp. of America Lowel-Light Mfg., Inc. Lumitrol, Ltd. Matthews Studio Equipment, Inc. Modulight Systems Inc. Mole-Richardson Co. Multiplier Industries Corp. L. E. Nelson Corp. Packaged Lighting Systems Smith-Victor Corp. Strand Century, Inc.	CSP Inc. Continental Electronics Mfg. Co. Dielectric Communications A Unit of General Signal <b>Electro Impulse, Inc.</b> ..... 239 Marconi Communication Systems Ltd. Marconi Electronics Inc. Broadcast & Communication Div. Micro Communications, Inc. North Hills Electronics, Inc. Rex Rheostat & Co., Inc. Shively Laboratories Div. of Howell Labs, Inc. TTC-Wilkinson Radio Div.
<b>Lighting, TV Portable System</b> Arriflex Corp. AVAB America Inc. B-W Lighting Systems (formerly Panoak Lighting) Bardwell & McAlister, Inc. Belden Communications, Inc. Walter S. Brewer Co., Inc. CAE Inc. Calzone Case Co. Century Precision Cine/Optics Cine 60, Inc. Colortran, Inc. Comprehensive Video Supply Corp. Cool Light Co., Inc. Design Line Inc. Dynamic Technology Ltd. Electro Controls Electronics Diversified, Inc. Frezzolini Electronics, Inc. Alan Gordon Enterprises Inc. The Great American Market Janson Industries <b>Kliegl Bros. Lighting</b> ..... 78 Kobold of America Corp. LTM Corp. of America Lowel-Light Mfg., Inc. Lumitrol, Ltd. Modulight Systems Inc. Mole-Richardson Co. L. E. Nelson Corp. Packaged Lighting Systems Skirpan Lighting Systems, Inc. Smith-Victor Corp. Strand Century, Inc. Theatre Techniques Inc. Union Connector Co., Inc. The Will-Burt Co. TMD Div.	<b>Lightning Protection Systems</b> Cosmin Electronics DYMA Engineering, Inc. EEV, Inc. Eagle Hill Electronics, Inc. LEA, Inc. A Dynatech Co. (Formerly Lightning Elimination Assoc.) MCG Electronics Inc. Swager Tower Corp. TTC-Wilkinson Radio Div. Topaz Transtector Systems Div. Konic International Corp.	<b>Lights, Studio Warning</b> Fidelipac Corp. Mole-Richardson Co.	<b>Low Frequency Extenders</b> <b>Comrex Corp.</b> ..... 220 Marcom
<b>Lighting, TV Studio System</b> Peter Albrecht Corp. AVAB America Inc. B-W Lighting Systems (formerly Panoak Lighting) Bardwell & McAlister, Inc. Belden Communications, Inc. Walter S. Brewer Co., Inc. CAE Inc. CFA-Media Specialties, Inc. Colortran, Inc. Comprehensive Video Supply Corp. Cool Light Co., Inc. Design Line Inc. Dynamic Technology Ltd. Electro Controls Electronics Diversified, Inc. Alan Gordon Enterprises Inc. The Great American Market Jamieson & Associates, Inc. Janson Industries <b>Kliegl Bros. Lighting</b> ..... 78 Kobold of America Corp. LTM Corp. of America Lowel-Light Mfg., Inc. Lumitrol, Ltd. Matthews Studio Equipment, Inc. Modulight Systems Inc. Mole-Richardson Co. L. E. Nelson Corp. Packaged Lighting Systems Skirpan Lighting Systems, Inc. Smith-Victor Corp. Strand Century, Inc. Telaudio Centre Theatre Techniques Inc. Theatrical Services Inc. Union Connector Co., Inc.	<b>Lights, HMI Ballast</b> Arriflex Corp. B-W Lighting Systems (formerly Panoak Lighting) Belden Communications, Inc. Cinema Products Corp. Cinematography Electronics Colortran, Inc. Alan Gordon Enterprises Inc. The Great American Market Kobold of America Corp. LTM Corp. of America Modulight Systems Inc. Mole-Richardson Co. L. E. Nelson Corp. Osram Sales Corp. Strand Century, Inc.	<b>Lights, Tower Control</b> Atlas Tower Corp. CSP Inc. Crouse-Hinds Co. Aviation Lighting <b>Hughes &amp; Phillips Inc.</b> ..... 252 LeBlanc & Royle Communications Inc. Rohn SSAC Inc. Swager Tower Corp. World Tower Co. Inc.	<b>LPTV Systems</b> Alford Mfg. Co. Andrew Corp. Bogner Broadcast Equipment Corp. Comark Communications, Inc. Compucon, Inc. Comsearch, Inc. Delta-Benco-Cascade Ltd. EMCEE Broadcast Products Harris Corp. Broadcast Group Information Transmission Systems, Corp. MCL Inc. The Management Micro Communications, Inc. Peirce-Phelps Inc. Video Systems Div. Pihler Electronica S. A. Roscor Corp. Shively Laboratories Div. of Howell Labs, Inc. TTC-Television Tech. Div. Tele-Engineering Corp. <b>Tennaplex Systems Ltd.</b> ..... 44 Thomson-CSF Broadcast, Inc. <b>Townsend Associates, Inc.</b> ..... 65 Triple Crown Electronics, Inc. Video Masters, Inc.
<b>Lighting, TV Studio System</b> Peter Albrecht Corp. AVAB America Inc. B-W Lighting Systems (formerly Panoak Lighting) Bardwell & McAlister, Inc. Belden Communications, Inc. Walter S. Brewer Co., Inc. CAE Inc. CFA-Media Specialties, Inc. Colortran, Inc. Comprehensive Video Supply Corp. Cool Light Co., Inc. Design Line Inc. Dynamic Technology Ltd. Electro Controls Electronics Diversified, Inc. Alan Gordon Enterprises Inc. The Great American Market Jamieson & Associates, Inc. Janson Industries <b>Kliegl Bros. Lighting</b> ..... 78 Kobold of America Corp. LTM Corp. of America Lowel-Light Mfg., Inc. Lumitrol, Ltd. Matthews Studio Equipment, Inc. Modulight Systems Inc. Mole-Richardson Co. L. E. Nelson Corp. Packaged Lighting Systems Skirpan Lighting Systems, Inc. Smith-Victor Corp. Strand Century, Inc. Theatre Techniques Inc. Theatrical Services Inc. Union Connector Co., Inc.	<b>Lights, Portable, Battery and AC</b> Anton/Bauer, Inc. Arriflex Corp. B-W Lighting Systems (formerly Panoak Lighting) Bardwell & McAlister, Inc. Belden Communications, Inc. Cine 60, Inc. Cinema Products Corp. Colortran, Inc. Comprehensive Video Supply Corp. Cool Light Co., Inc. Film/Video Equip. Service Co. Frezzolini Electronics, Inc. G & M Power Products Inc. Alan Gordon Enterprises Inc. The Great American Market Karl Heitz, Inc. Kliegl Bros. Lighting Kobold of America Corp. LTM Corp. of America Lowel-Light Mfg., Inc. Modulight Systems Inc. Mole-Richardson Co. L. E. Nelson Corp. Osram Sales Corp. Packaged Lighting Systems Perrott Eng. Labs, Inc. Smith-Victor Corp. Strand Century, Inc.	<b>Lights, Tower Obstruction</b> Andrew Corp. Atlas Tower Corp. Continental Electronics Mfg. Co. Crouse-Hinds Co. Aviation Lighting EG&G Inc. <b>Hughes &amp; Phillips Inc.</b> ..... 252 Rohn SSAC Inc. Swager Tower Corp. Utility Tower Co. World Tower Co. Inc.	<b>Magnetic Field Indicators</b> R. B. Annis, Co.
<b>Lighting, TV Studio System</b> Peter Albrecht Corp. AVAB America Inc. B-W Lighting Systems (formerly Panoak Lighting) Bardwell & McAlister, Inc. Belden Communications, Inc. Walter S. Brewer Co., Inc. CAE Inc. CFA-Media Specialties, Inc. Colortran, Inc. Comprehensive Video Supply Corp. Cool Light Co., Inc. Design Line Inc. Dynamic Technology Ltd. Electro Controls Electronics Diversified, Inc. Alan Gordon Enterprises Inc. The Great American Market Jamieson & Associates, Inc. Janson Industries <b>Kliegl Bros. Lighting</b> ..... 78 Kobold of America Corp. LTM Corp. of America Lowel-Light Mfg., Inc. Lumitrol, Ltd. Matthews Studio Equipment, Inc. Modulight Systems Inc. Mole-Richardson Co. L. E. Nelson Corp. Packaged Lighting Systems Skirpan Lighting Systems, Inc. Smith-Victor Corp. Strand Century, Inc. Theatre Techniques Inc. Theatrical Services Inc. Union Connector Co., Inc.	<b>Lights, Portable, Kit</b> All Mobile Video B-W Lighting Systems (formerly Panoak Lighting) Bardwell & McAlister, Inc. Bogen Photo Corp. Walter S. Brewer Co., Inc. Calzone Case Co. Central Dynamics Corp. See also American Data Century Precision Cine/Optics Cine 60, Inc. Cinema Products Corp. Colortran, Inc. Comprehensive Video Supply Corp. Cool Light Co., Inc. Electro Controls Electronics Diversified, Inc. Frezzolini Electronics, Inc.	<b>Line Selectors, TV</b> Grass Valley Group, Inc. Leader Instruments Corp.	<b>Maintenance Services, AM</b> CSI Electronics, Inc. Century 21 Programming Inc. Harris Corp. Broadcast Group Harrison Systems Ltd. High Country Engineering Fred A. Nudd Corp. Old Dominion Broadcast Eng. Service Radiotechniques Consulting Engineers Soll, Inc. Utility Tower Co. World Tower Co. Inc.
<b>Lighting, TV Studio System</b> Peter Albrecht Corp. AVAB America Inc. B-W Lighting Systems (formerly Panoak Lighting) Bardwell & McAlister, Inc. Belden Communications, Inc. Walter S. Brewer Co., Inc. CAE Inc. CFA-Media Specialties, Inc. Colortran, Inc. Comprehensive Video Supply Corp. Cool Light Co., Inc. Design Line Inc. Dynamic Technology Ltd. Electro Controls Electronics Diversified, Inc. Alan Gordon Enterprises Inc. The Great American Market Jamieson & Associates, Inc. Janson Industries <b>Kliegl Bros. Lighting</b> ..... 78 Kobold of America Corp. LTM Corp. of America Lowel-Light Mfg., Inc. Lumitrol, Ltd. Matthews Studio Equipment, Inc. Modulight Systems Inc. Mole-Richardson Co. L. E. Nelson Corp. Packaged Lighting Systems Skirpan Lighting Systems, Inc. Smith-Victor Corp. Strand Century, Inc. Theatre Techniques Inc. Theatrical Services Inc. Union Connector Co., Inc.	<b>Lights, Portable, Kit</b> All Mobile Video B-W Lighting Systems (formerly Panoak Lighting) Bardwell & McAlister, Inc. Bogen Photo Corp. Walter S. Brewer Co., Inc. Calzone Case Co. Central Dynamics Corp. See also American Data Century Precision Cine/Optics Cine 60, Inc. Cinema Products Corp. Colortran, Inc. Comprehensive Video Supply Corp. Cool Light Co., Inc. Electro Controls Electronics Diversified, Inc. Frezzolini Electronics, Inc.	<b>Line Surge Protectors</b> Bud Industries, Inc. ComSonic, Inc. Delta Electronics Inc. (VA) Dielectric Communications A Unit of General Signal DYMA Engineering, Inc. EEV, Inc. LEA, Inc. A Dynatech Co. (Formerly Lightning Elimination Assoc.) MCG Electronics Inc. Multiplier Industries Corp. Perma Power Electronics, Inc. Radcom, Inc. The Superior Electric Co. TTC-Wilkinson Radio Div. Topaz Transtector Systems Div. Konic International Corp. Vanner, Inc.	<b>Maintenance Services, FM</b> CSI Electronics, Inc. Century 21 Programming Inc. Fort Worth Tower Co. Harris Corp. Broadcast Group Harrison Systems Ltd. High Country Engineering Fred A. Nudd Corp. Old Dominion Broadcast Eng. Service Radiotechniques Consulting Engineers Soll, Inc. Utility Tower Co. World Tower Co. Inc.
<b>Lighting, TV Studio System</b> Peter Albrecht Corp. AVAB America Inc. B-W Lighting Systems (formerly Panoak Lighting) Bardwell & McAlister, Inc. Belden Communications, Inc. Walter S. Brewer Co., Inc. CAE Inc. CFA-Media Specialties, Inc. Colortran, Inc. Comprehensive Video Supply Corp. Cool Light Co., Inc. Design Line Inc. Dynamic Technology Ltd. Electro Controls Electronics Diversified, Inc. Alan Gordon Enterprises Inc. The Great American Market Jamieson & Associates, Inc. Janson Industries <b>Kliegl Bros. Lighting</b> ..... 78 Kobold of America Corp. LTM Corp. of America Lowel-Light Mfg., Inc. Lumitrol, Ltd. Matthews Studio Equipment, Inc. Modulight Systems Inc. Mole-Richardson Co. L. E. Nelson Corp. Packaged Lighting Systems Skirpan Lighting Systems, Inc. Smith-Victor Corp. Strand Century, Inc. Theatre Techniques Inc. Theatrical Services Inc. Union Connector Co., Inc.	<b>Lights, Portable, Kit</b> All Mobile Video B-W Lighting Systems (formerly Panoak Lighting) Bardwell & McAlister, Inc. Bogen Photo Corp. Walter S. Brewer Co., Inc. Calzone Case Co. Central Dynamics Corp. See also American Data Century Precision Cine/Optics Cine 60, Inc. Cinema Products Corp. Colortran, Inc. Comprehensive Video Supply Corp. Cool Light Co., Inc. Electro Controls Electronics Diversified, Inc. Frezzolini Electronics, Inc.	<b>LNAs</b> <b>Antenna Technology Corp.</b> ..... 52 Avantek Inc. Broadcast Microwave Services, Inc. <b>Comtech Data Corp.</b> ..... 24 GEC McMichael Ltd. Gould Inc. Dexcel Div. McCullough Satellite Equip., Inc. <b>Microdyne Corp.</b> ..... 99 Pinzone Communications Products Inc. SED Systems Inc. TTC-Television Tech. Div.	<b>Maintenance Services, Microwave</b> Andrew Corp. Broadcast Microwave Services, Inc. Fort Worth Tower Co. Gabriel Electronics, Inc. Harris Corp. Broadcast Group Harris Corp. Broadcast Microwave Hughes Aircraft Co. Microwave Communications Products Lang Video Systems Corp.
<b>Lighting, TV Studio System</b> Peter Albrecht Corp. AVAB America Inc. B-W Lighting Systems (formerly Panoak Lighting) Bardwell & McAlister, Inc. Belden Communications, Inc. Walter S. Brewer Co., Inc. CAE Inc. CFA-Media Specialties, Inc. Colortran, Inc. Comprehensive Video Supply Corp. Cool Light Co., Inc. Design Line Inc. Dynamic Technology Ltd. Electro Controls Electronics Diversified, Inc. Alan Gordon Enterprises Inc. The Great American Market Jamieson & Associates, Inc. Janson Industries <b>Kliegl Bros. Lighting</b> ..... 78 Kobold of America Corp. LTM Corp. of America Lowel-Light Mfg., Inc. Lumitrol, Ltd. Matthews Studio Equipment, Inc. Modulight Systems Inc. Mole-Richardson Co. L. E. Nelson Corp. Packaged Lighting Systems Skirpan Lighting Systems, Inc. Smith-Victor Corp. Strand Century, Inc. Theatre Techniques Inc. Theatrical Services Inc. Union Connector Co., Inc.	<b>Lights, Portable, Kit</b> All Mobile Video B-W Lighting Systems (formerly Panoak Lighting) Bardwell & McAlister, Inc. Bogen Photo Corp. Walter S. Brewer Co., Inc. Calzone Case Co. Central Dynamics Corp. See also American Data Century Precision Cine/Optics Cine 60, Inc. Cinema Products Corp. Colortran, Inc. Comprehensive Video Supply Corp. Cool Light Co., Inc. Electro Controls Electronics Diversified, Inc. Frezzolini Electronics, Inc.	<b>Load Resistors, RF</b> Alford Mfg. Co. Bird Electronic Corp.	

- See Adv. Page**      **See Adv. Page**      **See Adv. Page**      **See Adv. Page**
- Microwave Assoc. Communications  
Fred A. Nudd Corp.  
Radiotechniques Consulting Engineers  
Swager Tower Corp.  
Utility Tower Co.  
World Tower Co. Inc.
- Maintenance Services, TV**
- Alpha Video & Electronics Co.  
Robert Bosch GmbH  
Bowen Broadcast Service Co., Inc.  
Broadcast Aids, Inc.  
Comark Communications, Inc. .... 69  
EMCEE Broadcast Products ..... 218
- Electrohome Ltd.  
Fort Worth Tower Co.  
General TV Network  
Harris Corp. Broadcast Group  
Harrison Systems Ltd.  
Jenel Consultants Corp.  
Fred A. Nudd Corp.  
Peirce-Phelps Inc. Video Systems Div.  
The Real World Tech. Group, Inc.  
Soll, Inc.  
Swager Tower Corp.  
Tele-Measurements Inc.  
Townsend Associates, Inc.  
Utility Tower Co.  
Varian Associates, Inc. Electron Device Group  
Video Masters, Inc.  
World Tower Co. Inc.
- Masts**
- Andrew Corp.  
Cetec Antennas  
E-N-G Corp. Electronic News Group  
Marconi Communication Systems Ltd.  
Fred A. Nudd Corp.  
Allen Osborne Associates ..... 104  
Rohn  
The Will-Burt Co. TMD Div.
- MDS Systems**
- Alford Mfg. Co.  
Andrew Corp.  
Bogner Broadcast Equipment Corp.  
Compucon, Inc.  
Comsearch, Inc.  
EMCEE Broadcast Products ..... 218  
Information Transmission Systems, Corp.  
Leasametric, Inc.  
Nurad, Inc.  
Standard Communications Corp.  
Texscan  
Texscan Corp.  
Townsend Associates, Inc. .... 65  
Varian Associates, Inc. Electron Device Group
- Memory Accessories, Displays**
- Cetec Broadcast Group
- Meters, Antenna Base**
- CSP Inc.  
Delta Electronics Inc. (VA)
- Meters, Antenna Impedance**
- CSP Inc.  
Delta Electronics Inc. (VA)  
Shively Laboratories Div. of Howell Labs, Inc.
- Meters, Blanking Interval**
- Auburn Instruments  
Grumman Aerospace Corp.  
World Video Inc.
- Meters, Burst Phase**
- Bruel & Kjaer Instruments, Inc.  
Michael Cox Electronics Ltd.  
Video Aids of Colorado
- Meters, Field Strength RF**
- Audio Technology  
Avantek Inc.  
Belar Electronics Lab., Inc.  
Blonder-Tongue Lab., Inc.  
CSP Inc.  
Michael Cox Electronics Ltd.  
Holaday Industries  
Leader Instruments Corp.  
McMartin Industries, Inc.  
Potomac Instruments, Inc. .... 246  
Rycom Instruments  
TM Systems, Inc.  
TEAC Corp. of America  
Texscan Corp.
- Meters, Flutter and Wow**
- Alphaton Elektroakustik  
Asaca/Shibasoku Corp.  
Bruel & Kjaer Instruments, Inc.  
EMT-FRANZ GMBH  
Fidelipac Corp.  
Gotham Audio Corp.  
Leader Instruments Corp.  
Marconi Instruments Div. of Marconi Electronics Inc.  
Potomac Instruments, Inc. .... 246  
Sound Technology ..... 129  
Technical Projects Ltd.
- Meters, Frequency AF**
- Alphaton Elektroakustik  
Amber Electro Design Inc.  
Michael Cox Electronics Ltd.  
Global Specialties Corp.  
Ivie Electronics, Inc.  
Leader Instruments Corp.  
Leasametric, Inc.  
Rycom Instruments  
Technical Projects Ltd.
- Meters, Frequency RF**
- Belar Electronics Lab., Inc.  
CSP Inc.  
Global Specialties Corp.  
Harris Corp. GSSD PRD Instruments  
Leader Instruments Corp.  
Leasametric, Inc.  
Texscan
- Meters, Frequency Calibrating**
- Eidson Electronic Co.  
Global Specialties Corp.  
Tracor Inc. Industrial Instruments Div.
- Meters, Line Voltage**
- General Microwave Corp.  
Leasametric, Inc.  
Motorola Communications and Electronics Inc.  
VIZ Mfg. Co.
- Meters, Modulation**
- Belar Electronics Lab., Inc.  
Boonton Electronics Corp.  
Marconi Instruments Div. of Marconi Electronics Inc.  
Polarad Electronics, Inc.  
Wavetek Indiana, Inc.
- Meters, Panel Replacement**
- Datel-Intersil Inc.  
Delta Electronics Inc. (VA)  
Dorrough Electronics  
General Microwave Corp.
- Meters, Peak Program**
- ADM Technology, Inc.  
ATI-Audio Technologies Inc.  
Advancing Technology Corp.  
Alice (Stancoil Ltd.)  
Audio + Design (Audio & Design Recording, Inc.)  
Audio Technology
- Auditronics, Inc. .... 238  
Clyde Electronics Ltd.  
General Microwave Corp.  
Harrison Systems, Inc.  
Inovonics Inc.  
Logitek Electronic Systems, Inc. .... 222  
Modulation Sciences, Inc.  
Quad-Eight Electronics  
Ramko Research Inc. .... 81  
The Real World Tech. Group, Inc.  
Selco Products Co.  
Technical Projects Ltd.  
Ward-Beck Systems Ltd.  
Westrex Div. Litton Industries
- Meters, Phase Angle**
- Bruel & Kjaer Instruments, Inc.  
EELA Audio, c/o Audio + Design Recording, Inc.  
Gorman-Redlich Mfg. Co.  
Harris Corp. GSSD PRD Instruments  
Harrison Systems, Inc.  
Potomac Instruments, Inc. .... 246  
Video Aids of Colorado
- Meters, Power**
- Altec Lansing Int'l.  
American Photonics Inc.  
Audio Technology  
Bird Electronic Corp.  
Boonton Electronics Corp.  
Delta Electronics Inc. (VA)  
Dielectric Communications A Unit of General Signal  
Electro Impulse, Inc. .... 239  
G & M Power Products Inc.  
General Microwave Corp.  
Harris Corp. GSSD PRD Instruments  
Leasametric, Inc.  
North American Soar Corp.  
Rohde & Schwarz Sales Co.  
Wavetek Indiana, Inc.
- Meters, RF**
- Bayly Engineering Ltd. Member of AEG-Telefunken Group  
Bird Electronic Corp.  
Boonton Electronics Corp.  
CSP Inc.  
Delta Electronics Inc. (VA)  
Rohde & Schwarz Sales Co.  
Shively Laboratories Div. of Howell Labs, Inc.  
Texscan Corp.
- Meters, SC/H Phase and Display**
- Grass Valley Group, Inc. .... 7  
Leitch Video Ltd.  
Lenco Inc. Electronics Div.  
World Video Inc.
- Meters, Standing Wave**
- Bird Electronic Corp.  
Dielectric Communications A Unit of General Signal  
Harris Corp. GSSD PRD Instruments  
Leasametric, Inc.  
Shively Laboratories Div. of Howell Labs, Inc.
- Meters, VITS**
- Asaca/Shibasoku Corp.  
Marconi Instruments Div. of Marconi Electronics Inc.
- Meters, Video Level**
- Asaca/Shibasoku Corp.  
Michael Cox Electronics Ltd.  
Marconi Instruments Div. of Marconi Electronics Inc.
- Meters, Video Noise**
- All Mobile Video  
Asaca/Shibasoku Corp.
- Lenco Inc. Electronics Div.  
Link Electronics Ltd.  
Marconi Instruments Div. of Marconi Electronics Inc.  
Rohde & Schwarz Sales Co. .... 248
- Meters, VU**
- ADM Technology, Inc.  
ATI-Audio Technologies Inc.  
Advancing Technology Corp.  
Amber Electro Design Inc.  
Audio + Design (Audio & Design Recording, Inc.)  
Audio Technology  
Broadcast Technology, Inc.  
Clyde Electronics Ltd.  
Datatronix, Inc.  
Fostex Corp. of America  
Harrison Systems, Inc.  
Logitek Electronic Systems, Inc. .... 222  
Ramko Research Inc. .... 81  
The Real World Tech. Group, Inc.  
Selco Products Co.  
TEAC Corp. of America ..... 27  
Technical Projects Ltd.  
Valley People, Inc.  
Ward-Beck Systems Ltd.  
Westrex Div. Litton Industries
- Microphone Splitters**
- All Mobile Video  
Alphaton Elektroakustik  
Audisar  
DYMA Engineering, Inc.  
RCI (Recording Consultants Inc.)  
Ramko Research Inc.  
Russco Electronics Mfg. Inc.  
Sescom, Inc.  
Straight Wire Audio, Inc.  
Switchcraft Inc.  
Technical Projects Ltd.  
Wireworks Corp.
- Microphone Stands and Booms**
- AKG Acoustics, Inc.  
Accurate Sound Corp.  
All Mobile Video  
Astatic Corp.  
Atlas Sound  
Audiotechniques Inc.  
Beyer Dynamic, Inc.  
Bogen Div. Lear Siegler, Inc.  
Calzone Case Co.  
Century 21 Programming Inc.  
Cinema Products Corp.  
Continental Electronics Mfg. Co.  
Elektroimpex  
Fidelipac Corp.  
Alan Gordon Enterprises Inc.  
Gotham Audio Corp.  
Matthews Studio Equipment, Inc.  
Keith Monks Audio (USA) Inc.  
PoleStar Products  
Schoeps/Posthorn Recordings  
See Hear Industries Div. of RJA Inc.  
Sennheiser Electronic Corp.
- Microphones, Boom**
- AKG Acoustics, Inc.  
All Mobile Video  
Astatic Corp.  
Audio Service Corp.  
Audio-Technica U.S., Inc.  
Beyer Dynamic, Inc. .... 141  
Calrec Audio Ltd., c/o Audio + Design  
Century 21 Programming Inc.  
Electro-Voice Inc.  
Ercona Corp.  
Fidelipac Corp.  
Fostex Corp. of America  
Alan Gordon Enterprises Inc.  
Gotham Audio Corp.  
Karl Heitz, Inc.  
LTM Corp. of America  
Panasonic Industrial Co. Audio Video Systems Div.  
R-Columbia Products Co., Inc.  
Schoeps/Posthorn Recordings  
Sennheiser Electronic Corp.

See Adv. Page

See Adv. Page

See Adv. Page

See Adv. Page

Shure Brothers Inc.  
Tandberg of America, Inc.  
Telex Communications, Inc.

Panasonic Industrial Co. Audio Video Systems Div.  
Schoeps/Posthorn Recordings  
See Hear Industries Div. of RJA Inc.  
Sennheiser Electronic Corp.  
**Shure Brothers Inc. .... 43**  
Sony Professional Audio  
Studer Revox America  
Swintek Enterprises, Inc.  
Tandberg of America, Inc.  
TEAC Corp. of America  
Telex Communications, Inc.  
Vidaire Electronics Mfg. Corp.

System Wireless Ltd.  
Technical Projects Ltd.  
Telex Communications, Inc.

Tennaplex Systems Ltd.  
Video Masters, Inc.

**Microphones, Desk**

AKG Acoustics, Inc.  
Astatic Corp.  
Audio Service Corp.  
Audio-Technica U.S., Inc.  
**Beyer Dynamic, Inc. .... 141**  
Bogen Div. Lear Siegler, Inc.  
Calrec Audio Ltd., c/o Audio + Design  
Century 21 Programming Inc.  
Coherent Communications  
Comprehensive Video Supply Corp.  
Continental Electronics Mfg. Co.  
Crown International, Inc.  
Electro-Voice Inc.  
Elektroimpex  
Ercona Corp.  
Fidelipac Corp.  
Fostex Corp. of America  
Alan Gordon Enterprises Inc.  
Gotham Audio Corp.  
Micron Audio Products Ltd.  
Panasonic Co. Technics  
Panasonic Industrial Co. Audio Video Systems Div.  
Schoeps/Posthorn Recordings  
See Hear Industries Div. of RJA Inc.  
Sennheiser Electronic Corp.  
Shure Brothers Inc.  
Sony Corp. of America  
Sony Professional Audio  
Studer Revox America  
Tandberg of America, Inc.  
TEAC Corp. of America  
Telex Communications, Inc.

**Microphones, Lavalier**

AKG Acoustics, Inc.  
All Mobile Video  
Astatic Corp.  
Audio Service Corp.  
Audio-Technica U.S., Inc.  
Audiotechniques Inc.  
**Beyer Dynamic, Inc. .... 141**  
Bogen Div. Lear Siegler, Inc.  
Century Precision Cine/Optics  
Coherent Communications  
Comprehensive Video Supply Corp.  
Countryman Associates Inc.  
Crown International, Inc.  
Electro-Voice Inc.  
Ercona Corp.  
Fidelipac Corp.  
Fostex Corp. of America  
Alan Gordon Enterprises Inc.  
Gotham Audio Corp.  
Micron Audio Products Ltd.  
Nagra Magnetic Recorders, Inc.  
Panasonic Industrial Co. Audio Video Systems Div.  
Schoeps/Posthorn Recordings  
See Hear Industries Div. of RJA Inc.  
**Sennheiser Electronic Corp. .... 86**  
Shure Brothers Inc.  
Sony Corp. of America  
**Sony Professional Audio .... 94**  
Swintek Enterprises, Inc.  
Telex Communications, Inc.

**Microwave Antenna Towers, ENG Van**

Atlas Tower Corp.  
Broadcast Microwave Services, Inc.  
Central Dynamics Corp. See also American Data  
Centro Corp.  
E-N-G Corp. Electronic News Group  
Harris Corp. Broadcast Group  
Microflect Co., Inc.  
Microwave Assoc. Communications  
Fred A. Nudd Corp.  
Nurad, Inc.  
**Allen Osborne Associates .... 104**  
Quick-Set Inc.  
Radio-Research Instrument Co., Inc.  
Rohn  
Roscor Corp.  
Tele-Measurements Inc.  
Telex Communications, Inc.  
Wolf Coach Inc.  
World Tower Co. Inc.

**Modulators, TV**

Barco Industries Video & Communications N.V.  
**Belar Electronics Lab., Inc. .... 120**  
Blonder-Tongue Lab., Inc.  
Catel/Tomco Divs. of United Scientific Corp.  
**Comark Communications, Inc. .... 69**  
Comtech Data Corp.  
Delta-Benco-Cascade Ltd.  
Discom Satellite Systems, Inc.  
Elector USA, Inc.  
GEC McMichael Ltd.  
Harris Corp. Satellite Communications Div.  
Information Transmission Systems, Corp.  
Javelin Electronics  
Jerold Div. General Instrument Corp.  
Magnavox CATV Systems, Inc.  
Marconi Communication Systems Ltd.  
McCullough Satellite Equip., Inc.  
Microdyne Corp.  
Phasecom Corp.  
**Philips Test & Measuring Instruments, Inc. .... 237**  
RCA Cablevision Systems  
Rohde & Schwarz Sales Co.  
Scientific-Atlanta, Inc.  
Synchronous Communications, Inc.  
TTC-Television Tech. Div.  
Telemet Div. A Geotel, Co.  
**Townsend Associates, Inc. .... 65**  
Triple Crown Electronics, Inc.  
UHF Associates  
Varian Associates, Inc. Electron Device Group

**Microphones, Floor**

AKG Acoustics, Inc.  
Astatic Corp.  
Audio Service Corp.  
Audio-Technica U.S., Inc.  
**Beyer Dynamic, Inc. .... 141**  
Bogen Div. Lear Siegler, Inc.  
Bruel & Kjaer Instruments, Inc.  
Calrec Audio Ltd., c/o Audio + Design  
Crown International, Inc.  
Electro-Voice Inc.  
Elektroimpex  
Ercona Corp.  
Fidelipac Corp.  
Fostex Corp. of America  
Alan Gordon Enterprises Inc.  
Gotham Audio Corp.  
Micron Audio Products Ltd.  
Panasonic Industrial Co. Audio Video Systems Div.  
Schoeps/Posthorn Recordings  
See Hear Industries Div. of RJA Inc.  
Sennheiser Electronic Corp.  
Shure Brothers Inc.  
Sony Professional Audio  
TEAC Corp. of America  
Telex Communications, Inc.

**Microphones, Parabolic, Shotgun and Stereo**

AKG Acoustics, Inc.  
All Mobile Video  
Audio Service Corp.  
Audio-Technica U.S., Inc.  
Audiotechniques Inc.  
Beyer Dynamic, Inc.  
Calrec Audio Ltd., c/o Audio + Design  
Comprehensive Video Supply Corp.  
Electro-Voice Inc.  
Ercona Corp.  
Fidelipac Corp.  
Alan Gordon Enterprises Inc.  
Gotham Audio Corp.  
Panasonic Industrial Co. Audio Video Systems Div.  
RD Systems of Canada  
Sennheiser Electronic Corp.  
Sony Corp. of America  
Sony Professional Audio

**Microwave Components**

Amperex Electronic Corp.  
Amplica, Inc.  
Andrew Corp.  
Avantek Inc.  
Broadcast Microwave Services, Inc.  
Channel Master Satellite Systems  
DowKey Div. Of Kilovac Corp.  
Dynatech/U-Z, Inc.  
**EEV, Inc. .... 117**  
English Electric Valve Co. Ltd.  
GEC McMichael Ltd.  
General Microwave Corp.  
Harris Corp. Broadcast Group  
Harris Corp. GSSD PRD Instruments  
International Microwave Corp.  
M/A-Com Microwave Power Devices  
**MCL Inc. .... 232**  
Micro Communications, Inc.  
Microwave Assoc. Communications  
**Moseley Associates, Inc. .... 227**  
The Narda Microwave Corp.  
North Hills Electronics, Inc.  
Nurad, Inc.  
RHG Electronics Laboratory, Inc.  
Semiconductor Supermarket  
TRW Semiconductors  
Texscan  
Texscan Corp.  
UTE Microwave, Inc.

**Monitor Controls, Remote**

D'San Corp.  
Fernseh Inc.  
Gorman-Redlich Mfg. Co.  
ProTech Audio Corp.  
Studio Systems Inc.

**Microphones, Hand Held**

AKG Acoustics, Inc.  
Astatic Corp.  
Audio Service Corp.  
Audio-Technica U.S., Inc.  
Audiotechniques Inc.  
**Beyer Dynamic, Inc. .... 141**  
Bogen Div. Lear Siegler, Inc.  
Calrec Audio Ltd., c/o Audio + Design  
Century Precision Cine/Optics  
Comprehensive Video Supply Corp.  
Continental Electronics Mfg. Co.  
Crown International, Inc.  
DYMA Engineering, Inc.  
Electro-Voice Inc.  
Ercona Corp.  
Fidelipac Corp.  
Fostex Corp. of America  
Alan Gordon Enterprises Inc.  
Gotham Audio Corp.  
HM Electronics, Inc.  
Micron Audio Products Ltd.  
Mineroff Electronics, Inc. Uher Products

**Microphones, Wireless**

All Mobile Video  
Audio Service Corp.  
Audiotechniques Inc.  
Beyer Dynamic, Inc.  
**Cetec Vega .... 74**  
Coherent Communications  
Comprehensive Video Supply Corp.  
Comrex Corp.  
Edcor Product Assurance Corp.  
Ercona Corp.  
Alan Gordon Enterprises Inc.  
**HM Electronics, Inc. .... 58**  
Micron Audio Products Ltd.  
Nady Systems Inc.  
Panasonic Industrial Co. Audio Video Systems Div.  
The Ken Schaffer Group, Inc.  
See Hear Industries Div. of RJA Inc.  
Sennheiser Electronic Corp.  
Sony Corp. of America  
Sony Professional Audio

**Microwave Systems, ENG**

Andrew Corp.  
Broadcast Microwave Services, Inc.  
Centro Corp.  
Coherent Communications  
Compucon, Inc.  
DYMA Engineering, Inc.  
E-N-G Corp. Electronic News Group  
ENG Helicopter Satellites, Ltd.  
GEC McMichael Ltd.  
Gabriel Electronics, Inc.  
HDS Inc.  
HN Engineering Inc.  
Harris Corp. Broadcast Group  
Harris Corp. Broadcast Microwave  
Hughes Aircraft Co. Microwave Communications Products  
Ikegami Electronics (U.S.A.), Inc.  
Lang Video Systems Corp.  
Leasametric, Inc.  
M/A-Com Microwave Power Devices  
MCL Inc.  
**Marti Electronics .... 20**  
Microwave Assoc. Communications  
Moseley Associates, Inc.  
NEC America, Inc. Broadcast Equip. Div.  
Nurad, Inc.  
R.F. Technology, Inc.  
RHG Electronics Laboratory, Inc.  
Rockwell Int'l. Commercial Elec. Operations  
Studio Systems Inc.

**Monitor Mounts**

Avtech Electronics Inc. (formerly Team Electronics)  
Elector USA, Inc.  
Electrohome Ltd.  
GBC Closed Circuit TV Corp.  
GKM Mfg. Corp.  
Omnimount Systems  
Peerless Sales  
Rohde & Schwarz Sales Co.  
Video Masters, Inc.  
**Winsted Corp. .... 244**

**Monitors, Antenna Base Current**

CSP Inc.  
Delta Electronics Inc. (VA)  
Gorman-Redlich Mfg. Co.  
Potomac Instruments, Inc.

**Monitors, Antenna Sampling**

Continental Electronics Mfg. Co.  
Delta Electronics Inc. (VA)  
Gorman-Redlich Mfg. Co.  
**Potomac Instruments, Inc. .... 246**  
Wide Band Engineering Co., Inc.

**Monitors, Directional Antenna**

CSP Inc.  
Delta Electronics Inc. (VA)  
Gorman-Redlich Mfg. Co.  
**Potomac Instruments, Inc. .... 246**

**Monitors, Frequency**

**Belar Electronics Lab., Inc. .... 120**  
Compucon, Inc.  
Continental Electronics Mfg. Co.  
Eidson Electronic Co.  
Global Specialties Corp.

	See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page	
McMartin Industries, Inc. Motorola Communications and Electronics Inc. Rohde & Schwarz Sales Co. TFT Inc. TTC-Wilkinsor Radio Div.		UREI Inc. Videotek, Inc. World Video Inc. Yamaha International Corp. Combo Div.	Feathercam Inc. Fernseh Inc. Fibervision Div. of Math Associates GBC Closed Circuit TV Corp. GEC McMichael Ltd. Glentronix (1977) Ltd. Hitachi Denshi America, Ltd. Ikegami Electronics (U.S.A.), Inc. Javelin Electronics Lenco Inc. Electronics Div. Listec TV Equipment Corp. Motorola Communications and Electronics Inc. Panasonic Industrial Co. Audio Video Systems Div. Piher Electronica S. A. Sony Corp. of America Terminal Display Systems Ltd. VMI-Visual Methods Inc. Video Masters, Inc.	<b>Monitors, Waveform</b> All Mobile Video Amtron Corp. Broadcast Video Systems, Ltd. Electronic Visuals Ltd. Glentronix (1977) Ltd. Hitachi Denshi America, Ltd. Leader Instruments Corp. Leasametric, Inc. Lectrotech Inc. <b>Philips Test &amp; Measuring Instruments, Inc. ....237</b> <b>Sencore Inc. .... 15</b> <b>Tektronix Inc. .... 18-19</b> Ultra Audio Pixtec Videotek, Inc. .... 45	
<b>Monitors, Microwave Radiation</b> General Microwave Corp. Holaday Industries The Narda Microwave Corp.		<b>Monitors, RF Level</b> <b>Belar Electronics Lab., Inc. ....120</b> Bird Electronic Corp. ComSonics, Inc. Delta Electronics Inc. (VA) Soll, Inc. Wide Band Engineering Co., Inc.	<b>Monitors, Video Color</b> All Mobile Video Amtron Corp. Asaca/Shibasoku Corp. Aydin Controls Barco Industries Video & Communications N.V. Robert Bosch GmbH Brabury Ltd. Calzone Case Co. Conrac Div. Conrac Corp. Crow of Reading Ltd. DigiVision, Inc. <b>Elector USA, Inc. ....257</b> Electrohome Ltd. Electronic Visuals Ltd. Elektroimpex Fernseh Inc. Fibervision Div. of Math Associates GEC McMichael Ltd. Glentronix (1977) Ltd. Hitachi Denshi America, Ltd. Ikegami Electronics (U.S.A.), Inc. Image Magnificator, Inc. JVC Co. of America Leasametric, Inc. Lectrotech Inc. Lenco Inc. Electronics Div. Listec TV Equipment Corp. National Video Services Panasonic Industrial Co. Audio Video Systems Div. Piher Electronica S. A. Sharp Electronics Corp. Professional Products Div. Sony Corp. of America Terminal Display Systems Ltd. Video Aids of Colorado <b>Videotek, Inc. .... 45</b> World Video Inc.	<b>Monitors, Modulation</b> <b>Belar Electronics Lab., Inc. ....120</b> Continental Electronics Mfg. Co. Marconi Instruments Div. of Marconi Electronics Inc. McMartin Industries, Inc. QEI Corp. <b>TFT Inc. ....118</b> TTC-Wilkinson Radio Div.	<b>Monitors, Set-up and Matching Equipment</b> Anchor Systems, Inc. Robert Bosch GmbH Calzone Case Co. HEDCO (Hughes Elec. Devices Corp.) Minolta Corp. Industrial Meter Div. Porta-Pattern Inc. Television Equipment Associates
<b>Monitors, Phase</b> <b>Belar Electronics Lab., Inc. ....120</b> CSP Inc. Delta Electronics Inc. (VA) Gorman-Redlich Mfg. Co. Leitch Video Ltd. <b>Potomac Instruments, Inc. ....246</b>		<b>Monitors, Stereo</b> <b>Belar Electronics Lab., Inc. ....120</b> Di-Tech Inc. Fibervision Div. of Math Associates HEDCO (Hughes Elec. Devices Corp.) JVC Co. of America James B. Lansing Sound, Inc. McMartin Industries, Inc. QEI Corp. ROH Corp. C.N. Rood B.V. Broadcasting Div. Russo Electronics Mfg. Inc. Sono-Mag Corp. Spectra Sonics TFT Inc. TTC-Wilkinson Radio Div. Yamaha International Corp. Combo Div		<b>Mounting Hardware</b> Omnimount Systems	
<b>Monitors, Power</b> Arrakis Sytems Inc. B & I Electronics, Inc. <b>Belar Electronics Lab., Inc. ....120</b> Bird Electronic Corp. Delta Electronics Inc. (VA) Dielectric Communications A Unit of General Signal G & M Power Products Inc. Global Specialties Corp. Harris Corp. GSSD PRD Instruments The Narda Microwave Corp. North American Soar Corp. The Superior Electric Co. Wide Band Engineering Co., Inc.		<b>Monitors, TV System</b> Avtech Electronics Inc. (formerly Team Electronics) <b>Belar Electronics Lab., Inc. ....120</b> Robert Bosch GmbH Broadcast Systems, Inc. Calzone Case Co. Cohu, Inc. Electronics Div. Elector USA, Inc. Electrohome Ltd. Fernseh Inc. GBC Closed Circuit TV Corp. GEC McMichael Ltd. HEDCO (Hughes Elec. Devices Corp.) Hitachi Denshi America, Ltd. JVC Co. of America Javelin Electronics Marconi Communication Systems Ltd. Marconi Instruments Div. of Marconi Electronics Inc. Merlin Engineering Works, Inc. Panasonic Industrial Co. Audio Video Systems Div. Piher Electronica S. A. Rohde & Schwarz Sales Co. Roscor Corp. Sharp Electronics Corp. Professional Products Div. TFT Inc. Videotek, Inc. World Video Inc.		<b>Multicarrier Systems, FM</b> Aydin Microwave Div. Catel/Tomco Divs. of United Scientific Corp. Coastcom HDS Inc. HN Engineering Inc. Johnson Electronics Inc. McMartin Industries, Inc. Modulation Associates Inc. Moseley Associates, Inc. C.N. Rood B.V. Broadcasting Div.	
<b>Monitors, Program Audio</b> ATI-Audio Technologies Inc. Altec Lansing Int'l. Amber Electro Design Inc. Anchor Systems, Inc. Arrakis Sytems Inc. Audio Technology Audisar B & I Electronics, Inc. <b>Belar Electronics Lab., Inc. ....120</b> Bogen Div. Lear Siegler, Inc. Comrex Corp. Datatronix, Inc. Delta Electronics Inc. (VA) Di-Tech Inc. DYMA Engineering, Inc. Electro-Voice Inc. Elektroimpex Fostex Corp. of America Gotham Audio Corp. HEDCO (Hughes Elec. Devices Corp.) James B. Lansing Sound, Inc. Marcom Mart Electronics McMartin Industries, Inc. Merlin Engineering Works, Inc. Micro-Trak Corp. Modular Audio Products Unit of Modular Devices, Inc. Modulation Associates Inc. ProTech Audio Corp. <b>Ramko Research Inc. .... 81</b> The Real World Tech. Group, Inc. ROH Corp. Roscor Corp. Spectra Sonics Straight Wire Audio, Inc. Studer Revox America Technical Projects Ltd. Telemet Div. A Geotel, Co. UMC Electronics Co. Broadcast Products Div. Ultra Audio Pixtec		<b>Monitors, Video Pulse Cross</b> Asaca/Shibasoku Corp. Robert Bosch GmbH Brabury Ltd. Conrac Div. Conrac Corp. <b>Elector USA, Inc. ....257</b> Electrocraft Consultants Ltd. Electrohome Ltd. GEC McMichael Ltd. Lenco Inc. Electronics Div. Piher Electronica S. A. Video Masters, Inc. Videotek, Inc. World Video Inc.		<b>Multimeters, Microwave</b> The Narda Microwave Corp.	
		<b>Monitors, Video B&amp;W</b> All Mobile Video Asaca/Shibasoku Corp. Avtech Electronics Inc. (formerly Team Electronics) Barco Industries Video & Communications N.V. Robert Bosch GmbH Calzone Case Co. Cohu, Inc. Electronics Div. Conrac Div. Conrac Corp. Elector USA, Inc. Electrocraft Consultants Ltd. Electrohome Ltd.		<b>Multiplexers</b> Alford Mfg. Co. Aydin Microwave Div. Belden Elec. Wire & Cable Electronics Div. Blonder-Tongue Lab., Inc. Broadcast Microwave Services, Inc. CSP Inc. Coastcom Comark Communications, Inc. Datel-Inters Inc. Dielectric Communications A Unit of General Signal Fernseh Inc. Global Specialties Corp. Harris Corp. Satellite Communications Div. Johnson Electronics Inc. Kalart Victor Corp. Laird Telemedia Inc. M/A-Com DCC, Inc. Micro Communications, Inc. Modulation Associates Inc. Motorola Semiconductor Products Inc. Mu-Del Electronics, Inc. NEC America, Inc. Broadcast Equip. Div. North Hills Electronics, Inc. Rockwell Int'l. Commercial Elec. Operations C.N. Rood B.V. Broadcasting Div. Shively Laboratories Div. of Howell Labs, Inc. Tennaplex Systems Ltd. Thomson-CSF Broadcast, Inc. The Zei-Mark Corp.	
		<b>Monitors, VTR and TBC</b> A. F. Associates, Inc. All Mobile Video Robert Bosch GmbH Broadcast Systems, Inc. Calzone Case Co. Elector USA, Inc. GEC McMichael Ltd. HEDCO (Hughes Elec. Devices Corp.) Marconi Electronics Inc. Broadcast & Communication Div. Videotek, Inc.		<b>Music, Production</b> American Image Productions Calzone Case Co. Century 21 Programming Inc. Comprehensive Video Supply Corp. Continental Recordings Inc. De Wolfe Music Library Live Sound Inc. Network Production Music Library Soper Sound Music Library Soper Sound Media Music William B. Tanner Co. Inc. Thomas Valentino Inc.	

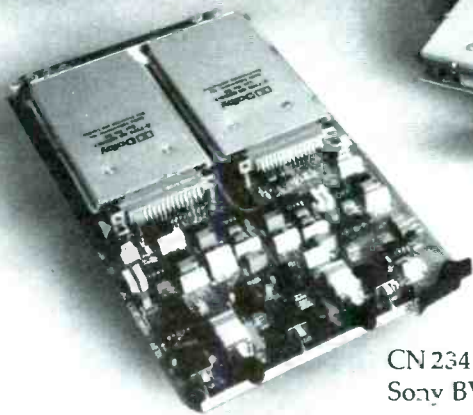


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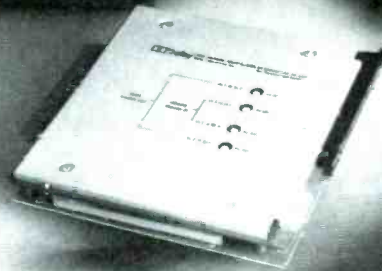
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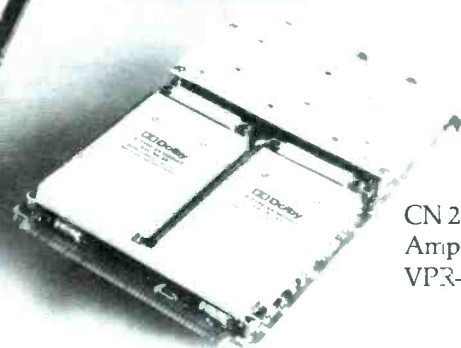
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Sony BVH 2000



CN 221B for  
Sony BVH  
100C/1100



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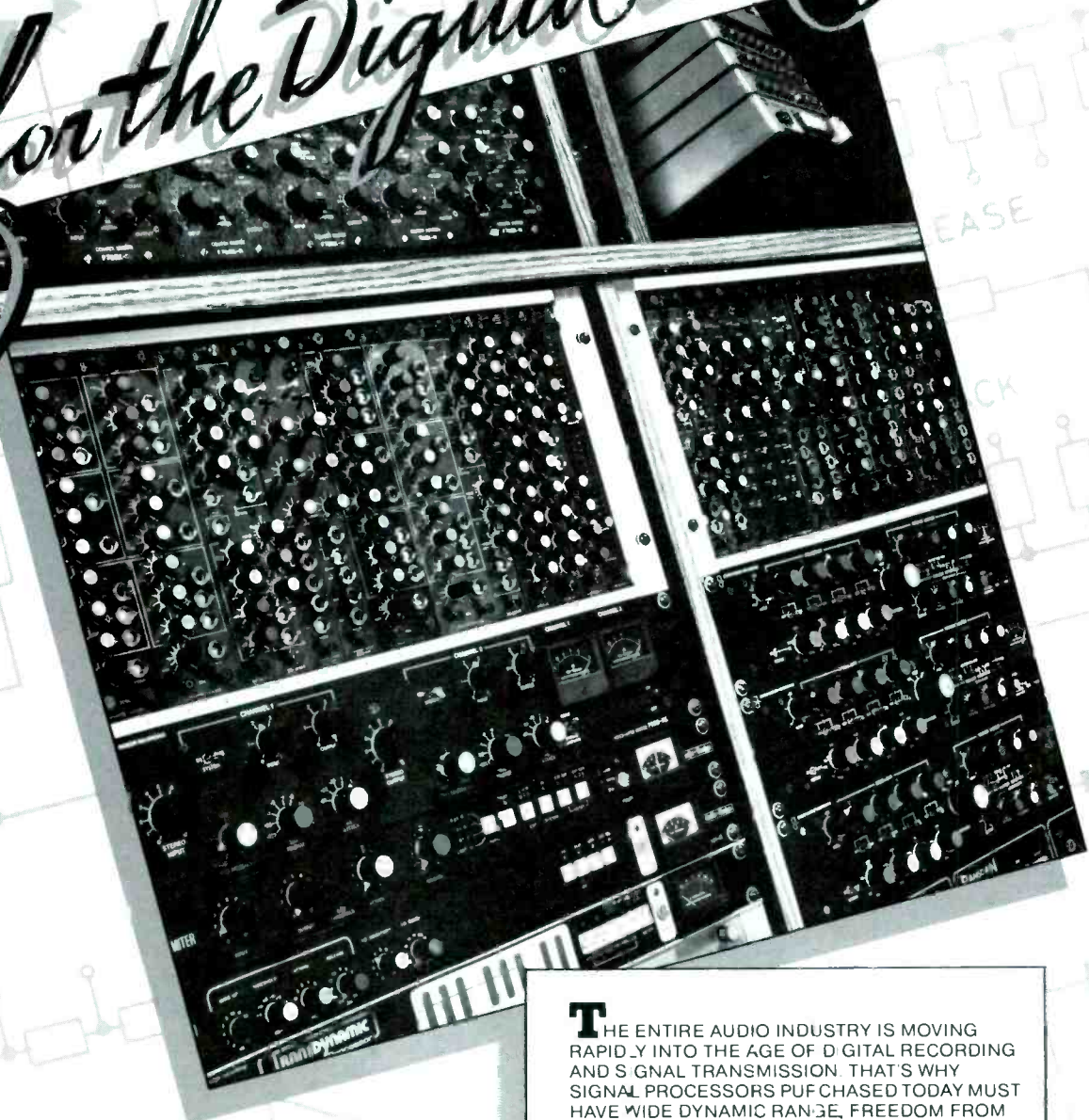
 **Dolby®**

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
<b>Music, Programmed</b>	<b>Networks, Mixing</b>	Gorman-Redlich Mfg. Co. High Country Engineering Modular Audio Products Unit of Modular Devices, Inc. Monroe Electronics, Inc. Motorola Communications and Electronics Inc. Neal Ferrograph U.S.A., Inc. Rupert Neve Inc. Opamp Labs, Inc. Phoenix Audio Lab, Inc. ProTech Audio Corp. Quad-Eight Electronics Shure Brothers Inc. TM Systems, Inc. Technical Projects Ltd. Tektronix Inc. UREI Inc.	Tektronix Inc.
BPI (Broadcast Programming Int'l.) Broadcast Programming Int'l. The CnB Studios CaVox Stereo Productions Century 21 Programming Inc. Command Productions Radio Broadcasting Services Concept Productions Drake-Chenault Enterprises, Inc. KalaMusic Live Sound Inc. The Music Director Programming Service Radio Programming/Management William B. Tanner Co. Inc. Tape-Athon Corp. Cavox Stereo Productions Thomas Valentino Inc.	MBI Broadcast Systems ProTech Audio Corp. Quad-Eight Electronics <b>Shallco, Inc.</b> ..... 120 Tech Laboratories Inc.	<b>Oscillators, TV</b>	<b>Parts and Components, Electronic</b>
<b>Music, Sound Effects/Libraries</b>	<b>Networks, Phasing</b>	Asaca/Shibasoku Corp. Leitch Video Ltd. Tektronix Inc.	American Photonics Inc. CSP Inc. Cetec Broadcast Group EEV, Inc. Eagle Hill Electronics, Inc. Ercona Corp. Global Specialties Corp. Lang Video Systems Corp. Merlin Engineering Works, Inc. Panasonic Industrial Co. Audio Video Systems Div. <b>Penny &amp; Giles</b> ..... 54 Semiconductor Supermarket Varian Associates, Inc. Electron Device Group Vector Electronic Co., Inc.
American Image Productions Audio Kinetics, Inc. Calzone Case Co. Century 21 Programming Inc. Columbia Special Products Comprehensive Video Supply Corp. Continental Recordings Inc. De Wolfe Music Library Drummex Inc. The Music Director Programming Service Network Production Music Library Phoenix Systems, A Product of The Briner Chase Group Soper Sound Music Library Soper Sound Media Music Sound Ideas Sound Effects Library William B. Tanner Co. Inc. Thomas Valentino Inc.	CSI Electronics, Inc. CSP Inc. Continental Electronics Mfg. Co. Cosmin Electronics Eventide Clockworks, Inc. Harris Corp. Broadcast Group Kahn Communications, Inc. Shively Laboratories Div. of Howell Labs, Inc. T T E, Inc.	<b>Oscilloscope Cameras</b>	<b>Patch Panels, Jacks and Plugs</b>
<b>Narrow Band FM Equipment</b>	<b>Noise Reduction Systems</b>	Karl Heitz, Inc. Leasametric, Inc. Philips Test & Measuring Instruments, Inc.	ADC Magnetic Controls ADM Technology, Inc. A. F. Associates, Inc. ANT Telecommunications (Formerly AEG-Telefunken) ATI-Audio Technologies Inc. Altec Lansing Int'l. Atlantic Research Corp. Audio Accessories, Inc. Auditronics, Inc. AVA Electronics Avitel Electronics Ltd. B-W Lighting Systems (formerly Panoak Lighting) Brabury Ltd. <b>Broadcast Systems, Inc.</b> ..... 219 Datatronic, Inc. Dielectric Communications A Unit of General Signal DYMA Engineering, Inc. Dynamic Technology Ltd. <b>Dynatech Data Systems</b> ..... 62 Electronics Diversified, Inc. Ercona Corp. Farrtronics Ltd. Fostex Corp. of America Gentner Engineering Ghielmetti Inc. Switches & Data Devices Glenatronix (1977) Ltd. Jenel Consultants Corp. Kliegl Bros. Lighting Lumitrol, Ltd. Micro Communications, Inc. Modular Audio Products Unit of Modular Devices, Inc. Packaged Lighting Systems Patch Bay Designation Phelps Dodge Communications Co. Potomac Instruments, Inc. RCA Distributor & Special Products Div. Radio Systems Inc. Rex Rheostat & Co., Inc. Sescom, Inc. <b>Shively Laboratories Div. of Howell Labs, Inc.</b> ..... 118 Strand Century, Inc. Switchcraft Inc. <b>TEAC Corp. of America</b> ..... 27 Theatre Techniques Inc. Townsend Associates, Inc. Trompeter Electronics, Inc. Turner Engineering Union Connector Co., Inc. Vector Electronic Co., Inc. Vidaire Electronics Mfg. Corp.
CSI Electronics, Inc. Coastcom Communitec Ltd. Gorman-Redlich Mfg. Co. Marti Electronics McMartin Industries, Inc. Microdyne Corp. Modulation Associates Inc. Motorola Communications and Electronics Inc. Standard Communications Corp.	ADM Technology, Inc. ANT Telecommunications (Formerly AEG-Telefunken) ATI-Audio Technologies Inc. Advancing Technology Corp. Audio + Design (Audio & Design Recording, Inc.) Audiotechniques Inc. Coastcom dbx, Inc. Deltamod Corp. <b>Dolby Laboratories, Inc.</b> ..... 161 Faroudja Labs, Inc. Fernseh Inc. <b>Fortel Inc.</b> ..... 93 Fostex Corp. of America Gotham Audio Corp. <b>Harris Video Systems</b> ..... 82, 83 Industrial Acoustics Inovonics Inc. Integrex, Inc. Kahn Communications, Inc. MCI/Quantel MICMIX Audio Products, Inc. Microtime, Inc. Modulation Associates Inc. Philips Television Systems, Inc. Pye TVT Ltd. Broadcast Co. of Philips Siegel Electronics Straight Wire Audio, Inc. Symetrix Inc. Thomson-CSF Broadcast, Inc. UREI Inc. Valley People, Inc.	<b>Oscilloscope Vector Displays</b>	
<b>Network Joiners</b>	<b>Oscillator Transformers</b>	<b>Sencore Inc.</b> ..... 15 Tektronix Inc. Ultra Audio Pixtec	
Cetec Broadcast Group Continental Recordings Inc. ESE	Audisar Nortronics Co., Inc. Recorder Care Div.	<b>Oscilloscopes, Dual Trace</b>	
<b>Networks, Matching Audio</b>	<b>Oscillators, AM</b>	All Mobile Video B & K Precision Dynascan Corp. Glenatronix (1977) Ltd. Gould Inc. Instruments Div. Hitachi Denshi America, Ltd. <b>Leader Instruments Corp.</b> ..... 5 Leasametric, Inc. Lectrotech Inc. Motorola Communications and Electronics Inc. North American Soar Corp. Philips Test & Measuring Instruments, Inc. <b>Sencore Inc.</b> ..... 15 Tektronix Inc. VIZ Mfg. Co.	
Altec Lansing Int'l. DYMA Engineering, Inc. ProTech Audio Corp. Quad-Eight Electronics <b>Shallco, Inc.</b> ..... 120 Shure Brothers Inc. T T E, Inc. Tech Laboratories Inc.	Delta Electronics Inc. (VA) DYMA Engineering, Inc. John Fluke Mfg. Co., Inc. International Microwave Corp. Marconi Instruments Div. of Marconi Electronics Inc. Tektronix Inc.	<b>Oscilloscopes, Triggered Sweep</b>	
<b>Networks, Matching RF</b>	<b>Oscillators, FM</b>	All Mobile Video B & K Precision Dynascan Corp. Glenatronix (1977) Ltd. Gould Inc. Instruments Div. <b>Leader Instruments Corp.</b> ..... 5 Leasametric, Inc. Lectrotech Inc. Motorola Communications and Electronics Inc. North American Soar Corp. Philips Test & Measuring Instruments, Inc. <b>Sencore Inc.</b> ..... 15 Tektronix Inc. VIZ Mfg. Co.	
Afford Mfg. Co. Audiolab Electronics, Inc. CSI Electronics, Inc. CSP Inc. Comark Communications, Inc. Continental Electronics Mfg. Co. Cosmin Electronics Dielectric Communications A Unit of General Signal ESC Electronics Corp. Gabriel Electronics, Inc. <b>North Hills Electronics, Inc.</b> ..... 230 T T E, Inc. Trompeter Electronics, Inc. Wide Band Engineering Co., Inc.	Andersen Labs, Inc. John Fluke Mfg. Co., Inc. International Microwave Corp. Marconi Instruments Div. of Marconi Electronics Inc. C.N. Rood B.V. Broadcasting Div. Tektronix Inc.	<b>Oscilloscopes, Wideband</b>	
	<b>Oscillators, Tone</b>	All Mobile Video B & K Precision Dynascan Corp. Gould Inc. Instruments Div. <b>Leader Instruments Corp.</b> ..... 5 Leasametric, Inc. Lectrotech Inc. North American Soar Corp. Philips Test & Measuring Instruments, Inc. <b>Sencore Inc.</b> ..... 15	<b>Phase Converters, Single to Three Phase</b>
	ADM Technology, Inc. Altec Lansing Int'l. Audisar Bald Mountain Lab Cetec Vega Channematic, Inc. Clyde Electronics Ltd. Comex Systems Datatronic, Inc.		California Instruments Div. of Amstar Tech. Products Co., Inc. Kay Industries, Inc.
			<b>Phono Tracking Force Gauges</b>
			Shure Brothers Inc.

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
<b>Plans, Broadcast Equipment Construction</b>	Sorensen Co. A Unit of Raytheon Co. Straight Wire Audio, Inc. Vanner, Inc. VIZ Mfg. Co.	Sono-Mag Corp. Spectra Sonics Stanton Magnetics Inc. Straight Wire Audio, Inc. TTC-Wilkinson Radio Div. Tandberg of America, Inc. <b>TEAC Corp. of America</b> ..... 27 Technical Projects Ltd. Telex Communications, Inc. UREI Inc. Valley People, Inc. VIF International Westlake Audio Professional Products Mfg. Group Yamaha International Corp. Combo Div.	Nagra Magnetic Recorders, Inc. Rupert Neve Inc. Opamp Labs, Inc. ProTech Audio Corp. Quad-Eight Electronics <b>RTS Systems, Inc.</b> ..... 147 Raindirk Ltd. <b>Ramko Research Inc.</b> ..... 81 Richmond Sound Design, Ltd. ROH Corp. Scientific Systems, Inc. Sescom, Inc. Shure Brothers Inc. Solid State Logic Spectra Sonics Straight Wire Audio, Inc. Technical Projects Ltd. Ultra Audio Pixtec UREI Inc. Valley People, Inc.
Peter Albrecht Corp. Alpha Video & Electronics Co. Bowen Broadcast Service Co., Inc. CSP Inc. Centro Corp. DYMA Engineering, Inc. Gentner Engineering HN Engineering Inc. Jamieson & Associates, Inc. Jenel Consultants Corp. Lakeside Associates Inc. Kenneth R. Meades Radio Systems Inc. Radiotechniques Consulting Engineers The Real World Tech. Group, Inc. Roscor Corp. Rosner TV Systems, Inc. Soll, Inc. Studio Systems Inc. Unitel Video Masters, Inc.	<b>Power Supplies, Standby</b> Dynamote Corp. G & M Power Products Inc. HN Engineering Inc. Kay Industries, Inc. LEA, Inc. A Dynatech Co. (Formerly Lightning Elimination Assoc.) <b>M/A-Com Microwave Power Devices</b> ..... 91 Microwave Assoc. Communications North Hills Electronics, Inc. RCA Cablevision Systems RMS Electronics, Inc. Straight Wire Audio, Inc. Tech Laboratories Inc. Teledyne Energy Systems Texscan Topaz Tungstone Batteries Inc. Tweed Audio USA Inc. Vanner, Inc. Wilk Power & Video Inc.	<b>Preamplifiers, Limiter-Compressor</b> ATI-Audio Technologies Inc. Acoustilog Inc. Advancing Technology Corp. Alphaton Elektroakustik Altec Lansing Int'l. Amek Consoles Inc. Amek Systems & Controls Ltd. Aphex Systems Ltd. Ashly Audio Audio + Design (Audio & Design Recording, Inc.) Audioarts Engineering Div. of Wheatstone Corp. Calzone Case Co. Connectronics Corp. DYMA Engineering, Inc. Furman Sound, Inc. Gregg Laboratories Ivie Electronics, Inc. Orban Associates Inc. ProTech Audio Corp. Quad-Eight Electronics <b>Ramko Research Inc.</b> ..... 81 Richmond Sound Design, Ltd. Sescom, Inc. Shure Brothers Inc. Spectra Sonics Technical Projects Ltd. Ultra Audio Pixtec UREI Inc. Valley People, Inc.	<b>Preamplifiers, Microwave</b> ANT Telecommunications (Formerly AEG-Telefunken) Amplica, Inc. Avantek Inc. Broadcast Microwave Services, Inc. HDS Inc. Harris Corp. Satellite Communications Div. M/A-Com Microwave Power Devices Microwave Assoc. Communications Mu-Del Electronics, Inc. North Hills Electronics, Inc. Nurad, Inc. RHG Electronics Laboratory, Inc.
<b>Pointers, Video Screen</b> Apis Corp. Central Dynamics Corp. See also American Data Central Dynamics Ltd. Colorado Video Inc. Ednalite Corp. For-A Corp. of America Industrial Sciences, Inc. (ISI) Interand Corp. Telestrator Div. <b>Laird Telemedia Inc.</b> ..... 22	<b>Preamplifiers, Audio</b> ADM Technology, Inc. ANT Telecommunications (Formerly AEG-Telefunken) ATI-Audio Technologies Inc. Acoustilog Inc. Alphaton Elektroakustik Altec Lansing Int'l. Amek Consoles Inc. Amek Systems & Controls Ltd. American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp. Arrakis Sytems Inc. Atlantic Research Corp. Audio + Design (Audio & Design Recording, Inc.) Audio Service Corp. Audio Technology Audioarts Engineering Div. of Wheatstone Corp. Audisair Autogram Corp. Bogen Div. Lear Siegler, Inc. Broadcast Technology, Inc. Bryston Ltd. Brystonvermont Ltd. Calzone Case Co. Clyde Electronics Ltd. Connectronics Corp. Continental Electronics Mfg. Co. Crown International, Inc. Datatronix, Inc. Delta Electronics Inc. (NC) Dukane Corp. DYMA Engineering, Inc. Eddor Product Assurance Corp. Excalibur Electronics, Inc. Furman Sound, Inc. Hammond Industries Inc. Integrated Sound Systems Inc. International Nuclear Corp. Ivie Electronics, Inc. <b>Logitek Electronic Systems, Inc.</b> ..... 222 McCurdy Radio Ind. Inc. McMartin Industries, Inc. Micro-Trak Corp. Modular Audio Products Unit of Modular Devices, Inc. Rupert Neve Inc. Opamp Labs, Inc. Panasonic Co. Technics Panasonic Industrial Co. Audio Video Systems Div. ProTech Audio Corp. Quad-Eight Electronics <b>RTS Systems, Inc.</b> ..... 147 Raindirk Ltd. <b>Ramko Research Inc.</b> ..... 81 Richmond Sound Design, Ltd. Russco Electronics Mfg. Inc. Scantex Labs Inc. Sescom, Inc. Shure Brothers Inc.	<b>Preamplifiers, Turntable</b> <b>ATI-Audio Technologies Inc.</b> ..... 206 Acoustilog Inc. Advancing Technology Corp. Allied Broadcast Equipment Arrakis Sytems Inc. Audio Metrics By Radio Systems Audio Technology Audisair Broadcast Audio Corp. Broadcast Electronics, Inc. Bryston Ltd. Brystonvermont Ltd. Continental Electronics Mfg. Co. Crown International, Inc. Datatronix, Inc. DYMA Engineering, Inc. EMT-FRANZ GMBH EELA Audio, c/o Audio + Design Recording, Inc. Excalibur Electronics, Inc. Hammond Industries Inc. <b>Howe Audio Productions, Inc.</b> ..... 135 LPB Inc. <b>Logitek Electronic Systems, Inc.</b> ..... 222 McCurdy Radio Ind. Inc. McMartin Industries, Inc. Micro-Trak Corp. Modular Audio Products Unit of Modular Devices, Inc. Opamp Labs, Inc. Phoenix Audio Lab, Inc. ProTech Audio Corp. <b>RTS Systems, Inc.</b> ..... 147 Raindirk Ltd. <b>Ramko Research Inc.</b> ..... 81 <b>Russco Electronics Mfg. Inc.</b> ..... 264 Spectra Sonics <b>Stanton Magnetics Inc.</b> ..... 195 Straight Wire Audio, Inc. TTC-Wilkinson Radio Div. Technical Projects Ltd. <b>UREI Inc.</b> ..... 123 Westrex Div. Litton Industries	
<b>Power Supplies, AC</b> Altec Lansing Int'l. Anton/Bauer, Inc. Audisair Bogen Div. Lear Siegler, Inc. Broadcast Microwave Services, Inc. California Instruments Div. of Amstar Tech. Products Co., Inc. Cine 60, Inc. Delta Electronics Inc. (NC) Dynamote Corp. EELA Audio, c/o Audio + Design Recording, Inc. Frezzaolini Electronics, Inc. Hipotronics Inc. Kay Industries, Inc. M/A-Com Microwave Power Devices Magnavox CATV Systems, Inc. Microwave Assoc. Communications Modulation Associates Inc. Motorola Communications and Electronics Inc. Nagra Magnetic Recorders, Inc. Opamp Labs, Inc. Perrott Eng. Labs, Inc. Powermark Quad-Eight Electronics RCA Cablevision Systems RMS Electronics, Inc. Roscor Corp. Sorensen Co. A Unit of Raytheon Co. Straight Wire Audio, Inc. Texscan Topaz Townsend Associates, Inc. Tweed Audio USA Inc. Vanner, Inc. Wilk Power & Video Inc.	<b>Preamplifiers, Microphone</b> AB Systems Design Inc. ADM Technology, Inc. AKG Acoustics, Inc. ANT Telecommunications (Formerly AEG-Telefunken) ATI-Audio Technologies Inc. All Mobile Vicoe Alphaton Elektroakustik Altec Lansing Int'l. Amek Consoles Inc. Amek Systems & Controls Ltd. Arrakis Sytems Inc. Audio + Design (Audio & Design Recording, Inc.) Audio Service Corp. Audisair Auditronics, Inc. Autogram Corp. Bogen Div. Lear Siegler, Inc. Broadcast Technology, Inc. BrueI & Kjaer Instruments, Inc. Connectronics Corp. Crown International, Inc. Dateatek Corp. Datatronix, Inc. DYMA Engineering, Inc. Eddor Product Assurance Corp. Electro-Voice Inc. Electrocraft Consultants Ltd. Elektroimpex Furman Sound, Inc. Harrison Systems, Inc. ITI Electronics, Inc. International Nuclear Corp. Ivie Electronics, Inc. Johnson Electronics Inc. Link Electronics Ltd. McMartin Industries, Inc. Micro-Trak Corp. Modular Audio Products Unit of Modular Devices, Inc.	<b>Power Supplies, Precision</b> Altec Lansing Int'l. B & K Precision Dynascan Corp. Christie Electric Corp. Datel-Intersil Inc. Harris Corp. GSSD PRD Instruments Leader Instruments Corp. <b>M/A-Com Microwave Power Devices</b> ..... 91 Modular Audio Products Unit of Modular Devices, Inc. North American Soar Corp. North Hills Electronics, Inc. Opamp Labs, Inc. Power Products Group ProTech Audio Corp.	

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
<p>Cablewave Systems Inc. Dielectric Communications A Unit of General Signal Micro Communications, Inc. Shively Laboratories Div. of Howell Labs, Inc.</p> <p><b>Probes, Oscilloscope</b></p> <p>B &amp; K Precision Dynascan Corp. Glentronix (1977) Ltd. Leader Instruments Corp. Leasametric, Inc. Lectrotech Inc. North American Soar Corp. Philips Test &amp; Measuring Instruments, Inc. VIZ Mfg. Co.</p> <p><b>Processing Equipment, Audio</b> --See Audio Effects Systems</p> <p><b>Processing Equipment, Video</b></p> <p>ADDA Corp. Automation Techniques, Inc. Robert Bosch GmbH <b>Broadcast Video Systems, Ltd.</b> ..... 115 Dynair Electronics, Inc. Faroudja Labs, Inc. Fernseh Inc. For-A Corp. of America Grass Valley Group, Inc. Grove Corp. Knox Video Products Div. Grumman Aerospace Corp. <b>Harris Video Systems</b> ..... 82, 83 HEDCO (Hughes Elec. Devices Corp.) ICM Video Industrial Sciences, Inc. (ISI) King Instrument Corp. Knox Video Products Leitch Video Ltd. Lenco Inc. Electronics Div. MCI/Quantel Marconi Electronics Inc. Broadcast &amp; Communication Div. Microtime, Inc. Siegel Electronics Telemet Div. A Geotel, Co. Thomson-CSF Broadcast, Inc. 3M Co., Broadcast &amp; Related Products Div. URSA MAJOR, Inc.</p> <p><b>Processors, Electronic Still</b></p> <p>ADDA Corp. Harris Corp. Broadcast Group MCI/Quantel</p> <p><b>Programmer/Comparators</b></p> <p><b>Broadcast Aids, Inc.</b> <b>ESE</b> ..... 12-13 Microprobe Electronics, Inc. Tape-Athon Corp. Cavox Stereo Productions</p> <p><b>Projector Lamps/Accessories</b></p> <p>Belden Communications, Inc. Bell &amp; Howell Audio Visual Div. Calzone Case Co. Alan Gordon Enterprises Inc. Hammond Industries Inc. Kinetone Inc. L. E. Nelson Corp. Osram Sales Corp. Plastic Reel Corp. of America Schuessler Case Co., Inc. Varian Associates, Inc. Electron Device Group</p> <p><b>Projectors, Film</b></p> <p>Bell &amp; Howell Audio Visual Div. Beston Electronics Inc. Calzone Case Co. Century Precision Cine/Optics Dukane Corp. Elektroimpex Alan Gordon Enterprises Inc. Karl Heitz, Inc.</p>	<p>Kalart Victor Corp. Kinetone Inc. L-W International Laird Telemedia Inc. <b>Magna-Tech Electronic Co., Inc.</b> ..... 185 Multi-Track Magnetics, Inc. Neilson-Hordell Ltd. Pioneer Marketing Corp. RTI-Research Tech. Int'l. Radmar, Inc. Redlake Corp. Telex Communications, Inc. Westrex Div. Litton Industries The Zei-Mark Corp.</p> <p><b>Projectors, Film Rear</b></p> <p>Calzone Case Co. Dukane Corp. Kinetone Inc. Pioneer Marketing Corp. RTI-Research Tech. Int'l. Radmar, Inc.</p> <p><b>Projectors, Slide</b></p> <p>Calzone Case Co. D.O. Industries, Inc. Dukane Corp. The Great American Market Hammond Industries Inc. Kliegl Bros. Lighting Laird Telemedia Inc. RTI-Research Tech. Int'l. Radmar, Inc. Sauppe Media, Inc. Warren R. Smith Co. Telex Communications, Inc. Tiffen Mfg. Corp. The Zei-Mark Corp.</p> <p><b>Projectors, TV Large Screen</b></p> <p>Robert Bosch GmbH Calzone Case Co. Crow of Reading Ltd. Elector USA, Inc. Electrohome Ltd. Electronic Systems Products General Electric Co. Projection <b>Display Products</b> ..... 143 Image Magnification, Inc. Kalart Victor Corp. Panasonic Industrial Co. Audio Video Systems Div. Sony Corp. of America Tele-Measurements Inc. VIA Video, Inc.</p> <p><b>Projectors, Video Test Slide</b></p> <p>All Mobile Video Porta-Pattern Inc.</p> <p><b>Prompters</b></p> <p>All Mobile Video Beston Electronics Inc. Cinema Products Corp. D'San Corp. Alan Gordon Enterprises Inc. Lee-Ray Industries, Inc. <b>Listec TV Equipment Corp.</b> ..... 28 Q-TV Telescript, Inc. Vica Associates</p> <p><b>Proof Workbook (For FCC Test Requirements)</b></p> <p>All Mobile Video ComSonics, Inc.</p> <p><b>Pulse Assignment Systems</b></p> <p>Audico, Inc. Robert Bosch GmbH Central Dynamics Corp. See also American Data Central Dynamics Ltd. Grass Valley Group, Inc. Leitch Video Ltd.</p>	<p><b>Purchasing Services, Broadcast Equipment</b></p> <p>Robert Bosch GmbH CSP Inc. Centro Corp. 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TFT Inc.</p> <p><b>Receivers, Communications</b></p> <p>Artel Communications Corp. Audisar Broadcast Microwave Services, Inc. Communitronics Ltd. Datum Inc. Eddystone Radio Ltd. Harris Corp. Satellite Communications Div. Kahn Communications, Inc. Marconi Electronics Inc. Broadcast &amp; Communication Div. Meret Inc. Nagra Magnetic Recorders, Inc. Nurad, Inc. Ramsey Electronics, Inc. Scientific Radio Systems, Inc. Stoner Communications Inc.</p> <p><b>Receivers, EBS</b></p> <p>Emergency Alert Receiver Inc. Also known as EAR Inc. Gorman-Redlich Mfg. Co. International Nuclear Corp. Johnson Electronics Inc. McMartin Industries, Inc. Microwave Assoc. Communications TFT Inc.</p> <p><b>Receivers, Earth Station</b></p> <p>Amplica, Inc. Antenna Development &amp; Mfg., Inc. <b>Antenna Technology Corp.</b> ..... 52 Automation Techniques, Inc. Avantek Inc. Aydin Microwave Div. Blonder-Tongue Lab., Inc. California Microwave Coastcom Comtech Data Corp.</p>	<p>Dalsat, Inc. Discom Satellite Systems, Inc. Electrohome Ltd. GEC McMichael Ltd. Gould Inc. Dexcel Div. H &amp; R Communications Harris Corp. Satellite Communications Div. ICM Video Jerrold Div. General Instrument Corp. LNR Communications, Inc. M/A-Com DCC, Inc. McCullough Satellite Equip., Inc. McMartin Industries, Inc. Microdyne Corp. Microwave Assoc. Communications Modulation Associates Inc. NEC America, Inc. Broadcast Equip. Div. Pinzone Communications Products Inc. Radio-Research Instrument Co., Inc. Ramsey Electronics, Inc. Rockwell Int'l. Commercial Elec. Operations The Ken Schaffer Group, Inc. SED Systems Inc. Standard Communications Corp. TTC-Television Tech. Div. <b>Townsend Associates, Inc.</b> ..... 65 Triple Crown Electronics, Inc.</p> <p><b>Receivers, FM</b></p> <p>Altec Lansing Int'l. Bang &amp; Olufsen of America Bogen Div. Lear Siegler, Inc. Catal/Tomco Divs. of United Scientific Corp. Communitronics Ltd. Eddystone Radio Ltd. Emergency Alert Receiver Inc. Also known as EAR Inc. 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See Adv. Page

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International Microwave Corp.  
Johnson Electronics Inc.  
McMartin Industries, Inc.  
Meret Inc.  
Modulation Associates Inc.  
Modulation Sciences, Inc.  
Rockwell Int'l. Commercial Elec. Operations

**Receivers, SCA**

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Contel Mfg.  
Emergency Alert Receiver Inc. Also known as EAR Inc.  
Johnson Electronics Inc.  
Marti Electronics  
McMartin Industries, Inc.  
Modulation Sciences, Inc.

**Receivers, Time Signal**

Amtel Systems Inc.  
Communitronics Ltd.  
Datum Inc.  
Scientific Radio Systems, Inc.  
**True Time .....264**

**Receivers, TV**

Robert Bosch GmbH  
Elector USA, Inc.  
Electrohome Ltd.  
GEC McMichael Ltd.  
Harris Corp. Satellite Communications Div.  
Image Magnification, Inc.  
JVC Co. of America  
Meret Inc.  
Panasonic Industrial Co. Audio Video Systems Div.  
SED Systems Inc.  
Sharp Electronics Corp. Professional Products Div.  
Sony Corp. of America

**Receivers, Weather**

Advanced Designs Corp.  
Catal/Tomco Divs. of United Scientific Corp.  
Emergency Alert Receiver Inc. Also known as EAR Inc.  
Gorman-Redlich Mfg. Co.  
Kavouras Inc.  
Motorola Communications and Electronics Inc.  
Nagra Magnetic Recorders, Inc.  
Scientific Radio Systems, Inc.  
Texscan

**Recorder Care Products**

Allsop, Inc.  
Discwasher  
Hammond Industries Inc.  
Keith Monks Audio (USA) Inc.  
Panasonic Industrial Co. Audio Video Systems Div.  
Robins-Div. of Benjamin Electroproducts  
**Stanton Magnetics Inc. ....195**

**Recorder Amplifiers**

Audio Service Corp.  
Calzone Case Co.  
Datatronix, Inc.  
Gould Inc. Instruments Div.  
Inovonics Inc.  
**International Tapetronics Corp./3M .....100-101**  
Studer Revox America  
Taber Mfg. & Eng. Co.  
Telectro Systems Corp.  
Telex Communications, Inc.  
United Research Lab Corp.

See Adv. Page

VIF International  
Westrex Div. Litton Industries

**Recorder Care Products**

Allsop, Inc.  
Comprehensive Video Supply Corp.  
Discwasher  
Fidelipac Corp.  
Marathon Products Corp.  
Nortronics Co., Inc. Recorder Care Div.  
RTI-Research Tech. Int'l.  
Robins-Div. of Benjamin Electroproducts  
See Hear Industries Div. of RJA Inc.  
Tandberg of America, Inc.  
VIF International

**Recorder Carrying Systems, Videotape Portable**

All Mobile Video  
Audio Service Corp.  
Robert Bosch GmbH  
Calzone Case Co.  
Comprehensive Video Supply Corp.  
Javelin Electronics  
Lee-Ray Industries, Inc.  
Panasonic Industrial Co. Audio Video Systems Div.  
Thermodyne International Ltd.  
Wheelit, Inc.

**Recorder Drive Motor Power Supply Units**

Datatronix, Inc.  
Merlin Engineering Works, Inc.

**Recorder Modification/Attachments, Extended Play**

Channematic, Inc.  
Merlin Engineering Works, Inc.  
Recortec, Inc.

**Recorder Modifications, Reel Servo**

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Alpha Video & Electronics Co.  
Audio Service Corp.  
Inovonics Inc.  
Merlin Engineering Works, Inc.  
Mineroff Electronics, Inc. Uher Products  
Multi-Track Magnetics, Inc.  
Recortec, Inc.  
Telectro Systems Corp.

**Recorder Reconditioning, Videotape**

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Bowen Broadcast Service Co., Inc.  
Merlin Engineering Works, Inc.  
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Taber Mfg. & Eng. Co.  
Turner Engineering  
Video Masters, Inc.

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Century 21 Programming Inc.  
United Research Lab Corp.

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Inovonics Inc.  
Merlin Engineering Works, Inc.  
Mineroff Electronics, Inc. Uher Products  
Opamp Labs, Inc.  
Taber Mfg. & Eng. Co.  
United Research Lab Corp.

See Adv. Page

VIF International

**Recorder Replacement Motors**

Century 21 Programming Inc.  
Merlin Engineering Works, Inc.  
UMC Electronics Co. Broadcast Products Div.  
VIF International

**Recorder Tape Tension Controls, Audio**

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Marathon Products Corp.  
Tentel

**Recorder Tape Tension Controls, VTR**

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Recortec, Inc.  
Tentel

**Recorder Tape Tension Gauges**

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Technical Projects Ltd.  
Tentel  
VIF International

**Recorder Velocity Error Correctors**

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**Recorder V-Lock Helical Attachments**

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Broadcast Controls Div. Of Automated Broadcast Controls  
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Century 21 Programming Inc.  
Cetec Broadcast Group  
Contel Mfg.  
Continental Electronics Mfg. Co.  
EMT-FRANZ GMBH  
International Electro-Magnetics  
**International Tapetronics Corp./3M .....100-101**  
The Management  
McCurdy Radio Ind. Inc.  
Micro-Trak Corp.  
**Pacific Recorders & Eng. Corp. ....111**  
RCA Broadcast Systems  
**Ramko Research Inc. ....81**  
**The L.J. Scully Mfg. Corp. ....266**  
Sono-Mag Corp.  
Telex Communications, Inc.  
UMC Electronics Co. Broadcast Products Div.

**Recorders, Audio Cassette**

Amilon Corp.  
Bang & Olufsen of America  
Bell & Howell Audio Visual Div.  
Calzone Case Co.  
Fostex Corp. of America  
Hammond Industries Inc.  
International Electro-Magnetics  
Micro-Trak Corp.  
Neal Ferrograph U.S.A., Inc.

See Adv. Page

Panasonic Co. Technics  
Panasonic Industrial Co. Audio Video Systems Div.  
RTI-Research Tech. Int'l.  
Scribe Recorders, Inc.  
See Hear Industries Div. of RJA Inc.  
Sharp Electronics Corp. Professional Products Div.  
Sony Professional Audio  
Studer Revox America  
Tandberg of America, Inc.  
TEAC Corp. of America  
Telex Communications, Inc.  
Tiffen Mfg. Corp.  
Yamaha International Corp. Combo Div.

**Recorders, Audio Reel**

Accurate Sound Corp.  
**Ampex Corp. ....77**  
Ampro/Scully Div. Ram Mfg. Inc.  
Audiotechniques Inc.  
Calzone Case Co.  
Century 21 Programming Inc.  
Cetec Broadcast Group  
**Dictaphone Corp. ....179**  
Enertec/Schlumberger Dept. Audio Professional  
Fostex Corp. of America  
Alan Gordon Enterprises Inc.  
Gotham Audio Corp.  
Hammond Industries Inc.  
International Tapetronics Corp./3M  
J.C. Audio Distributors  
**MCI, Div. of Sony Corp. of America ....228-229**  
The Management  
McCurdy Radio Ind. Inc.  
Micro-Trak Corp.  
Mineroff Electronics, Inc. Uher Products  
Nagra Magnetic Recorders, Inc. .80  
Neal Ferrograph U.S.A., Inc.  
**Otari Corp. ....47**  
Pacific Recorders & Eng. Corp.  
Panasonic Co. Technics  
Panasonic Industrial Co. Audio Video Systems Div.  
Ramko Research Inc.  
**The L.J. Scully Mfg. Corp. ....266**  
Sony Professional Audio  
Soundcraft Inc.  
**Studer Revox America ....25**  
**Tandberg of America, Inc. ....78**  
TEAC Corp. of America  
Telectro Systems Corp.  
Telex Communications, Inc.  
United Research Lab Corp.  
VIF International  
Zellan Enterprises, Ltd.

**Recorders, Digital Audio**

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UREL Inc.

**Recorders, Digital Video**

Ampex Corp.  
Calzone Case Co.  
Oktel Corp.

**Recorders, Program Logging**

Accurate Sound Corp.  
Amilon Corp.  
Channematic, Inc.  
**Dictaphone Corp. ....179**  
Foundation Elec. Instruments Inc.  
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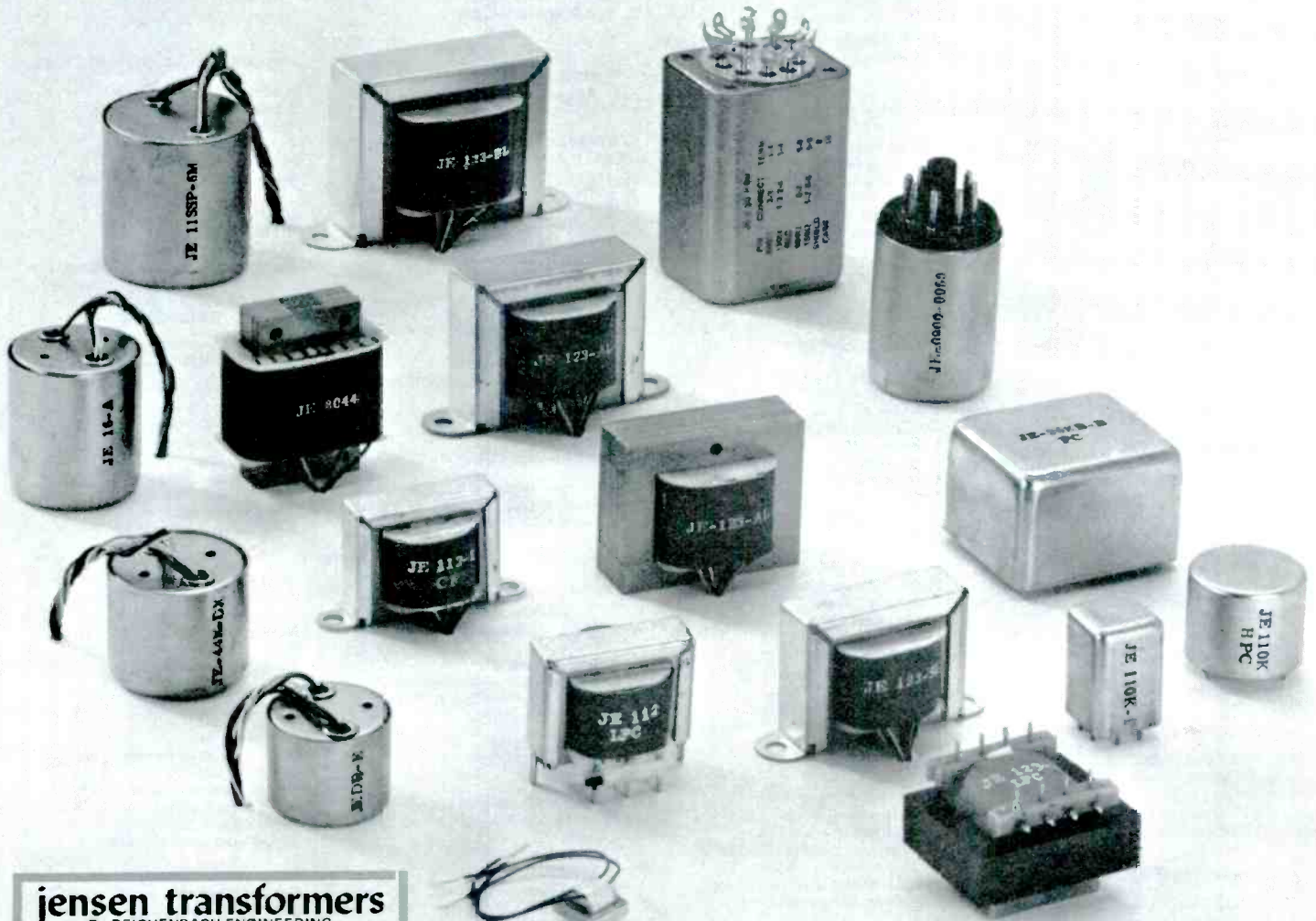
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- | See Adv. Page  | See Adv. Page  | See Adv. Page  | See Adv. Page  |
|--|--|--|--|
| <p>QSI Systems Inc.<br/>Sono-Mag Corp.<br/>Sony Corp. of America<br/>SoundScriber Magnetic Recording Co., Inc.<br/>Stancil Corp.<br/>Studer Revox America<br/><b>Tandberg of America, Inc. .... 78</b><br/>Telectro Systems Corp.<br/>Telex Communications, Inc.</p> <p><b>Recorders, Videodisc/Slow Motion</b></p> <p>A. F. Associates, Inc.<br/>Eigen Video<br/>Fernseh Inc.<br/>Marconi Electronics Inc. Broadcast &amp; Communication Div.<br/>Oktel Corp.<br/>Panasonic Industrial Co. Audio Video Systems Div.<br/>Precision Echo<br/>Sony Corp. of America<br/>TEAC Corp. of America</p> <p><b>Recorders, Videotape 2-inch Cartridge</b></p> <p>Bowen Broadcast Service Co., Inc.<br/>KAVCO, Inc.<br/>RCA Broadcast Systems</p> <p><b>Recorders, Videotape Cassette</b></p> <p>All Mobile Video<br/>Alpha Video &amp; Electronics Co.<br/>Robert Bosch GmbH<br/>Calzone Case Co.<br/>Delcom Corp.<br/><b>Fernseh Inc. .... 103</b><br/>Hitachi Denshi America, Ltd.<br/>Ikegami Electronics (U.S.A.), Inc.<br/>JVC Co. of America<br/>Javelin Electronics<br/>Motorola Communications and Electronics Inc.<br/>National Video Services<br/><b>Panasonic Industrial Co. Audio Video Systems Div. .... 50-51</b><br/>RCA Broadcast Systems<br/>Recortec, Inc.<br/>Sharp Electronics Corp. Professional Products Div.<br/>Sony Corp. of America<br/>TEAC Corp. of America</p> <p><b>Recorders, Videotape 1-inch Helical</b></p> <p>A. F. Associates, Inc.<br/>All Mobile Video<br/>Ampex Corp.<br/>Robert Bosch GmbH<br/>Calzone Case Co.<br/>Fernseh Inc.<br/>Hitachi Denshi America, Ltd.<br/>International Video Corp.<br/>Marconi Communication Systems Ltd.<br/>Marconi Electronics Inc. Broadcast &amp; Communication Div.<br/>Pye TVT Ltd. Broadcast Co. of Philips<br/>RCA Broadcast Systems<br/>Sony Corp. of America<br/>3M Co., Broadcast &amp; Related Products Div.<br/>Video Rentals, Inc.</p> <p><b>Recorders, Videotape Quad</b></p> <p>A. F. Associates, Inc.<br/>All Mobile Video<br/>Merlin Engineering Works, Inc.<br/>RCA Broadcast Systems<br/>Video Rentals, Inc.</p> <p><b>Recording Services, Audiotape</b></p> <p>Audio Kinetics, Inc.<br/>Calzone Case Co.<br/>Command Productions Radio Broadcasting Services<br/>Koplar Communications Center</p> | <p>Media Concepts, Inc.<br/>Old Dominion Broadcast Eng. Service<br/>Schoeps/Posthorn Recordings<br/>Sound Ideas Sound Effects Library<br/>Tape-Athlon Corp. Cavox Stereo Productions<br/>Thomas Valentino Inc.</p> <p><b>Recording Services, Videotape to Film</b></p> <p>Audio Kinetics, Inc.<br/>Calzone Case Co.<br/>Devlin Productions, Inc.<br/>De Wolfe Music Library<br/>Image Transform, Inc.<br/>Radmar, Inc.</p> <p><b>Recording Synchronizers</b></p> <p>Adams-Smith<br/>Ampex Corp.<br/><b>Audio Kinetics, Inc. .... 42</b><br/>Audio Service Corp.<br/>The BTX Corp.<br/>Central Dynamics Corp. See also American Data<br/>Control Video Corp.<br/>Datum Inc.<br/><b>MCI, Div. of Sony Corp. of America .... 228-229</b><br/>Magna-Tech Electronic Co., Inc.<br/>Mineroff Electronics, Inc. Uher Products<br/>Nagra Magnetic Recorders, Inc. .80<br/><b>Studer Revox America .... 25</b><br/>Telex Communications, Inc.<br/>Tiffen Mfg. Corp.</p> <p><b>Reel Storage/Retrieval Systems, Film and VTR</b></p> <p>Calzone Case Co.<br/>The Durafilm Co.<br/>Drummex Inc.<br/>DYMA Engineering, Inc.<br/>Goldberg Brothers Inc.<br/>Neumade Industries, Inc.<br/>Plastic Reel Corp. of America<br/>Quickscan Systems Ltd.<br/>RTI-Research Tech. Int'l.<br/>Schuessler Case Co., Inc.<br/>Storeel Corp.<br/>Wallach &amp; Associates Inc.<br/><b>Winsted Corp. .... 244</b></p> <p><b>Reels, Audiotape</b></p> <p>Ampex Corp.<br/>Burlington Audio Tapes, Inc.<br/>Century 21 Programming Inc.<br/>Continental Recordings Inc.<br/>Fidelipac Corp.<br/>Fostex Corp. of America<br/>Goldberg Brothers Inc.<br/>Maxell Corp. of America<br/>Mineroff Electronics, Inc. Uher Products<br/>The Music Director Programming Service<br/>Panasonic Industrial Co. Audio Video Systems Div.<br/>Plastic Reel Corp. of America<br/><b>Polyline Corp. .... 244</b><br/>Schuessler Case Co., Inc.<br/>See Hear Industries Div. of RJA Inc.<br/>Studer Revox America<br/>TEAC Corp. of America<br/>3M Co. Magnetic A/V Products Div.</p> <p><b>Reels, Cable</b></p> <p>Andrew Corp.<br/>Brabury Ltd.<br/>D'San Corp.<br/>E-N-G Corp. Electronic News Group<br/><b>Clifford B. Hannay &amp; Son, Inc. .... 90</b><br/>Keith Monks Audio (USA) Inc.<br/>Reel-O-Matic Systems, Inc.</p> <p><b>Reels, Videotape</b></p> <p>Ampex Corp.</p> | <p>Robert Bosch GmbH<br/>Calzone Case Co.<br/><b>Fuji Photo Film USA, Inc. Magnetic Products Div. .... 183</b><br/>Goldberg Brothers Inc.<br/>Maxell Corp. of America<br/>Panasonic Industrial Co. Audio Video Systems Div.<br/>Plastic Reel Corp. of America<br/><b>Polyline Corp. .... 244</b><br/>Schuessler Case Co., Inc.<br/>Sony Corp. of America<br/>3M Co. Magnetic A/V Products Div.</p> <p><b>Reflectors, Passive</b></p> <p>Fort Worth Tower Co.<br/>Microflect Co., Inc.</p> <p><b>Reflectors, Time Domain (TDR)</b></p> <p>Avtek Inc.<br/>Biddle Instruments<br/>Radar Engineers Div. of Epic Corp.<br/>Tektronix Inc.</p> <p><b>Regulators, Voltage</b></p> <p>California Instruments Div. of Amstar Tech. Products Co., Inc.<br/>Continental Electronics Mfg. Co.<br/>Hipotronics Inc.<br/>Kay Industries, Inc.<br/>LEA, Inc. A Dynatech Co. (Formerly Lightning Elimination Assoc.)<br/>Motorola Semiconductor Products Inc.<br/>Powermark<br/>Straight Wire Audio, Inc.<br/>The Superior Electric Co.<br/><b>Townsend Associates, Inc. .... 65</b></p> <p><b>Remote Antennas -- See Antennas, Remote</b></p> <p><b>Remote Broadcast Cue Systems</b></p> <p><b>BSM Systems .... 187</b><br/>Cetec Vega<br/>Channematic, Inc.<br/>Comrex Corp.<br/>DYMA Engineering, Inc.<br/>Dynamic Technology Ltd.<br/>HM Electronics, Inc.<br/>McMartin Industries, Inc.<br/>Moseley Associates, Inc.<br/>Motorola Communications and Electronics Inc.<br/>ProTech Audio Corp.<br/>RCI (Recording Consultants Inc.)<br/>Studio Systems Inc.<br/>Telfax Communications</p> <p><b>Remote Control Monitors, VIT</b></p> <p>Grumman Aerospace Corp.<br/>Marconi Instruments Div. of Marconi Electronics Inc.<br/><b>Moseley Associates, Inc. .... 226</b><br/>Philips Test &amp; Measuring Instruments, Inc.<br/>Studio Systems Inc.</p> <p><b>Remote Control Systems</b></p> <p>Adams-Smith<br/>American Laser Systems, Inc.<br/>Antenna Development &amp; Mfg., Inc.<br/>Auburn Instruments<br/><b>Audio Kinetics, Inc. .... 42</b><br/>Audio Service Corp.<br/><b>Auditronics, Inc. .... 68</b><br/><b>BSM Systems .... 187</b><br/>Broadcast Microwave Services, Inc.<br/>Catel/Tomco Divs. of United Scientific Corp.<br/>Cetec Vega<br/>Channematic, Inc.<br/>Comark Communications, Inc.<br/>Commerce Airborne Div. IFR Avionics, Inc.<br/>Continental Electronics Mfg. Co.<br/>Control Video Corp.<br/>Delta Electronics Inc. (VA)</p> | <p>D'San Corp.<br/>DYMA Engineering, Inc.<br/>Dynamic Technology Ltd.<br/>The Engineering Lab, Inc.<br/>Glenitronix (1977) Ltd.<br/>Graham-Patten Systems, Inc.<br/>Hallikainen &amp; Friends, Inc.<br/>Harris Corp. Broadcast Group<br/>Harrison Systems Ltd.<br/><b>Hitachi Denshi America, Ltd. .... 3</b><br/><b>Image Video Ltd. .... 121</b><br/>International Video Corp.<br/>Kaitronics Corp.<br/>KAVCO, Inc.<br/>Marconi Communication Systems Ltd.<br/>Marconi Instruments Div. of Marconi Electronics Inc.<br/>Marti Electronics<br/>Microwave Assoc. Communications Modulation Associates Inc.<br/>Monroe Electronics, Inc.<br/>Moseley Associates, Inc.<br/>National Video Services<br/>Nurad, Inc.<br/>Potomac Instruments, Inc.<br/>ProTech Audio Corp.<br/>QEI Corp.<br/>Quick-Set Inc.<br/>Richmond Sound Design, Ltd.<br/>Scientific Radio Systems, Inc.<br/>Soll, Inc.<br/>H. A. Solutec Ltd.<br/>Sono-Mag Corp.<br/>Studio Systems Inc.<br/>Symetrix Inc.<br/><b>TFT Inc. .... 104</b><br/>Tele-Cine Corp. Div. of Schneider Corp. of America<br/>Tele-Measurements Inc.<br/>Torpey Controls &amp; Eng. Ltd.</p> <p><b>Remote Pickup Systems, Radio</b></p> <p>Audiocom Electronics Inc.<br/>Broadcast Int'l. Inc.<br/>Communitronics Ltd.<br/>Comrex Corp.<br/>Harrison Systems Ltd.<br/>International Microwave Corp.<br/><b>Marti Electronics .... 20</b><br/>McMartin Industries, Inc.<br/>Micro-Trak Corp.<br/>Moseley Associates, Inc.<br/>Motorola Communications and Electronics Inc.<br/>Sony Corp. of America<br/>Telfax Communications</p> <p><b>Remote Pickup Systems, TV</b></p> <p>AVT TV Productions<br/>Alpha Video &amp; Electronics Co.<br/>Broadcast Microwave Services, Inc.<br/>Broadcast Systems, Inc.<br/>Comrex Corp.<br/>Harris Corp. Broadcast Microwave<br/>Harrison Systems Ltd.<br/>International Microwave Corp.<br/>Lang Video Systems Corp.<br/><b>M/A-Com Microwave Power Devices .... 91</b><br/>Microwave Assoc. Communications<br/>Motorola Communications and Electronics Inc.<br/>Nurad, Inc.<br/>Studio Systems Inc.<br/>Telfax Communications</p> <p><b>Rental Equipment</b></p> <p>Acoustilog Inc.<br/>American Laser Systems, Inc.<br/>Audio Service Corp.<br/>Belden Communications, Inc.<br/>Birms &amp; Sawyer Inc.<br/>Robert Bosch GmbH<br/>CFA-Media Specialties, Inc.<br/><b>The Camera Mart, Inc. .... 4</b><br/>Center Video Center<br/>Cetec Antennas<br/>Cinema Products Corp.<br/>Clear-Com Intercom Systems<br/>Crow of Reading Ltd.<br/><b>Dictaphone Corp. .... 179</b><br/>ENG Helicopter Satellites, Ltd.</p> |



See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
<p>Film/Video Equip. Service Co. General TV Network Alan Gordon Enterprises Inc. <b>Laumic Co., Inc.</b> .....263 Leasametric, Inc. Microwave Assoc. Communications L. Matthew Miller Associates Ltd. Old Dominion Broadcast Eng. Service One Pass Film &amp; Video Plastic Reel Corp. of America Quick-Set Inc. Roscor Corp. Schoeps/Posthorn Recordings Solid Electronics Labs Tele-Cine Corp. Div. of Schneider Corp. of America Tele-Measurements Inc. Trident (USA) Inc. U.S. Instrument Rentals, Inc. Video Masters, Inc. Video Rentals, Inc.</p> <p><b>Reverberation Systems</b></p> <p>AKG Acoustics, Inc. Advanced Music Systems Altec Lansing Int'l. Comex Systems Connectronics Corp. DYMA Engineering, Inc. EMT-FRANZ GMBH Electro-Voice Inc. <b>Eventide Clockworks, Inc.</b> .....60 Fostex Corp. of America Furman Sound, Inc. Gotham Audio Corp. Lexicon Inc. MICMIX Audio Products, Inc. Opamp Labs, Inc. Orban Associates Inc. Quad-Eight Electronics Sony Professional Audio Studio Technologies, Inc. Trident (USA) Inc. URSA MAJOR, Inc.</p> <p><b>Rewinders, Film</b></p> <p>The Durafilm Co. Goldberg Brothers Inc. K B Systems Kalart Victor Corp. Kintone Inc. Lipsner-Smith Co. Subsidiary of RTI Neumade Industries, Inc. Plastic Reel Corp. of America RTI-Research Tech. Int'l.</p> <p><b>Rewinders, Tape</b></p> <p>Audico, Inc. Mitomo Co., Ltd. Neumade Industries, Inc. RTI-Research Tech. Int'l.</p> <p><b>Satellite Communications/Systems</b></p> <p>Alpha Video &amp; Electronics Co. American Laser Systems, Inc. Amplica, Inc. Andrew Corp. Antenna Development &amp; Mfg., Inc. <b>Antenna Technology Corp.</b> .....52 Atlantic Satellite Communications, Inc. Automation Techniques, Inc. California Microwave Catel/Tomco Divs. of United Scientific Corp. Coastcom Compucon, Inc. Comsearch, Inc. Comtech Antenna Corp. <b>Comtech Data Corp.</b> .....24 Dalsat, Inc. Discom Satellite Systems, Inc. Electrohome Ltd. Gabriel Electronics, Inc. Gillaspie &amp; Associates Inc. Gould Inc. Dexcel Div. Grumman Aerospace Corp. HN Engineering Inc. H &amp; R Communications Harris Corp. Broadcast Group</p>	<p>Harris Corp. Satellite Communications Div. Jamieson &amp; Associates, Inc. Jenel Consultants Corp. M/A-Com DCC, Inc. <b>MCL Inc.</b> .....232 McCullough Satellite Equip., Inc. McMartin Industries, Inc. <b>Microdyne Corp.</b> .....99 Microprobe Electronics, Inc. Microwave Assoc. Communications Misar Industries Modulation Associates Inc. Oak Communications Inc. Pinzone Communications Products Inc. RCA American Communications Radio-Research Instrument Co., Inc. Ramsey Electronics, Inc. Rosner TV Systems, Inc. SatCom Technologies, Inc. An RSi Co. Satellite Transmission Systems, Inc. A CA Microwave, Inc. Subsidiary The Ken Schaffer Group, Inc. Scientific-Atlanta, Inc. SED Systems Inc. Sigmacom Systems Inc. Spar Aerospace Ltd. Satellite &amp; Aerospace Sys. Div. Spectrum Planning Inc. Tele-Measurements Inc. <b>Townsend Associates, Inc.</b> .....65 Western Union Video Services</p> <p><b>Satellite Program Distribution Services</b></p> <p>Coastcom Harris Corp. Satellite Communications Div. Kavouras Inc. Koplar Communications Center Microprobe Electronics, Inc. Oak Communications Inc. Quickscan Systems Ltd. RCA American Communications Sigmacom Systems Inc. Western Union Video Services</p> <p><b>SCA Equipment</b></p> <p>BBL Industries, Inc. <b>Circuit Research Labs, Inc.</b> .....239 Colorado Video Inc. Emergency Alert Receiver Inc. Also known as EAR Inc. Johnson Electronics Inc. Marti Electronics McMartin Industries, Inc. Microwave Assoc. Communications Modulation Associates Inc. <b>Modulation Sciences, Inc.</b> .....199 Moseley Associates, Inc. C.N. Rood B.V. Broadcasting Div. TFT Inc. Tepco Corp.</p> <p><b>SCPC Systems</b></p> <p><b>Comtech Data Corp.</b> .....24 Modulation Associates Inc. Scientific-Atlanta, Inc.</p> <p><b>Screens, Projection</b></p> <p>Arben Design Robert Bosch GmbH Bretford Mfg. Co. Da-Lite Screen Co., Inc. Electrohome Ltd. Kintone Inc. Raven Screen Corp. Rosco Labs Inc. The Screen Works, Ltd. Theatrical Services Inc.</p> <p><b>Semiconductors, Hybrid Circuits</b></p> <p>Amperex Electronic Corp.</p> <p><b>Semiconductors, ICs</b></p> <p>Alpha Electronics, Inc. Avantek Inc. Datel-Intersil Inc.</p>	<p>Fairchild Camera &amp; Instrument Corp. CCD Imaging Div. Motorola Semiconductor Products Inc. Opamp Labs. Inc. Panasonic Industrial Co. Audio Video Systems Div. RCA Distributor &amp; Special Products Div. Semiconductor Supermarket Valley People, Inc.</p> <p><b>Semiconductors, Microprocessor</b></p> <p>Motorola Semiconductor Products Inc. Panasonic Industrial Co. Audio Video Systems Div. RCA Distributor &amp; Special Products Div. Semiconductor Supermarket Westinghouse Electric Corp. Semiconductor Div.</p> <p><b>Semiconductors, Rectifier High Voltage Stack</b></p> <p>Amperex Electronic Corp. Eagle Hill Electronics, Inc. Electronic Devices, Inc. Motorola Semiconductor Products Inc. RCA Distributor &amp; Special Products Div. Semiconductor Supermarket Wilkinson Radio Div. Westinghouse Electric Corp. Semiconductor Div.</p> <p><b>Semiconductors, Rectifier Power</b></p> <p>Amperex Electronic Corp. Electronic Devices, Inc. Motorola Semiconductor Products Inc. RCA Distributor &amp; Special Products Div. Semiconductor Supermarket Westinghouse Electric Corp. Semiconductor Div.</p> <p><b>Semiconductors, Rectifier SCR/Thyristor</b></p> <p>Amperex Electronic Corp. Motorola Semiconductor Products Inc. Panasonic Industrial Co. Audio Video Systems Div. RCA Distributor &amp; Special Products Div. Richardson Electronics Ltd. Semiconductor Supermarket Varian Associates, Inc. Electron Device Group Westinghouse Electric Corp. Semiconductor Div.</p> <p><b>Semiconductors, Rectifier Signal</b></p> <p>Amperex Electronic Corp. Electronic Devices, Inc. Motorola Semiconductor Products Inc. RCA Distributor &amp; Special Products Div. Semiconductor Supermarket Varian Associates, Inc. Electron Device Group Westinghouse Electric Corp. Semiconductor Div.</p> <p><b>Semiconductors, Transistors</b></p> <p>Alpha Electronics, Inc. Amperex Electronic Corp. Avantek Inc. R. F. Gain, Ltd. Motorola Semiconductor Products Inc. Panasonic Industrial Co. Audio Video Systems Div. RCA Distributor &amp; Special Products Div. Richardson Electronics Ltd. Semiconductor Supermarket TRW Semiconductors Varian Associates, Inc. Electron Device Group</p>	<p>Westinghouse Electric Corp. Semiconductor Div.</p> <p><b>Sensors, Tone</b></p> <p>Century 21 Programming Inc. Cetec Vega Channematic, Inc. Modulation Associates Inc. Monroe Electronics, Inc. ProTech Audio Corp. TM Systems, Inc. VIF International</p> <p><b>Services, Standards Conversion</b></p> <p>Atlantic Satellite Communications, Inc. Audio Plus Video Int'l.</p> <p><b>Set-up Trucks</b></p> <p>CFA-Media Specialties, Inc. Centro Corp. Neumade Industries, Inc. Roscor Corp. Storeel Corp. Studio Systems Inc. <b>Winsted Corp.</b> .....244</p> <p><b>Shifters, Phase Microwave</b></p> <p>Dielectric Communications A Unit of General Signal Microwave Assoc. Communications The Narda Microwave Corp. North Hills Electronics, Inc.</p> <p><b>Slide Services</b></p> <p>The Graphic Express Corp.</p> <p><b>Slow Scan TV Systems</b></p> <p>American Laser Systems, Inc. Colorado Video Inc. GEC McMichael Ltd. Interand Corp. Telestrator Div. International Video Corp. Javelin Electronics NEC America, Inc. Broadcast Equip. Div. The Ken Schaffer Group, Inc.</p> <p><b>Sound Effect Systems</b></p> <p>Advanced Music Systems Alphaton Elektroakustik Altec Lansing Int'l. <b>Audio + Design (Audio &amp; Design Recording, Inc.)</b> .....165 <b>Audio Kinetics, Inc.</b> .....42 Century 21 Programming Inc. Comprehensive Video Supply Corp. Continental Recordings Inc. dbx, Inc. De Wolfe Music Library DYMA Engineering, Inc. Eventide Clockworks, Inc. <b>Inovonics Inc.</b> .....224 Klark-Teknik Electronics Lexicon Inc. Richmond Sound Design, Ltd. The Ken Schaffer Group, Inc. Sound Ideas Sound Effects Library UMC Electronics Co. Broadcast Products Div. UREI Inc. URSA MAJOR, Inc. Thomas Valentino Inc.</p> <p><b>Sound Systems, Automatic Level Control</b></p> <p>ANT Telecommunications (Formerly AEG-Telefunken) ATI-Audio Technologies Inc. Alphaton Elektroakustik Altec Lansing Int'l. <b>Audio + Design (Audio &amp; Design Recording, Inc.)</b> Eddor Product Assurance Corp. Ivie Electronics, Inc. McMartin Industries, Inc.</p>

See Adv. Page

See Adv. Page

See Adv. Page

See Adv. Page

ProTech Audio Corp.  
United Media, Inc.  
UREI Inc.  
Valley People, Inc.

**Sound Systems, Studio**

ANT Telecommunications (Formerly AEG-Telefunken)  
ATI-Audio Technologies Inc.  
Alphaton Elektroakustik  
Altec Lansing Int'l  
Anchor Systems, Inc.  
Audioarts Engineering Div of Wheatstone Corp.  
Audisar  
Auratone Corp.  
Bode Sound Co.  
Bogen Div. Lear Siegler, Inc.  
Brabury Ltd.  
Cetec Broadcast Group  
Delta Electronics Inc. (NC)  
Deltamod Corp.  
DYMA Engineering, Inc.  
Electro-Voice Inc.  
Electrocraft Consultants Ltd  
Fostex Corp. of America  
Gotham Audio Corp.  
Hartley Products Corp.  
Hoppmann Corp.  
Integrated Sound Systems Inc.  
Jamieson & Associates, Inc.  
Lakeside Associates Inc.  
James B. Lansing Sound, Inc.  
McMartin Industries, Inc.  
Micro-Trak Corp.  
**Rupert Neve Inc. .... 11**  
Panasonic Industrial Co. Audio Video Systems Div.  
Peirce-Phelps Inc. Video Systems Div.  
ProTech Audio Corp.  
Quad-Eight Electronics  
Richmond Sound Design, Ltd.  
Russco Electronics Mfg. Inc.  
**Soundcraft Inc. .... 233**  
Sounder Electronics Inc.  
Spectra Sonics  
Telectro Systems Corp.  
Turner Engineering  
Tweed Audio USA Inc.  
Ultra Audio Pixtec  
UREI Inc.  
Westlake Audio Professional Products Mfg. Group  
**Yamaha International Corp. Combo Div. .... 113, 114**

**Speakers and Enclosures**

AB Systems Design Inc.  
Altec Lansing Int'l.  
Amperex Electronic Corp.  
Anchor Systems, Inc.  
Argos Products Co., Inc.  
Atlas Sound  
Audio Service Corp.  
Audio-Technica U.S., Inc.  
Audisar  
Auernheimer Laboratories & Co.  
Auratone Corp.  
Bang & Olufsen of America  
Bogen Div. Lear Siegler, Inc.  
Broadcast Audio Corp.  
Community Light & Sound, Inc.  
DYMA Engineering, Inc.  
Ercona Corp.  
Fostex Corp. of America  
Hartley Products Corp.  
Integrated Sound Systems Inc.  
Lakeside Associates Inc.  
James B. Lansing Sound, Inc.  
**Logitek Electronic Systems, Inc. .... 222**  
Modular Sound Systems Inc. DBA-Bag End  
Panasonic Co. Technics  
Panasonic Industrial Co. Audio Video Systems Div.  
Perma Power Electronics, Inc.  
Pyramid Loudspeaker Corp.  
Quam-Nichols Co.  
RTI-Research Tech. Int'l.  
Russco Electronics Mfg. Inc.  
Sharp Electronics Corp. Professional Products Div.

Spectra Sonics  
Stoner Communications Inc.  
Studer Revox America  
Telectro Systems Corp.  
Thermodyne International Ltd.  
Ultra Audio Pixtec  
UREI Inc.  
VIF International  
Westlake Audio Professional Products Mfg. Group  
Yamaha International Corp. Combo Div.

**Spindle Height Gauges**

Merlin Engineering Works, Inc.  
Tentel

**STL Equipment**

Andrew Corp.  
Artel Communications Corp.  
Avantek Inc.  
Aydin Microwave Div  
Broadcast Microwave Services, Inc.  
Contel Mfg.  
DYMA Engineering, Inc.  
HN Engineering Inc.  
Harris Corp. Broadcast Group  
Harris Corp. Broadcast Microwave  
Hughes Aircraft Co. Microwave Communications Products  
International Microwave Corp.  
Lang Video Systems Corp.  
Leasametric, Inc.  
Marti Electronics  
Microwave Assoc. Communications  
**Moseley Associates, Inc. .... 227**  
NEC America, Inc. Broadcast Equip. Div.  
Nurad, Inc.  
Pihler Electronica S. A.  
Power Pak Systems, Inc.  
R.F. Technology, Inc.  
RHG Electronics Laboratory, Inc.  
Rockwell Int'l. Commercial Elec. Operations  
C.N. Rood B.V. Broadcasting Div.  
**TFT Inc. .... 76**  
Tepco Corp.

**Standard Converters**

A. F. Associates, Inc.  
Broadcast Video Systems, Ltd. .... 115  
GEC McMichael Ltd.  
Image Transform, Inc.  
MCI/Quantel  
Marconi Electronics Inc. Broadcast & Communication Div.  
Merlin Engineering Works, Inc.  
Video Int'l.

**Static Suppressors**

Racal-Decca Canada Inc. Insulators Div.

**Still Storers --See Frame/Field Storers****Stopwatches, Digital**

D'San Corp.  
**ESE .... 12-13**  
Evertz Microsystems Div. of Dynaquip Ltd.  
**Feldmar Watch & Clock Center. .... 234**  
Glentronix (1977) Ltd.  
High Country Engineering  
Jules Racine & Co., Inc.  
Torpey Controls & Eng. Ltd.

**Storage Racks, Film and Tape Container**

Allied Broadcast Equipment  
Aristocart Div., Western Int'l. Communications, Ltd.  
Bretford Mfg. Co.  
Calzone Case Co.  
Drummex Inc.

DYMA Engineering, Inc.  
Equipto  
Fidelipac Corp.  
Goldberg Brothers Inc.  
McCurdy Radio Ind. Inc.  
Micro-Trak Corp.  
Neumade Industries, Inc.  
Plastic Reel Corp. of America  
RTI-Research Tech. Int'l.  
Rack Techniques Corp.  
Schuessler Case Co., Inc.  
Smith-Victor Corp.  
Storeel Corp.  
Wallach & Associates Inc.  
**Winsted Corp. .... 244**

**Studio Design and Construction Services**

A. F. Associates, Inc.  
Acoustic Design by Jeff Cooper  
Peter Albrecht Corp.  
Alpha Video & Electronics Co.  
Altec Lansing Int'l.  
Arben Design  
Audiotechniques Inc.  
B-W Lighting Systems (formerly Panoak Lighting)  
Robert Bosch GmbH  
Brabury Ltd.  
Walter S. Brewer Co., Inc.  
Broadcast Systems, Inc.  
CFA-Media Specialties, Inc.  
Center Video Center  
Centro Corp.  
Colortran, Inc.  
Delcom Corp.  
Design Line Inc.  
DYMA Engineering, Inc.  
Dynamic Technology Ltd.  
Electro-Acoustic Designs, Inc.  
Elektroimpex  
Gagnon LaForest Inc.  
General TV Network  
Gentner Engineering  
The Graphic Express Corp.  
Harris Corp. Broadcast Group  
Harrison Systems Ltd.  
Industrial Acoustics  
Jamieson & Associates, Inc.  
Jenel Consultants Corp.  
Kustom Kraft, Inc.  
Lakeside Associates Inc.  
Link Electronics Ltd  
MBI Broadcast Systems  
National Video Services  
L. E. Nelson Corp.  
Old Dominion Broadcast Eng. Service  
Pacific Recorders & Eng. Corp.  
Pihler Electronica S. A.  
Rack Techniques Corp.  
Radio Systems Inc.  
Radiotechniques Consulting Engineers  
The Real World Tech. Group, Inc.  
Roscor Corp.  
Ruslang Corp.  
Soll, Inc.  
Sounder Electronics Inc.  
Spectra Sonics  
Studio Systems Inc.  
Telaudio Centre  
Theatrical Services Inc.  
Turner Engineering  
Video Masters, Inc.

**Studio Scenery**

Peter Albrecht Corp.  
Arben Design  
CFA-Media Specialties, Inc.  
Comprehensive Video Supply Corp.  
Design Line Inc.  
The Graphic Express Corp.  
The Great American Market  
Janson Industries  
Theatrical Services Inc.

**Studio Systems, Audio**

ADM Technology, Inc.  
Acoustilog Inc.  
Alice (Stancoil Ltd.)  
Alphaton Elektroakustik  
Altec Lansing Int'l.

Amek Consoles Inc.  
Amek Systems & Controls Ltd.  
Anchor Systems, Inc.  
Atlantic Research Corp.  
Audio Kinetics, Inc.  
Audioarts Engineering Div. of Wheatstone Corp.  
Audiotechniques Inc.  
Audisar  
Bogen Div. Lear Siegler, Inc.  
Brabury Ltd.  
Broadcast Electronics, Inc.  
Cetec Broadcast Group  
Clyde Electronics Ltd.  
Datatronix, Inc.  
Deltamod Corp.  
Design Line Inc.  
DYMA Engineering, Inc.  
Elektroimpex  
Eventide Clockworks, Inc.  
Fostex Corp. of America  
Harris Corp. Broadcast Group  
Harrison Systems Ltd.  
Hoppmann Corp.  
Jamieson & Associates, Inc.  
LPB Inc.  
Lakeside Associates Inc.  
James B. Lansing Sound, Inc.  
MBI Broadcast Systems  
**Magna-Tech Electronic Co., Inc. .... 185**  
**McCurdy Radio Ind. Inc. .... IBC**  
McMartin Industries, Inc.  
Micro-Trak Corp.  
L. E. Nelson Corp.  
**Rupert Neve Inc. .... 11**  
Delcom Corp.  
Pacific Recorders & Eng. Corp.  
Panasonic Industrial Co. Audio Video Systems Div.  
Peirce-Phelps Inc. Video Systems Div.  
ProTech Audio Corp.  
Quad-Eight Electronics  
Radio Systems Inc.  
Raindrik Ltd.  
Richmond Sound Design, Ltd.  
Scantex Labs Inc.  
Solid State Logic  
**Soundcraft Inc. .... 233**  
Sounder Electronics Inc.  
Spectra Sonics  
Studio Systems Inc.  
**TEAC Corp. of America .... 27**  
Tele-Measurements Inc.  
Turner Engineering  
Ultra Audio Pixtec  
Uni-Set Corp.  
UREI Inc.  
Ward-Beck Systems Ltd.  
**Yamaha International Corp. Combo Div. .... 113, 114**

**Studio/Telephone Conference Integrators**

Allied Broadcast Equipment  
Alpha Video & Electronics Co.  
Audiocom Electronics Inc.  
**Comrex Corp. .... 220**  
**Gentner Engineering .... 115**  
Gregg Laboratories  
High Country Engineering  
Old Dominion Broadcast Eng. Service  
**RTS Systems, Inc. .... 147**  
Studer Revox America

**Switchers, Alternate Transmitter**

Broadcast Int'l. Inc.  
**Comark Communications, Inc. .... 69**  
DowKey Div. Of Kilovac Corp.  
Eagle Hill Electronics, Inc.  
HN Engineering Inc.  
ITT Jennings

**Switchers, Antenna Transfer**

A.D. Data Systems, Inc.  
Broadcast Int'l. Inc.  
**Comark Communications, Inc. .... 69**  
DowKey Div. Of Kilovac Corp.  
Eagle Hill Electronics, Inc.  
General Microwave Corp.  
HN Engineering Inc.

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See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
ITT Jennings	McCurdy Radio Ind. Inc. Panasonic Industrial Co. Audio Video Systems Div. .... 50-51	Dielectric Communications A Unit of General Signal DowKey Div. Of Kilovac Corp. Dynatech/U-Z, Inc. General Microwave Corp. ITT Jennings Javelin Electronics Marconi Communication Systems Ltd. Marshall Electronics Micro Communications, Inc. RCA Cablevision Systems Richmond Hill Labs Ltd. Shively Laboratories Div. of Howell Labs, Inc. .... 118	Marconi Electronics Inc. Broadcast & Communication Div. McCurdy Radio Ind. Inc. Micro Communications, Inc. Microprobe Electronics, Inc. Modular Audio Products Unit of Modular Devices, Inc. .... 219
<b>Switchers, Master Control</b>	Ross Video Ltd. .... 119 Shintron Co. Inc. .... 177	Soll, Inc. Varian Associates, Inc. Electron Device Group Wide Band Engineering Co., Inc.	Monroe Electronics, Inc. Omicron Video .... 206 Opamp Labs, Inc. Panasonic Co. ProTech Audio Corp. Quick-Set Inc. Richmond Sound Design, Ltd. Rockwell Int'l. Commercial Elec. Operations Scantex Labs Inc. Shively Laboratories Div. of Howell Labs, Inc. .... 118
American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp. Ampex Corp. Beaveronics, Inc. Central Dynamics Corp. See also American Data .... 245	<b>Switchers, Routing</b> A.D. Data Systems, Inc. ATI-Audio Technologies Inc. Alice (Stancoil Ltd.) All Mobile Video Alphaton Elektroakustik American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp. Amtel Systems Inc. Arrakis Sytems Inc. Audiocom Electronics Inc. Avitel Electronics Ltd. BSM Systems .... 187 Beaveronics, Inc. Robert Bosch GmbH Broadcast Systems, Inc. .... 23 Broadcast Technology, Inc. Broadcast Video Systems, Ltd. Central Dynamics Corp. See also American Data .... 59	Robert Bosch GmbH Broadcast Technology, Inc. Datatronix, Inc. Delta Electronics Inc. (VA) HEDCO (Hughes Elec. Devices Corp.) ITT Jennings International Nuclear Corp. Pacific Recorders & Eng. Corp. Piher Electronica S. A. Richmond Hill Labs Ltd. Varian Associates, Inc. Electron Device Group	Sigma Electronics, Inc. H. A. Solutech Ltd. Sono-Mag Corp. Sony Corp. of America Tech Laboratories Inc. Tele-Engineering Corp. Telemet Div. A Geotel, Co. 3M Co., Broadcast & Related Products Div. Utah Scientific, Inc. .... 225 Vital Industries Inc.
Central Dynamics Ltd. Michael Cox Electronics Ltd. Grass Valley Group, Inc. Image Video Ltd. .... 121	Central Dynamics Ltd. Channelmatic, Inc. Michael Cox Electronics Ltd. Crow of Reading Ltd. Datatek Corp. .... 217	<b>Switches, Crossbar</b> A.D. Data Systems, Inc. ANT Telecommunications (Formerly AEG-Telefunken) American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp. Robert Bosch GmbH Broadcast Technology, Inc. Datatronix, Inc. Delta Electronics Inc. (VA) HEDCO (Hughes Elec. Devices Corp.) ITT Jennings International Nuclear Corp. Pacific Recorders & Eng. Corp. Piher Electronica S. A. Richmond Hill Labs Ltd. Varian Associates, Inc. Electron Device Group	Utah Scientific, Inc. .... 225 Vital Industries Inc.
Industrial Sciences, Inc. (ISI) Philips Television Systems, Inc. Regis Electronic Equipment Richmond Hill Labs Ltd. Ross Video Ltd. Seltech Equipment Ltd. Thomson-CSF Broadcast, Inc. Utah Scientific, Inc. .... 225	Central Dynamics Ltd. Dynamics Corp. Arrakis Sytems Inc. Audiocom Electronics Inc. Avitel Electronics Ltd. BSM Systems .... 187 Beaveronics, Inc. Robert Bosch GmbH Broadcast Systems, Inc. .... 23 Broadcast Technology, Inc. Broadcast Video Systems, Ltd. Central Dynamics Corp. See also American Data .... 59	<b>Switches, Power, Video Activated</b> A.D. Data Systems, Inc. Channelmatic, Inc. Lang Video Systems Corp. MRI Systems Ltd. Portac Inc. Richmond Hill Labs Ltd. Video Aids of Colorado	<b>Synchronizers, Audio/Video Machine</b> Acquis Ltd. Adams-Smith Ampex Corp. .... 77 Audio Kinetics, Inc. .... 42 Audio Kinetics (UK) Ltd. The BTX Corp. Central Dynamics Corp. See also American Data Control Video Corp. Datatron, Inc. ECCO Inc. Glentronix (1977) Ltd. Gotham Audio Corp. MCI, Div. of Sony Corp. of America Magna-Tech Electronic Co., Inc. .... 185 Multi-Track Magnetics, Inc. Omni Q Inc. Solid State Logic Telcom Research Trident (USA) Inc. United Media, Inc.
Viscount Industries Ltd. Vital Industries Inc.	Central Dynamics Ltd. Channalmatic, Inc. Michael Cox Electronics Ltd. Crow of Reading Ltd. Datatek Corp. .... 217 Datatron, Inc. Datatronix, Inc. Di-Tech Inc. DYMA Engineering, Inc. Dynair Electronics, Inc. .... 39 Fernseh Inc. Glentronix (1977) Ltd. Grass Valley Group, Inc. .... 9 Grumman Aerospace Corp. HEDCO (Hughes Elec. Devices Corp.) Image Video Ltd. Industrial Sciences, Inc. (ISI) International Nuclear Corp. International Video Corp. Javelin Electronics Kaitronics Corp. .... 53 Lang Video Systems Corp. Lenco Inc. Electronics Div. MBI Broadcast Systems MRI Systems Ltd. Marconi Communication Systems Ltd. NEC America, Inc. Broadcast Equip. Div. Omicron Video .... 206 Pacific Recorders & Eng. Corp. Pro-Bel Ltd. Ramko Research Inc. Scantex Labs Inc. Shintron Co. Inc. Technical Projects Ltd. Tele-Engineering Corp. Telemet Div. A Geotel, Co. .... 258 3M Co., Broadcast & Related Products Div. Ultra Audio Pixtec United Media, Inc. Utah Scientific, Inc. .... 225 Vamco Videotek, Inc. Viscount Industries Ltd. Vital Industries Inc. Ward-Beck Systems Ltd.	<b>Switching Systems</b> A.D. Data Systems, Inc. American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp. Beaveronics, Inc. Robert Bosch GmbH Broadcast Int'l. Inc. Broadcast Technology, Inc. Central Dynamics Corp. See also American Data .... 29, 59, 245 Central Dynamics Ltd. Commerce Airborne Div. IFR Avionics, Inc. Michael Cox Electronics Ltd. Crosspoint Latch Corp. .... 272 Datatek Corp. .... 217 Datatronix, Inc. Delta Electronics Inc. (VA) Di-Tech Inc. Dynair Electronics, Inc. .... 39 Dynamic Technology Ltd. ECHOlab, Inc. .... 98 Fernseh Inc. Ghielmetti Inc. Switches & Data Devices Glentronix (1977) Ltd. Graham-Patten Systems, Inc. Grass Valley Group, Inc. .... 9 Grumman Aerospace Corp. HEDCO (Hughes Elec. Devices Corp.) Image Video Ltd. .... 121 Industrial Sciences, Inc. (ISI) International Nuclear Corp. Javelin Electronics Kaitronics Corp. .... 53 Leitch Video Ltd. M/A-Corn Microwave Power Devices .... 91 MCL Inc. MRI Systems Ltd.	<b>Synchronizers, Digital Audio</b> Audio Kinetics, Inc. .... 42 Audio Service Corp. Fortel Inc. Lexicon Inc. MCI/Quantel
<b>Switchers, Production, Remote</b>	<b>Switchers, Production, Video</b> A.D. Data Systems, Inc. Acquis Ltd. Alco Electronic Products, Inc. All Mobile Video American Data, A Div. of Central Dynamics Corp. See also Central Dynamics Corp. Ampex Corp. Asaca/Shibasoku Corp. Beaveronics, Inc. Robert Bosch GmbH Central Dynamics Corp. See also American Data .... 29 Central Dynamics Ltd. Convergence Corp. Michael Cox Electronics Ltd. Crosspoint Latch Corp. .... 272 Crow of Reading Ltd. DYMA Engineering, Inc. ECHOlab, Inc. .... 98 Fernseh Inc. Glentronix (1977) Ltd. Grass Valley Group, Inc. .... 261 Image Video Ltd. .... 121 Industrial Sciences, Inc. (ISI) .... 262 International Nuclear Corp. JVC Co. of America Javelin Electronics Kaitronics Corp. Lang Video Systems Corp. Marconi Electronics Inc. Broadcast & Communication Div.	<b>Switchers, Coaxial</b> Arvin/Diamond AVA Electronics Bird Electronic Corp. Broadcast Int'l. Inc. CSP Inc. Cetec Antennas Comark Communications, Inc. COMPAC Comprehensive Video Supply Corp. Delta Electronics Inc. (VA)	<b>Synchronizers, Digital Video Frame</b> ADDA Corp. Advanced Music Systems Apert-Herzog Corp. Digital Video Systems Corp. Fortel Inc. .... 93 GEC McMichael Ltd. Grumman Aerospace Corp. Harris Corp. Broadcast Group Harris Video Systems MCI/Quantel Marconi Communication Systems Ltd. Microtime, Inc. Multi-Track Magnetics, Inc. NEC America, Inc. Broadcast Equip. Div. <b>Synthesizers, FM Stereo</b> Catel/Tomco Divs. of United Scientific Corp. McMartin Industries, Inc. Orban Associates Inc. C.N. Rood B.V. Broadcasting Div.



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See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
<p><b>Systems Research and Development</b></p> <p>Andrew Corp. Atlantic Research Corp. Audio Kinetics, Inc. Broadcast Systems, Inc. Centro Corp. Commerce Airborne Div. IFR Avionics, Inc. ComSonics, Inc. Dalsat, Inc. Delcom Corp. Dielectric Communications A Unit of General Signal DYMA Engineering, Inc. Grumman Aerospace Corp. International Electro-Magnetics Jamieson &amp; Associates, Inc. Link Electronics Ltd. MIS Div. Whitelove Showsystems MPB Technologies Inc. The Management Marconi Communication Systems Ltd. Microwave Assoc. Communications National Video Services ProTech Audio Corp. QSI Systems Inc. Radiotechniques Consulting Engineers Rosner TV Systems, Inc. Scantex Labs Inc. The Ken Schaffer Group, Inc. SED Systems Inc. Soll, Inc. Spectra Sonics Studio Systems Inc. Technical Projects Ltd. Telemet Div. A Geotel, Co. Townsend Associates, Inc. .... 65</p>	<p>See Hear Industries Div. of RJA Inc. Sony Corp. of America Studio Film &amp; Tape, Inc. 3M Co. Magnetic A/V Products Div.</p> <p><b>Tape Cleaners</b></p> <p>Asaca/Shibasoku Corp. Audico, Inc. Chyron Corp. Telesystems Glentronix (1977) Ltd. Maxell Corp. of America N.O.V.A. Corp. Nortronics Co., Inc. Recorder Care Div. RTI-Research Tech. Int'l. Recortec, Inc. See Hear Industries Div. of RJA Inc. TEAC Corp. of America Telectro Systems Corp. Television Equipment Associates 3M Co. Magnetic A/V Products Div.</p> <p><b>Tape Conditioners, Video</b></p> <p>Chyron Corp. Telesystems King Instrument Corp. N.O.V.A. Corp. RTI-Research Tech. Int'l. .... 70 Recortec, Inc. Television Equipment Associates</p> <p><b>Tape Deck and Turntable Speed Controls</b></p> <p>Marathon Products Corp. Panasonic Co. Technics Telectro Systems Corp.</p> <p><b>Tape Duplicators</b></p> <p>All Mobile Video CaVox Stereo Productions Century 21 Programming Inc. Garner Industries Magnetax Int'l., Inc. Otari Corp. Panasonic Co. Panasonic Industrial Co. Audio Video Systems Div. Recortec, Inc. See Hear Industries Div. of RJA Inc. Telex Communications, Inc. Video Masters, Inc.</p> <p><b>Tape Evaluators, Video</b></p> <p>Asaca/Shibasoku Corp. Chyron Corp. Telesystems Glentronix (1977) Ltd. Kaitronics Corp. Otari Corp. Quanta Corp. RTI-Research Tech. Int'l. .... 70 Recortec, Inc. Studio Film &amp; Tape, Inc. Television Equipment Associates</p> <p><b>Tape, Magnetic Recording Audio Cartridge</b></p> <p>Aristocart Div., Western Int'l. Communications, Ltd. .... 92 Avtech Electronics Inc. (formerly Team Electronics) BASF Burlington Audio Tapes, Inc. Capitol Magnetic Products ..... 30 Contel Mfg. Fidelipac Corp. .... 131 International Tapetronics Corp./3M Marathon Products Corp. Maxell Corp. of America Ramko Research Inc. Sono-Mag Corp. 3M Co. Magnetic A/V Products Div. UMC Electronics Co. Broadcast Products Div.</p> <p><b>Tape, Magnetic Recording Video</b></p> <p>Agfa-Gevaert Inc. Magnetic Tape Div. .... 33 All Mobile Video Ampex Corp. .... 31 Avtech Electronics Inc. (formerly Team Electronics) BASF Robert Bosch GmbH Burlington Audio Tapes, Inc. COARC ..... 240 Fernseh Inc. Fuji Photo Film USA, Inc. Magnetic Products Div. .... 183 JVC Co. of America Javelin Electronics Maxell Corp. of America .... 124-125 Panasonic Co. Panasonic Industrial Co. Audio Video Systems Div. Re-Play Video Cartridge Service See Hear Industries Div. of RJA Inc. Sony Corp. of America 3M Co. Magnetic A/V Products Div. .... 72-73</p> <p><b>Tape Motion Controls, Audio</b></p> <p>Audio Kinetics, Inc. The BTX Corp. Datum Inc. Tape-Athon Corp. Cavox Stereo Productions United Research Lab Corp.</p> <p><b>Tape Recording Accessories</b></p> <p>All Mobile Video Allsop, Inc. Ampex Corp. .... 77 R. B. Annis, Co. Audio Service Corp. Broadcast Electronics, Inc. Broadcast Systems, Inc. Comprehensive Video Supply Corp. Deltamod Corp. Discwasher Dolby Laboratories, Inc. Fidelipac Corp. Interactive Systems Co. Micro-Trak Corp. Mineroff Electronics, Inc. Uher Products Nagra Magnetic Recorders, Inc. Nortronics Co., Inc. Recorder Care Div. Panasonic Co. Polyline Corp. .... 244 RTI-Research Tech. Int'l. Robins-Div. of Benjamin Electroproducts See Hear Industries Div. of RJA Inc. Studer Revox America Taber Mfg. &amp; Eng. Co. Tandberg of America, Inc. TEAC Corp. of America Telex Communications, Inc. Tentel VIF International</p> <p><b>Tape, Magnetic Recording Audio Cartridge</b></p> <p>Soundcraft Inc. SoundScriber Magnetic Recording Co., Inc. Stancil Corp. Studer Revox America Tandberg of America, Inc. 3M Co. Magnetic A/V Products Div.</p> <p><b>Tape Splice Finders</b></p> <p>Ampro/Scully Div. Ram Mfg. Inc. International Tapetronics Corp./3M ..... 100-101 RTI-Research Tech. Int'l. UMC Electronics Co. Broadcast Products Div.</p> <p><b>Tape Splicers</b></p> <p>Audico, Inc. Comprehensive Video Supply Corp. The Durafilm Co. Fidelipac Corp. Goldberg Brothers Inc. Gotham Audio Corp. King Instrument Corp. Marathon Products Corp. Neumade Industries, Inc. Nortronics Co., Inc. Recorder Care Div. Plastic Reel Corp. of America RTI-Research Tech. Int'l. Robins-Div. of Benjamin Electroproducts</p> <p><b>Tape Tension Gauges --See Recorder Tape Tension Gauges</b></p> <p><b>Tape, Time Announced</b></p> <p>Century 21 Programming Inc. Fidelipac Corp. William B. Tanner Co. Inc. Tape-Athon Corp. Cavox Stereo Productions Tel-Mar Corp.</p> <p><b>Tape Transport Reconditioning Services</b></p> <p>A. F. Associates, Inc. Century 21 Programming Inc. Design Line Inc. International Tapetronics Corp./3M Merlin Engineering Works, Inc. Nagra Magnetic Recorders, Inc. .80 Old Dominion Broadcast Eng. Service Taber Mfg. &amp; Eng. Co. Telectro Systems Corp. United Research Lab Corp.</p> <p><b>Tape Transports</b></p> <p>Amilon Corp. Broadcast Electronics, Inc. International Electro-Magnetics International Tapetronics Corp./3M ..... 100-101 The Management McCurdy Radio Ind. Inc. Nagra Magnetic Recorders, Inc. Sono-Mag Corp. Studer Revox America Tape-Athon Corp. Cavox Stereo Productions Telex Communications, Inc. United Research Lab Corp. Video Rentals, Inc. VIF International</p> <p><b>Telemetry Equipment</b></p> <p>Catel/Tomco Divs. of United Scientific Corp. Communitronics Ltd. Datum Inc. HM Electronics, Inc. Hallikainen &amp; Friends, Inc. High Country Engineering Marti Electronics ..... 20 Microdyne Corp. Potomac Instruments, Inc. SED Systems Inc. TFT Inc.</p>	<p><b>Tape Cartridge Loaders</b></p> <p>Audico, Inc. Broadcast Electronics, Inc. King Instrument Corp. Neumade Industries, Inc. Re-Play Video Cartridge Service</p> <p><b>Tape Cassette Loaders</b></p> <p>Audico, Inc. Datel-Intersil Inc. King Instrument Corp. Neumade Industries, Inc. Recortec, Inc.</p> <p><b>Tape Cassettes, Audio</b></p> <p>BASF Bonneville Productions Div. of Bonneville Int'l. Corp. Continental Recordings Inc. Dictaphone Corp. Fuji Photo Film USA, Inc. Magnetic Products Div. Maxell Corp. of America Panasonic Co. Plastic Reel Corp. of America Polyline Corp. .... 244 See Hear Industries Div. of RJA Inc. Studio Film &amp; Tape, Inc. Tandberg of America, Inc. 3M Co. Magnetic A/V Products Div.</p> <p><b>Tape Cassettes, Video</b></p> <p>Agfa-Gevaert Inc. Magnetic Tape Div. .... 33 Ampex Corp. .... 31 Audico, Inc. BASF Robert Bosch GmbH Burlington Audio Tapes, Inc. Calzone Case Co. COARC ..... 240 Fuji Photo Film USA, Inc. Magnetic Products Div. .... 183 JVC Co. of America Maxell Corp. of America .... 124-125 Panasonic Co. Panasonic Industrial Co. Audio Video Systems Div. Plastic Reel Corp. of America Schuessler Case Co., Inc.</p>	<p><b>Tape Recording Logging</b></p> <p>Sono-Mag Corp.</p>



See Adv. Page

See Adv. Page

See Adv. Page

See Adv. Page

For-A Corp. of America  
Foundation Elec. Instruments Inc.  
Glenetronix (1977) Ltd.  
Gregg Laboratories  
H.E. Inc.  
High Country Engineering  
Leitch Video Ltd.  
Lindburg Enterprises, Inc.  
**Logitek Electronic Systems,  
Inc. ....222**

Monroe Electronics, Inc.  
Old Dominion Broadcast Eng. Service  
Pacific Recorders & Eng. Corp.  
Jules Racine & Co., Inc.  
SSAC Inc.  
Torpey Controls & Eng. Ltd.  
True Time  
Vamco  
Video Masters, Inc.

**Timers, Blanking Interval**

Broadcast Video Systems, Ltd.  
Marconi Instruments Div. of Marconi  
Electronics Inc.  
World Video Inc.

**Timers, Videotape**

Robert Bosch GmbH  
Convergence Corp.  
Michael Cox Electronics Ltd.  
Foundation Elec. Instruments Inc.  
Lindburg Enterprises, Inc.  
**Logitek Electronic Systems,  
Inc. ....222**

RTI-Research Tech. Int'l.  
Recortec, Inc.  
Vamco

**Tone Arms**

Audio-Technica U.S., Inc.  
Broadcast Electronics, Inc.  
Cetec Broadcast Group  
EMT-FRANZ GMBH  
Fidelipac Corp.  
International Electro-Magnetics  
LPB Inc.  
Micro-Trak Corp.  
**Russco Electronics Mfg. Inc. ....264**  
Shure Brothers Inc.

**Tool Kits (Hand Tools)**

AVA Electronics  
Avitel Electronics Ltd.  
Calzone Case Co.  
**Ben Hughes Communication  
Products Co. ....256**

Pace, Inc.  
Paladin Corp.  
Peterson Mfg. Co., Inc.  
RTI-Research Tech. Int'l.  
Sono-Mag Corp.  
Vector Electronic Co., Inc.

**Tower Beacon Light Flashers**

Andrew Corp.  
Atlas Tower Corp.  
CSP Inc.  
Crouse-Hinds Co. Aviation Lighting  
EG&G Inc.  
Elcom-Bauer  
**Hughey & Phillips Inc. ....252**

LeBlanc & Royle Communications Inc.  
Fred A. Nudd Corp.  
Rohn  
**SSAC Inc. ....255**

Swagger Tower Corp.  
Utility Tower Co.  
World Tower Co. Inc.

**Tower Guys --See Antenna and Tower Guys****Tower Light Failure Alarms**

Andrew Corp.  
CSP Inc.  
**Hughey & Phillips Inc. ....252**  
Moseley Associates, Inc.

Rohn  
**SSAC Inc. ....255**  
Swagger Tower Corp.

**Tower Light Indicator Panels**

Andrew Corp.  
CSP Inc.  
Crouse-Hinds Co. Aviation Lighting  
Hughey & Phillips Inc.

**Tower Lighting Isolation Transformers**

Andrew Corp.  
CSP Inc.  
Hughey & Phillips Inc.  
**Racal-Decca Canada Inc.  
Insulators Div. ....116**  
Rohn

**Towers, Antenna**

Advance Industries, Inc.  
Allied Tower Co., Inc.  
Andrew Corp.  
Atlas Tower Corp.  
Cetec Antennas  
Comark Communications, Inc.  
DHV, Inc.  
**EMCEE Broadcast Products ....218**  
Kline Iron & Steel Co.  
LeBlanc & Royle Communications Inc.  
Magnum Towers, Inc.  
Marconi Communication Systems Ltd.  
Microlect Co., Inc.  
Motorola Communications and  
Electronics Inc.  
Fred A. Nudd Corp.  
Allen Osborne Associates  
Rohn  
**Stainless, Inc. ....242**  
Swagger Tower Corp.  
Telex Communications, Inc.  
Utility Tower Co.  
The Will-Burt Co. TMD Div.  
World Tower Co. Inc.

**Towers, Mobile**

Advance Industries, Inc.  
Atlas Tower Corp.  
E-N-G Corp. Electronic News Group  
LeBlanc & Royle Communications Inc.  
Fred A. Nudd Corp.  
**Allen Osborne Associates ....104**  
Telex Communications, Inc.  
The Will-Burt Co. TMD Div.

**Transformers, Audio**

Alphaton Elektroakustik  
Altec Lansing Int'l.  
Atlas Sound  
Audio-Technica U.S., Inc.  
Audisar  
Bogen Div. Lear Siegler, Inc.  
Clyde Electronics Ltd.  
Crown International, Inc.  
Datatronix, Inc.  
Fostex Corp. of America  
Gotham Audio Corp.  
**Jensen Transformers Inc. ....167**  
Larus Corp.  
Modular Audio Products Unit of  
Modular Devices, Inc.  
Neutrik Products  
Opamp Labs, Inc.  
Potomac Instruments, Inc.  
ProTech Audio Corp.  
Sescom, Inc.  
Shure Brothers Inc.  
Spectra Sonics  
T T E, Inc.

**Transformers, Filament**

**Peter W. Dahl Co., Inc. ....116**  
Townsend Associates, Inc.

**Transformers, Line Level**

Alphaton Elektroakustik

Altec Lansing Int'l.  
Audisar  
Crown International, Inc.  
Datatronix, Inc.  
ProTech Audio Corp.  
Sescom, Inc.  
The Superior Electric Co.

**Transformers, Modulation**

**Peter W. Dahl Co., Inc. ....116**

**Transformers, Power**

**Peter W. Dahl Co., Inc. ....116**  
Hipotronics Inc.  
Piher Electronica S. A.  
Topaz  
Townsend Associates, Inc.

**Transformers, RF Sampling**

CSP Inc.  
Delta Electronics Inc. (VA)  
North Hills Electronics, Inc.  
T T E, Inc.

**Translator Systems, TV**

Acrodyne Industries Inc.  
Comark Communications, Inc.  
Comsearch, Inc.  
Contel Mfg.  
Delta-Benco-Cascade Ltd.  
DYMA Engineering, Inc.  
**EMCEE Broadcast Products ....218**  
Larcan Communications Equip. Inc.  
D. N. Latus & Co., Inc.  
M/A-Com Microwave Power Devices  
Marconi Electronics Inc. Broadcast &  
Communication Div.  
Piher Electronica S. A.  
Scientific-Atlanta, Inc.  
Shively Laboratories Div. of Howell  
Labs, Inc.  
TTC-Television Tech. Div.  
Teppo Corp.  
**Townsend Associates, Inc. ....65**  
Triple Crown Electronics, Inc.

**Translators, FM**

Contel Mfg.  
M/A-Com Microwave Power Devices  
McMartin Industries, Inc.  
Power Pak Systems, Inc.  
Shively Laboratories Div. of Howell  
Labs, Inc.  
TTC-Television Tech. Div.  
Teppo Corp.

**Transmission Lines and Service**

Andrew Corp.  
Belden Elec. Wire & Cable Electronics  
Div.  
Cablewave Systems Inc.  
Cetec Antennas  
Comark Communications, Inc.  
Continental Electronics Mfg. Co.  
Dielectric Communications A Unit of  
General Signal  
EMCEE Broadcast Products  
Gabriel Electronics, Inc.  
Micro Communications, Inc.  
Motorola Communications and  
Electronics Inc.  
Fred A. Nudd Corp.  
Nurad, Inc.  
**Phelps Dodge Communications  
Co. ....247**  
Pinzone Communications Products Inc.  
**Shively Laboratories Div. of  
Howell Labs, Inc. ....118**

Soll, Inc.  
TTC-Television Tech. Div.  
Tiner Communication Services, Inc.

**Transmission Sets**

Amber Electro Design Inc.  
Cablewave Systems Inc.  
Lang Video Systems Corp.

**Transmission Systems, TV Audio**

American Laser Systems, Inc.  
Artel Communications Corp.  
DYMA Engineering, Inc.  
Harrison Systems Ltd.  
Lang Video Systems Corp.  
Orban Associates Inc.  
Spectra Sonics  
**Townsend Associates, Inc. ....65**

**Transmission Systems, TV Optical Carrier**

American Laser Systems, Inc.  
American Photonics Inc.  
Artel Communications Corp.  
Catel/Tomco Divs. of United Scientific  
Corp.  
Fernseh Inc.  
Fibervision Div. of Math Associates  
Foundation Elec. Instruments Inc.  
Harrison Systems Ltd.  
Jenel Consultants Corp.  
Lightwave Communications, Inc. A  
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Motorola Communications and  
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Eagle Hill Electronics, Inc.  
McMartin Industries, Inc.  
Moseley Associates, Inc.  
Potomac Instruments, Inc.

**Transmitter Pulser/Power Supply Systems**

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Harris Corp. Broadcast Group  
RCA Broadcast Systems  
Radio-Research Instrument Co., Inc.  
**Townsend Associates, Inc. ....65**

**Transmitters, AM Carrier**

CSI Electronics, Inc.  
Communitronics Ltd.  
Contel Mfg.  
Eddystone Radio Ltd.  
LPB Inc.  
McMartin Industries, Inc.  
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Eddystone Radio Ltd.  
Elcom-Bauer  
Harris Corp. Broadcast Group  
International Microwave Corp.  
LPB Inc.  
**M/A-Com Microwave Power  
Devices ....91**  
Marconi Communication Systems Ltd.  
Marconi Electronics Inc. Broadcast &  
Communication Div.  
McMartin Industries, Inc.  
Nautel Maine, Inc.  
Nurad, Inc.  
RCA Broadcast Systems  
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Inc. ....224**  
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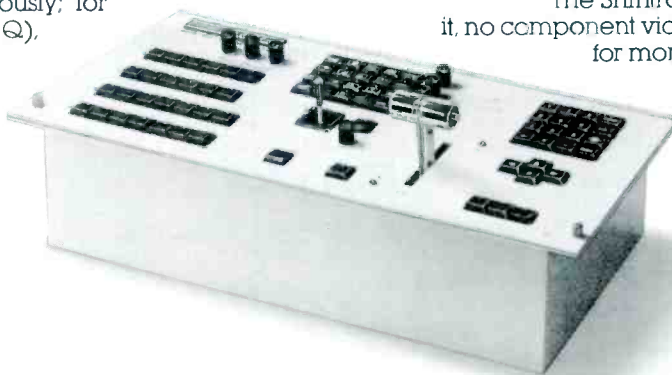
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See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
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<b>Transmitters, TV</b> Acrodyne Industries, Inc. <b>Comark Communications, Inc. .... 69</b> Contel Mfg. Delta-Benco-Cascade Ltd. <b>EMCEE Broadcast Products ..... 218</b> Harris Corp. Broadcast Group Information Transmission Systems, Corp. <b>Larcan Communications Equip. Inc. .... 258</b> <b>M/A-Com Microwave Power Devices ..... 91</b> MCL Inc. Marconi Communication Systems Ltd. Marconi Electronics Inc. Broadcast & Communication Div. Meret Inc. NEC America, Inc. Broadcast Equip. Div. <b>Philips Television Systems, Inc. .... 56-57</b> Pihler Electronica S. A. Pye TVT Ltd. Broadcast Co. of Philips RCA Broadcast Systems Rohde & Schwarz Sales Co. Singer Broadcast Products, Inc. Sintronic Corp. TRW Semiconductors TTC-Television Tech. Div. <b>Townsend Associates, Inc. .... 65,</b> Triple Crown Electronics, Inc. VMI-Visual Methods Inc.	<b>Tuners, AM</b> Audisar Bogen Div. Lear Siegler, Inc. Eddystone Radio Ltd. McMartin Industries, Inc. Ramko Research Inc. Stoner Communications Inc.	<b>Turntable Speed Controls --See</b> Tape Deck and Turntable Speed Controls	<b>Vacuum Tubes, Cathode Ray Oscilloscope</b> Alpha Electronics, Inc. Amperex Electronic Corp. Avtech Electronics Inc. (formerly Team Electronics) EEV, Inc. English Electric Valve Co. Ltd. RCA Distributor & Special Products Div. Richardson Electronics Ltd. Thomson CSF Components Corp. Electron Tube Div
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	<b>Tuners, TV Audio</b> Barco Industries Video & Communications N.V. Catel/Tomco Divs. of United Scientific Corp. Elector USA, Inc.	<b>Turntable Speed Controls --See</b> Equipment, Used and Reconditioned	
	<b>Turnkey Equipment Installation Services</b> A. F. Associates, Inc. ANT Telecommunications (Formerly AEG-Telefunken) Alice (Stancoil Ltd.) Alpha Video & Electronics Co. Atlantic Research Corp. <b>Avtec Industries, Inc. .... 251</b> Aydin Microwave Div. Robert Bosch GmbH Bowen Broadcast Service Co., Inc. Walter S. Brewer Co., Inc. British Videotex & Teletext <b>Broadcast Systems, Inc. .... 23</b> Byers Communications Corp. CSP Inc. Centro Corp. Clyde Electronics Ltd. Colortran, Inc. Comark Communications, Inc. ComSonics, Inc. Delcom Corp. Design Line Inc. DYMA Engineering, Inc. <b>EMCEE Broadcast Products ..... 218</b> Electro-Acoustic Designs, Inc. Electrohome Ltd. General TV Network Grumman Aerospace Corp. H & R Communications Harris Corp. Broadcast Group Harris Corp. Broadcast Microwave Harris Corp. Satellite Communications Div. Harrison Systems Ltd. International Microwave Corp. Jenel Consultants Corp. KAVCO, Inc. Lakeside Associates Inc. Link Electronics Ltd. <b>Magna-Tech Electronic Co., Inc. .... 185</b> Marconi Communication Systems Ltd. Microdyne Corp.	<b>Vacuum Tube Replacements, Solid State</b> Alpha Electronics, Inc. Avtech Electronics Inc. (formerly Team Electronics) California Microwave Eagle Hill Electronics, Inc. Electronic Devices, Inc. English Electric Valve Co. Ltd. <b>M/A-Com Microwave Power Devices ..... 91</b> Richardson Electronics Ltd. TTC-Wilkinson Radio Div.	

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CO: Audio Visual Systems, 2432 S. Downing St., Denver, CO 80210 (303) 744-1226 Robert Johnson

CT: Concord Communications, 970 High Ridge Rd., Stamford, CT 06905 (203) 322-9322 Gerard Rich

FL: Midwest Corp., 3331 N.W. 82nd Ave., Miami, FL 33122 (305) 592-5355 Sam Silverstein

GA: Sound Investment, DeKalb Peachtree Arp., Bldg. 34-A, Chamlee, GA 30341 (404) 455-0968 Douglas Wilmer  
GA: Video Supply Sales Co. Inc., 3440 Oakcliff Rd., Suite 112, Atlanta, GA 30340 (404) 458-2468 Robert Haney

HI: Boku Hawaii Inc., 1451 S. King St., Suite 311, Honolulu, HI 96814 (808) 947-8802 Boyd Collings

IL: Polyline, 1233 Rand Rd., Des Plaines, IL 60016 (312) 289-5300 John Kaiser  
IL: Roscor Corp., 6160 W. Oakton, Morton Grove, IL 60053 (312) 966-3010 Phil Roston

IN: Communications Systems, 1430 E. Calvert St., South Bend, IN 46613 (219) 289-6709 Larry Powell

LA: Mississippi School Supply, 1835 River Rd. N., Baton Rouge, LA 70821 (504) 387-5131 Robert Christian  
MD: Communications Televideo, Ltd., 918 Sligo Ave., Silver Spring, MD 20910 (301) 585-6311 Han S. Jan

MD: Maryland Video Systems Inc., 216 W. Saratoga St., Baltimore, MD 21201 (301) 528-9000 Bob Haller

MA: Professional Video Systems Inc., 1616 Soldiers Field Rd., Boston, MA 02135 (617) 254-2101 Mr. W. Morin  
MN: Bethany Corp. D13A, Alpha Video & Audio, 2100 West 98th St., Minneapolis, MN 55431 (612) 881-2055 Mr. T. A. Hegre

MN: Greatpates, 123 South 12th St., Minneapolis, MN 55405 (612) 339-1651 Diane Woelm  
MO: Video Masters, Inc., 1616 Broadway, Kansas City, MO 64141 (816) 474-8530

NE: Video Services of NE, Inc., 7040 Custer, Lincoln, NE 68529 (402) 467-3668 Bob Joyce  
NJ: Kallman-Boise Inc., 177 Mill Lane, Mountainside, NJ 07092 (201) 654-3600 Mr. R. J. Schenger

NJ: Lanky Associates, Inc., 1890 E. Markton Pike, Cherry Hill, NJ 18003 (609) 424-4660 James Landy  
NJ: Optimedia Systems Inc., 1080 Route 46, Clifton, NJ 07013 (201) 777-7600 George Hofman

NM: Black's Communications Consultants Inc., 120 W. Picocho, Las Cruces, NM, 88005 (505) 524-9681 Walter Black  
NY: Bryce Video, 115 West 40th St., New York, NY 10018 (212) 575-8600 Steve Novak

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TN: Memphis Communications Corp., 1381 Madison Ave., Memphis, TN 38104 (901) 725-9271

*TX: Magnetic Media Corp., 4801 Keller Springs, Dallas, TX 75248 (214) 931-0404 Eugene Tollini*  
*TX: MZB & Associates, 4203 Beltway, Dallas, TX 75234 (214) 233-5535 John Zienkosi*  
*VA: Media Associates, 5322 Sideburn Rd., Fairfax, VA 22032 (703) 978-3550 Robert Graver*  
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*OR: Components West, Inc., 13540 N. W. Mill Creek Dr., Portland, OR 97229 (503) 643-5588*

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**Allied Tower Co., Inc.**, 12450 Old Galveston Rd., Webster, TX 77598

**Allsop, Inc.**, Box 23, Bellingham, WA 98227

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**Alpha Electronics, Inc.**, 1365 39th St., Brooklyn, NY 11218

**Alpha Video & Electronics Co.**, 28 E. Mall Plaza, Carnegie, PA 15106

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**Altec Lansing Int'l.**, Box 3113, Anaheim, CA 92803

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**American Data, A Div. of Central Dynamics Corp.**, See also Central Dynamics Corp., 401 Wynn Dr. N.W., Huntsville, AL 35805

**American Image Productions**, Box 23355, Nashville, TN 37202

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*WA: Ampex Corp., 628 Industry Dr., Tukwila, WA 98188 (206) 575-0156 Dick Carroll, Sales Mgr.*

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**Anacomp, Inc., CMS Div.**, 6610 N. Shadeland Ave., Indianapolis, IN 46220

**Anchor Systems, Inc.**, 5097 Santa Fe St., San Diego, CA 92109

**Anders Inc.**, 77 Wolcott Rd., Simsbury, CT 06070

**Andersen Labs, Inc.**, 1280 Blue Hills Ave., Bloomfield, CT 06002

**Andrew Corp.**, 10500 West 153rd St., Orland Park, IL 60462

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*CA: Andrew California Corp., 1037 West 9th St., Upland, CA 91786 (714) 946-777 Mr. T. Glab*

*CO: Andrew Corp., 451 East 58th Ave., Room 2585, Denver, CO 80216 (303) 295-1042 Mr. J. Gyurko*

*MA: Andrew Corp., 594 Marrett Rd., Lexington, MA 02173 (617) 862-0888 Mr. B. Moreth*

*NJ: Andrew Corp., 106 Prospect St., Box 297, Ridgewood, NJ 07451 (201) 652-1310 Mr. B. Cohen*

*TX: Andrew Corp., 2701 Mayhill Rd., Denton, TX 76201 (817) 566-2400 Mr. T. Hewlett*

*TX: Andrew Corp., 2425 N. Central Expressway, Suite 359, Richardson, TX 75080 (214) 690-6064 Mr. T. Candrea*

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*AUSTRALIA: Andrew Antennas, 171 Henry St., Reservoir, Victoria Australia 3073 (03) 460-1544 Mr. J. Macey*

*BRAZIL: Andrew Antennas Ltda., Av. Victor Andrew, 585 Caixa Postal 600, Sao Paulo Brazil (0152) 318900 Mr. R. Apra*

*CANADA: Andrew Antenna Co. Ltd., Suite 2-2634 Shaughnessy St., Port Coquitlam, BC, Canada V3C 3G6 (604) 941-8204 Mr. L. Majoros*

*CANADA: Andrew Antenna Co. Ltd., 120 Holland Ave., Suite 202, Ottawa, Ont., Canada K1Y 0X6 (613) 728-7665 Mr. A. Heal*

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**Angenieux Corp. of America**, 12901 S.W. 74th St., Miami, FL 33183

*Joseph Martinez (305) 386-1740*

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*CANADA: Angenieux Corp., 190 Don Park Rd., Markham, Ont., Canada L3R 2V8 (416) 495-5454*

*SWITZERLAND: Opticam S.A., Case Postale 91, 1211 Geneva 17 Switzerland (22) 362266*

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**R. B. Annis Co.**, 1101 N. Delaware St., Indianapolis, IN 46202

**Antenna Development & Mfg., Inc.**, Box 1178, Poplar Bluff, MO 63901

**Antenna Technology Corp.**, 8711 E. Pinnacle Peak Rd., Suite C-103, Scottsdale, AZ 85225

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**Anton/Bauer, Inc.**, 1 Controls Dr., Shelton, CT 06484

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**Anvil Cases, Inc.**, 4128 Temple City Blvd., Rosemead, CA 91770

**Apert-Herzog Corp.**, 7007 Realm Dr., B3, San Jose, CA 95119

**Aphex Systems Ltd.**, 13340 Satocoy St., No. Hollywood, CA 91605

**Apis Corp.**, 2960 S. West Temple, Salt Lake City, UT 84115

**Aqua-Tronics, Inc.**, 3021 Industrial Way N.E., Salem, OR 97303

**Arben Design**, 9870 Derby Lane, Westchester, IL 60153

**Argos Products Co., Inc.**, 600 S. Sycamore St., Genoa, IL 60135

**Aristocart Div., Western, Int'l. Communications, Ltd.**, 505 Burrard St., #1960, Vancouver, B.C., Canada V7X 1M6

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 Syntec Int'l., 53 Victoria Ave., Chatswood, N.S.W. Australia 2067  
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**Artel Communications Corp.**, Box 100, West Side Station, Worcester, MA 01602

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**Arvin/Diamond**, Box 200, Lancaster, OH 43130

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**Atlas Tower Corp.**, Box 972, Vinita, OK 74301

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**Audi-Cord Corp.**, 1845 W. Hovey Ave., Normal, IL 61761

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**Audio Technology**, 1169 Tower Rd., Schaumburg, IL 60195

**Audio-Video Engineering Co.**, 65 Nancy Blvd., Merrick, NY 11566

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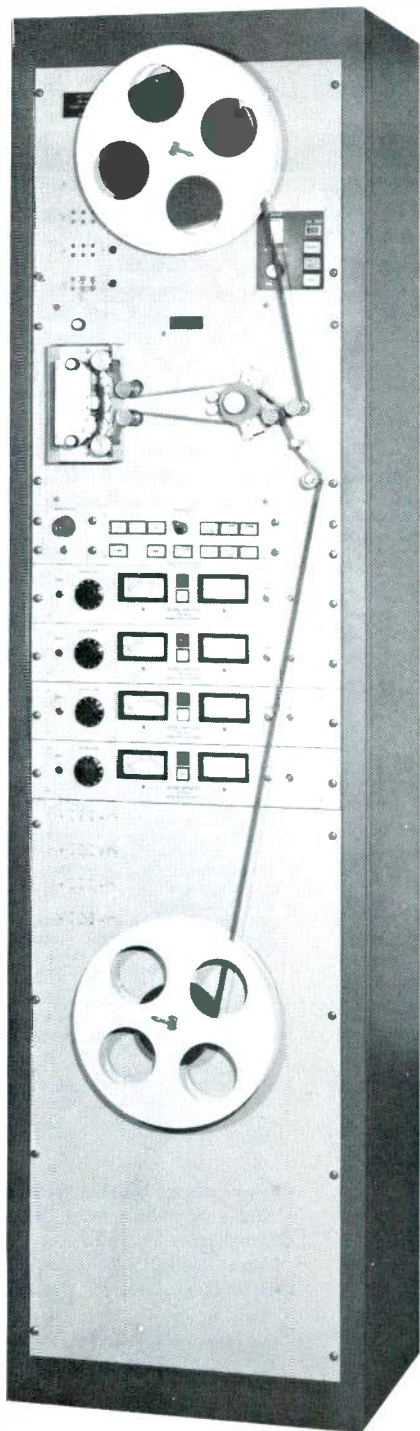
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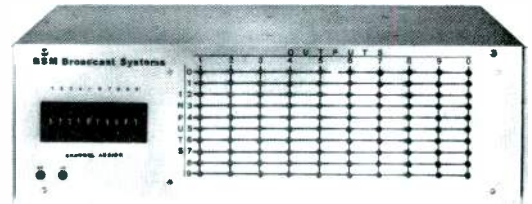
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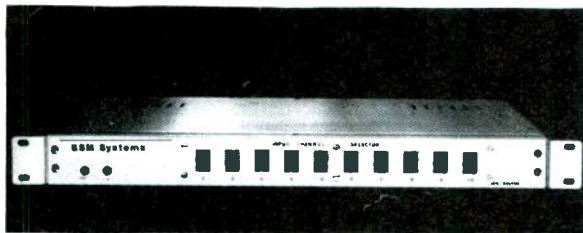


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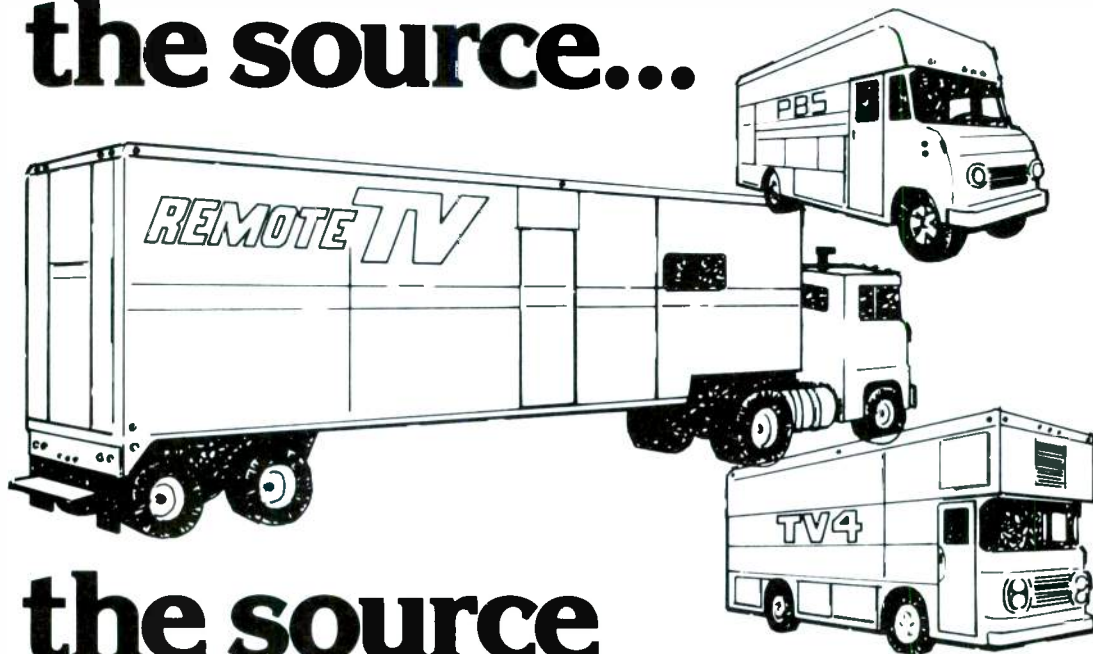
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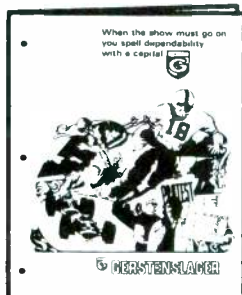
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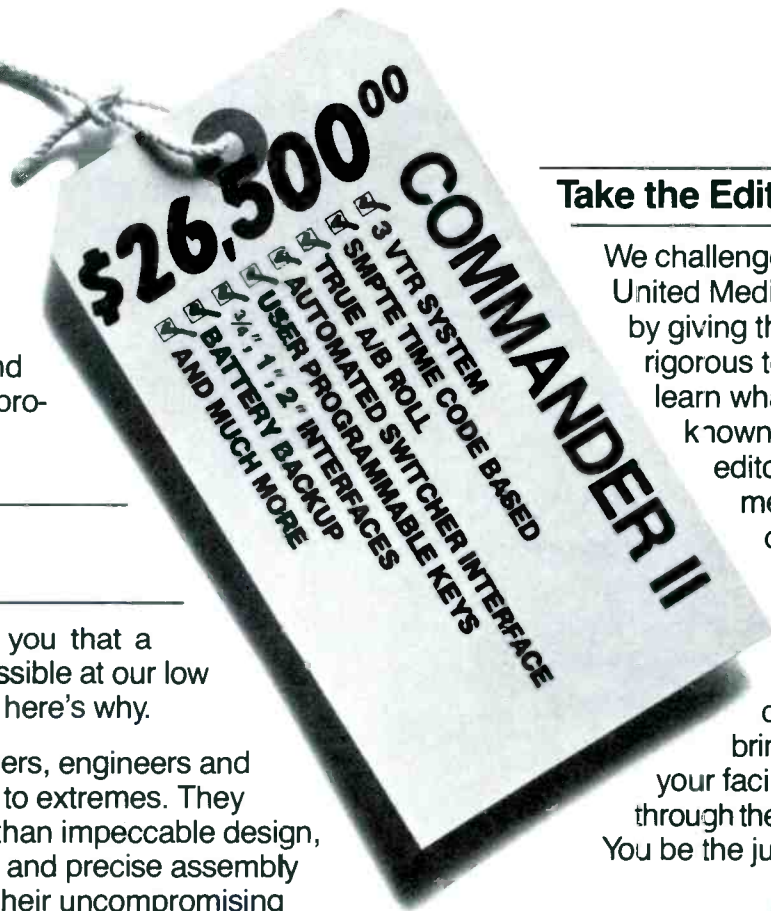
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ENG./AND: Grass Valley Group-Europe, St. Inuitas House / St. Thomas St., Winchester, Hampshire England SO23 9HE Telex UK 477766 GVG-ELU (0962) 53292 Harry Armstrong, Mgr

**Gray Engineering Labs, Inc.**, 504 W. Chapman Ave., Suite P, Orange, CA 92668

Tom C. Clark (714) 997 4151

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CA: Angstrom Stage Lighting, 7049 Vineland Ave., No. Hollywood, CA 91605 (213) 764-6858 Frans Klinkenberg

CA: Four Star Stage Lighting, 3935 N. Mission Rd., Los Angeles, CA 90031 (213) 221-5114 Bob Kruggel

CA: Holzmuller Corp., 2545 16th St., San Francisco, CA 94110 (415) 864-7800 Dick Gentschel

CA: Keylite Rental Co., Inc., 333 S. Front, Burbank, CA 91502 (213) 848-5483 Bob Young

CA: Litelab Corp., 5200 Venice Blvd., Los Angeles, CA 90019 (213) 936-6206 Joe Bates

CA: Musson Theatrical, Inc., 582 Stockton Ave., San Jose, CA 95126 (408) 298-0210 Jan Musson

CA: Norcostco-CA Costume, 2101 W. Garvey Ave. N., West Covina, CA 91790 (213) 960-4711 Wayne Thornton

CA: Olesen, 1535 Ivar Ave., Hollywood, CA 90028 (213) 461-4631 Stu Romans

CA: The Phoebus Co., Inc., 2800 Third St., San Francisco, CA 94107 (415) 550-0770 John Tedesco

CA: Sacramento Theatrical Lighting, 212 13th St., Sacramento, CA 95814 (916) 447-3258 John Cox

CA: San Diego Stage Lighting Supply, 2002 State St., San Diego, CA 92101 (714) 234-8379 Bob DeMent

CA: See Factor Pacific, 8248 Mannix Dr., Los Angeles, CA 90036 (213) 469-7214 Tony Mazzucchi

CA: Sound Chambers, 1204 Burbank Blvd., No. Hollywood, CA 91607 (213) 985-1376 Jerry Laidman

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CA: Theatre Vision, Inc., 5426 Fair Ave., No. Hollywood, CA 91601 (213) 769-0928 Dick Medwitz

CA: Triangle Scenery, Drapery & Lighting, 1215 Bates Ave., Los Angeles, CA 90029 (213) 661-1262 Curtis Seagrove

CO: Theatrx, Inc., 5138 East 39th Ave., Denver, CO 80207 (303) 388-9345 Judith or Robert Bauer

CT: Theatre Supply Association, Box 881, Southport, CT 06490 (203) 254-1407 John Petrafesa

DC: City Lights, 1232 9th St. N.W., Washington, DC 20001 (202) 289-1090 Al or Neil Fleitell

FL: Bay Stage Lighting Co. Inc., 310 S. Macdill Ave., Tampa, FL 33609 (813) 877-1089 Sam or Mary Marino

FL: Southern Lights Inc., 3050 S.E. Monroe St., Stuart, FL 33494 (305) 286-3737 Bill Jolliffe

FL: Stage Equip. & Lighting, 12231 N.E. 13th Court, Miami, FL 33161 (305) 891-2010 George or Vivian Gill

GA: C. Henning Studios, 550 Amsterdam Ave., Atlanta, GA 30324 (404) 872-6686 Cassandra Henning

GA: Herschel Harrington Scenic & Lighting Studio, 132-A 10th St. N.E., Atlanta, GA 30309 (404) 892-0065 Herschel Harrington

GA: Norcostco, Inc., 2089 Monroe Dr. N.E., Atlanta, GA 30324 (404) 874-7511 Mark Hylbak

HI: Brady Photo, 741 A Keikoi St., Honolulu, HI 96813 (808) 533-2065 Allan Brady

IL: Grand Stage Lighting Inc., 630 W. Lake St., Chicago, IL 60606 (312) 332-5611 Paul Tyler

IN: Merrill Stage Equipment, 6520 Westfield Blvd., Indianapolis, IN 46220 (317) 255-4666 Frank Merrill

KS: Theatrical Services, Inc., 128 S. Washington, Wichita, KS 67202 (316) 263-4415 Steve Wolf

MD: R & R Lighting Co., 813 Silver Spring Ave., Silver Spring, MD 20910 (301) 589-4710 Bernard or Eleanor Robertson

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MA: Barbizon Light of New England, Inc., 3 Draper St., Woburn, MA 01801 (617) 935-3920 Gail Henry

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MA: Limelight Productions, Inc., Yale Hill, Stockbridge, MA 01262 (413) 298-3771 Bill Beautyman

MA: Litelab Corp., 69 N. Beacon St., Boston, MA 02134

MN: Gopher Stage Lighting, 2839 11th Ave. S., Minneapolis, MN 55407 (612) 871-0138 Jerry Marquardt

MN: Norcostco, Inc., 3203 N. Highway 100, Minneapolis, MN 55422 (612) 533-2791 Fred Lange

MO: Video Tech/Lites, Highway UU at Neier Rd., Union, MO 63084 (314) 583-5863 Clark Gallagher

NV: Cinema Services, Inc., 3050 Sheridan St., Las Vegas, NV 89102 (702) 876-4667 Jimmy or Barbara Brennan

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TN: Delta Theatre Center, Box 40863, Memphis, TN 38104 (901) 278-6674 Gary Raibeau

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CANADA: Alex L. Clark Ltd., 30 Dorchester Ave., Toronto, Ont., Canada M8Z 4W6 (416) 225-8594 Geo. Birlay

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 CANADA: Wm. F. White Ltd., 36 Parklawn Rd., Toronto, Ont., Canada M8Y 3H8 (416) 252-7171 Wm. White  
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Robert Hannay, V.P. Mktg. (518) 797-3791

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**Harrison Systems Ltd.**, 7515 Annapolis Rd., Suite 411, Hyattsville, MD 20784

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 Peter Hughes, President (916) 273-9524

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**High Country Engineering**, Box 1924, Durango, CO 81301

**High Tech Marketing Co.**, Box 2056, Shawnee Mission, KS 66201

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 Seattle: 1051 Andover Park W., Tukwila, WA 98188 (206) 575-1690  
 Washington DC: 4720 P Boston Way, Lanham, MD 20801 (301) 459-8262 Bill Weston

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**Hoppmann Corp.**, Box 601, Chantilly, VA 22021

**Hotronic, Inc.**, 1210 S. Bascom Ave., Suite 128, San Jose, CA 95128

**House of Metal Enclosure Inc.**, Box 225, Hermann, MO 65041

**Howe Audio Productions, Inc.**, 3085 A Bluff St., Boulder, CO 80301

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 CO: Television Technology, 5970 West 60th Ave., Arvada, CO 80003 (303) 423-1652 Bill Harland  
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**Ben Hughes Communication Products Co.**, Box AS, Old Saybrook, CT 06475  
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**Hughey & Phillips Inc.**, 3050 N. California St., Burbank, CA 91504  
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FL: Robert Veazey & Associates, 511 Mediterranean Court S., Dunedin, FL 33528 (813) 733-4556  
 FL: Robert Veazey & Associates, 1509 N. State Rd. #7, Suite G, Margate, FL 33063 (305) 974-9365  
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 FL: Robert Veazey & Associates, Box 608, Ponte Berda Beach, FL 32082 (904) 285-2941

HI: Klopfenstein's Inc., 1120 Kaleikini Way, Honolulu, HI 96825 (808) 395-1167

IL: LVB Electrical Associates, Inc., 2150 16th St., Broadview, IL 60153 (312) 865-2628

KS: Utility Sales, Inc., Box 353, Shawnee Mission, KS 66201 (913) 492-5595

KY: A.L. Pickens Co., Inc., 413 Squire Circle, Apt. B, Lexington, KY 40502

KY: A.L. Pickens Co., Inc., 2024 Summerhayes Ct., Lexington, KY 40503

KY: A.L. Pickens Co., Inc., 2500 Data Dr., Louisville, KY 40099 (502) 491-4215

KY: A.L. Pickens Co., Inc., 1022 Elmdale Rd., Paducah, KY 42001 (502) 443-7463

MD: Faion Lott & Co., Box 534, Glen Burnie, MD 21061 (301) 744-4636

MA: Chapman-Richards, Inc., 27 Langley Circle, Wollaston, MA 02170 (617) 471-2545

MA: Luikart-Eason Associates, 338 Brooks Dr., Hazelwood, MO 63042 (314) 731-5767

NE: Claus Electrical Sales Inc., 268 North 115th St., Suite 4, Omaha, NE 68154 (402) 333-8301

NJ: David W. Caughlin Associates, 701 Foothill Rd., Bridgewater, NJ 08807 (201) 725-5623

NM: Ralph B. Black, 3206 Candelaria N.E., Albuquerque, NM 87107 (505) 344-3288

OH: Robert S. Howley Co., Box 197, Vermillion, OH 44089 (216) 967-8787

OK: T.F. Sears Co., Inc., Box 75066, Oklahoma City, OK (405) 942-8132

PA: Fieldstone Tech Sales Corp., Box 243, Newton Square, PA 19073 (215) 353-2977

SC: Lighting & Equipment Sales, Inc., Box 1014, West Columbia, SC 29169 (803) 794-1620

TX: T.F. Sears Co., Inc., 4255 LBJ Freeway, Suite 235, Dallas, TX 75234 (214) 661-1516

TX: T.F. Sears Co., Inc., Mutual Savings Bldg., Suite 204, Fort Worth, TX 76102 (817) 336-3634

TX: T.F. Sears Co., Inc., 8100 S. Kirkwood, Suite 109, Houston, TX 77072 (713) 495-3481

CANADA: Graygale Enterprises Ltd., Station C, P.O. Box 1581, Kitchener, Ont., Canada N2G 4P2 (519) 884-5351

**ICM Video**, Box 26330, Oklahoma City, OK 73126

**IGM Communications**, 4041 Home Rd., Bellingham, WA 98225

**ITI Electronics, Inc.**, 369 Lexington Ave., Clifton, NJ 07011

**ITT Jennings**, 970 McLaughlin Ave., San Jose, CA 95122

**Ikegami Electronics (U.S.A.), Inc.**, 37 Brook Ave., Maywood, NJ 07607

John Chow: Nick Balsamo (201) 368-9171

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TX: Ikegami Electronics, 330 North Belt E., Suite 228, Houston, TX 77060 (713) 445-0100 Len Wolff

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**Image Transform, Inc.**, 4142 Lankershim Blvd., No. Hollywood, CA 91602

**H**

**HDS Inc.**, 12310 Pinecrest Rd., Reston, VA 22091

**H.E. Inc.**, 2601 McLeod Dr., Las Vegas, NV 89121

**HM Electronics, Inc.**, 6151 Fairmount Ave., San Diego, CA 92120

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 NC: Applied Audio, 26 Audubon Dr., Asheville, NC 28804 (704) 658-2291 Robert Edsall  
 TX: Rep-Tech, Inc., Box 878, Terrell, TX 75160 (214) 222-2131 Bob Partridge  
 VA: Gemini Electronics Marketing, 115 4th Ave., S., Suite B, Edmonds, WA 98020 (206) 776-3121 Dean Nordquist

**HN Engineering Inc.**, 4664 Lougheed Highway, Burnaby, B.C., Canada V5C 5R7

**H & R Communications, Rt. 3 Box 103G**, Pocahtontas, AR 72455

**Hallikainen & Friends, Inc.**, 101 Suburban Rd., San Luis Obispo, CA 93401

**Image Video Ltd., 705 Progress Ave. #46, Scarborough, Ont., Canada M1H 2X1**

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NJ: Landy Associates, 1890 E. Marlton Pike, Cherry Hill, NJ 08003 (609) 424-4660 Jim Landy

AUSTRALIA: Broadcast Video Pty Ltd., 6 Dansie St., Greenslopes, Brisbane, QLD Australia 4120 (07) 394-2611 Keith Campbell

CANADA: Broadcast Video Systems Ltd., 150 McNicoll Ave., Unit 15, Agincourt, Ont., Canada M1W 2L8 (416) 497-1020 Bert Verwey

CANADA: Canamex, 146 Robert Hicks Dr., Willowdale, Ont., Canada M2R 3R5 (416) 654-327 Jorge Fernandez

CANADA: Wiltronic Ltd., 160 Duncan Mill Rd., Don Mills, Ont., Canada M3B 1Z5 (416) 444-8497 Tom Pressley

CANADA: National Electronic Agencies Ltd., 2137 Commercial Dr., Vancouver, B.C., Canada V5N 4B3 (604) 253-3191 Pat Paement

CANADA: Tresco Communications, 2910 Halpern N., St. Laurent, Que., Canada (514) 332-3430 Claude Tressidier

CANADA: United Video, 409-1230 Old Innes Rd., Ottawa, Ont., Canada K1B 3V3 (613) 741-5554 Bob Helfferman

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**Industrial Sciences, Inc. (ISI), Box 2580, Gainesville, FL 32602**

**Information Transmission Systems, Corp., 16 E. Water St., Canonsburg, PA 15317**

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**Inovonics Inc., 503-B Vandell Way, Campbell, CA 95008**

J. B. Wood, Pres. (408) 374-8300

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CA: VIF International, 1151 Viscaino Ave., Sunnyvale, CA 94086 (408) 739-9740

FL: The Harris Co., 1779 Tiggertail Rd., Miami, FL 33145 (305) 854-2003

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MA: Lebow Labs, 424 Cambridge St., Allston, MA 02134 (617) 782-0600

NJ: Joel Associates, 528 River Rd., Teaneck, NJ 07666 (201) 836-8741

NY: Inovonics, Box 1014, Port Washington, NY 11050 (516) 883-4818

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WA: Broadcast Supply West, 2711 Locust Ave. W., Tacoma, WA 98466 (206) 565-2301

**K**

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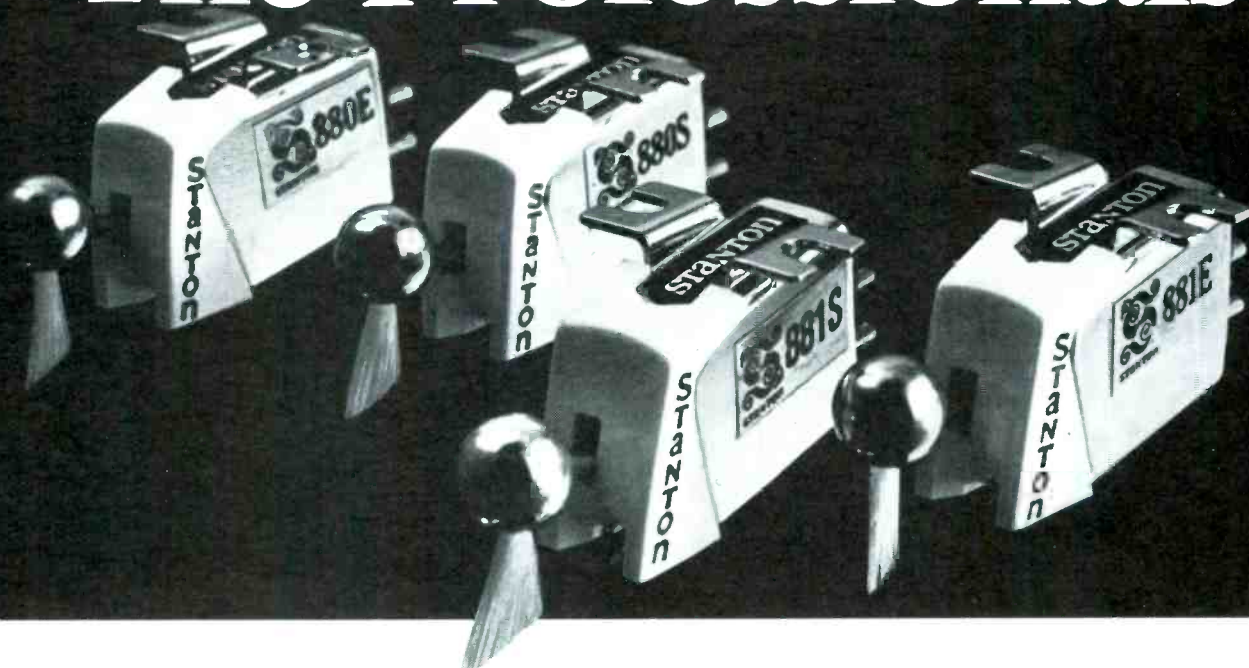
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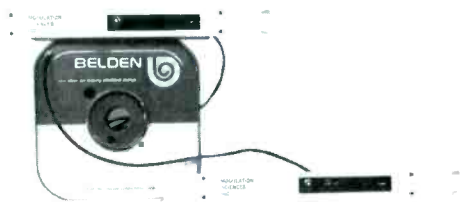


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Setcom Corp., 1400 Stierlin Rd., Mountain View, CA 94043

Shallok, Inc., Box 1089, Smithfield, NC 27577

Mike Sutton (919) 934-3135

**REGIONAL SALES CONTACTS:**

CA: Fischer Associates, 3089 Lawrence Expwy., Santa Clara, CA 95051 (408) 733-7350 Bud Fischer

CA: WCV Co., 14125 Inglewood Ave., Hawthorne, CA 90250 (213) 772-4479 Bill Vanbebbler

CA: Distributing Co., 14125 Inglewood Ave., Hawthorne, CA 90250 (213) 772-4479

FL: Southeast Electronics, 1125 Rosselle St., Jacksonville, FL 32203 (904) 356-3007 H. Clark Overton

IL: Imex Ltd., 540 Frontage Rd., Northfield, IL 60093 (312) 446-8934 Ken Sutch

IA: S & O Sales, 3744 Tanager Dr. N.E., Cedar Rapids, IA 52402 (319) 393-1845 Joseph Swanson

KS: Technical Sales Associates, 9290 Bond St., Suite 114, Shawnee Mission, KS 66214 (913) 888-3330 Bob Frantz

MD: Holden Engineering Sales Co., 1133 Gypsy Lane W., Towson, MD. 21204 (301) 823-3763 Al Holden

MA: MPS Electronics, Inc., 1410 Providence Hwy., Rm. 406, Norwood, MA 02062 (617) 769-8700 Nick Patos

MI: Audio Distributors, Inc., 2342 Division Ave. So., Grand Rapids, MI 49507 (616) 452-1596 David Veldsma

MN: R-J Inc., 7514 Oliver Ave. S., Minneapolis, MN 55423 (612) 866-3661 Bob Johnson

MO: Technical Sales Associates, Box 10907, Ferguson, MO 63135 (314) 725-5361 Duane Mazzacavallo

NY: HLJ Associates, 484 Merrick Rd., Lynbrook, NY 11563 (516) 599-2999 Herb Johnson

NY: Dan Hurley Sales, Box 26, Pittsford, NY 14534 (716) 586-6159 Dan Hurley

NY: Peerless Radio Corp., 19 Wilbur St., Lynbrook, NY 11563 (516) 593-2121 Anthony Valone

NY: Lothar Sanford Corp., 1615 Ninth Ave., Bohemia, NY 11716 (516) 737-0700 Carl Molinari

OH: Allen Nace Co., 804 McGraw Court, Box 68, Englewood, OH 45322 (513) 836-0931 George Zaebst

OH: Allen Nace Co., Box 174, Richfield, OH 44286 (216) 659-7178 Allen Nace

OH: United Radio, Inc., Summit Rd. & Rainhold Dr., Cincinnati, OH 45237 (513) 761-4030 Ed Moore

OH: Peerless Radio Corp., 19 Wilbur St., Lynbrook, NY 11563 (516) 593-2121 Anthony Valone

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OH: Peerless Radio Corp., 19 Wilbur St., Lynbrook, NY 11563 (516) 593-2121 Anthony Valone



PA: Freedman-Malta Associates, Box 582, King of Prussia, PA 19406 (215) 337-9211 Victor S. Malta  
 PA: Philadelphia Electronics, 112 North 12th St., Philadelphia, PA 19107 (215) 568-7400 David C. Shaw  
 TN: Broadcast Equipment & Supply Co., Box 3141, Bristol, TN 37620 (615) 878-2531 Clifton Droke  
 TX: Wholesale Electronics, 2809 Ross Ave., Dallas, TX 75201 (214) 824-3001 Debbie McClure  
 WI: Electronics Industries Inc., 19 E. Irving Ave., Oshkosh, WI 54901 (414) 235-8930 Wendell Tedlie  
 CANADA: Braydon Electro Ltd., 2925 De Miniac St. Laurent, Montreal, Que., Canada H4S 1L8 (514) 332-5650 Don MacKenzie

**Sharp Electronics Corp., Professional Products Div.**, 10 Sharp Plaza, Box 588, Paramus, NJ 07652  
**Shintron Co. Inc.**, 144 Rogers St., Cambridge, MA 02142

Dick Quinlan; Dan Geiger (617) 491-8700  
**REGIONAL SALES CONTACTS:**  
 CA: A-Vidd Electronics Co., 4930 Campus Dr., Newport Beach, CA 90815  
 CA: Adolph Gasser, Inc., 181 Second St., San Francisco, CA 94105  
 CA: Hoffman Video Systems Inc., 800 W. Pico Blvd., Los Angeles, CA 90015  
 CA: Shoreline, Ltd., 3459 Cahuenga Blvd. W., Hollywood, CA 90068  
 CO: Ceavo Audio Visual Co., 1650 Webster St., Denver, CO 80215  
 CT: Videoplay Systems Inc., Tolland Industrial Park, Box 800, Rt. 30, Rockville, CT 06066  
 FL: Florida Video Systems, 6593-3 Powers Ave., Jacksonville, FL 32217  
 GA: Gray Communications Consultants, 3684 Clearview, Doraville, GA 30341  
 GA: Technical Industries, Inc., 6000 Peachtree Rd. N.E., Atlanta, GA 30341  
 MD: CTL Communications, 918 Silgo Ave., Silver Spring, MD 20910  
 MA: Lake Systems Corp., 55 Chapel St., Newton, MA 02160  
 MO: NZ Video Systems, 513 Creer St., St. Louis, MO 63801  
 MO: VMI, 2368 Schuetz Rd., St. Louis, MO 63141  
 NY: The Camera Mart, Inc., 456 West 55th St., New York, NY 10019  
 NY: L. Matthew Miller Assocs., 48 West 21st St., New York, NY 10010  
 OH: Kavco, Inc., 3931 Image Dr., Dayton, OH 45414  
 OH: Midwest Corp., 11500 West 8th St., Cincinnati, OH 45414  
 TX: Magnetic Media, 7320 Ashcroft, Suite 205, Houston, TX 77081  
 TX: Video Systems, Inc., 2123 W. Governors Circle, Houston, TX 77092  
 UT: RIA Corp., 50 E. Malvern Ave., Salt Lake City, UT 84115

**Shively Laboratories, Div. of Howell Labs, Inc.**, 36 Harrison Rd., Bridgton, ME 04009  
 C.W. Peabody (207) 647-3327

**REGIONAL SALES CONTACTS:**  
 AR: Radcom Inc., Box 191, Eureka Springs, AR 72632 (501) 253-8702  
 CA: Macrom Inc., Box 66507, Scotts Valley, CA 95066 (408) 438-4273 Martin Jackson  
 FL: Beattie & Associates, 3317 Barrow Hill Trail, Tallahassee, FL 32308 (904) 893-1382 Bob Beattie  
 ID: Hall Electronics, Box 5031, Boise, ID 83705 (208) 336-5894 Larry Hall  
 LA: Audio Media Associates, Box 29264, New Orleans, LA 70189 (504) 242-6014 Corey Meyer  
 MI: H.M. Dyer Electronics, Inc., 48647 Twelve Mile Rd., Novi, MI 48050 (313) 349-7910 Leo Rymarz  
 NJ: H.M. Holzberg Assoc. Inc., Box 322, Totowa, NJ 07511 (201) 256-0455 Herb Holzberg  
 NM: Dyma Engineering, Box 1535, Los Lunas, NM 87031 (505) 865-6700 Carroll Cunningham  
 NC: Southern Coastal Marketing Services, 800 N. Polk St., Pineville, NC 28134 (704) 889-4508 Bob Cauffman  
 SC: Doug Cook Associates, Box 486, Lake Wylie, SC 29710 (803) 831-2442 Doug Cook  
 WI: Enterprises, Inc., 6943 Cummins Court, Hartford, WI 53027 (414) 966-3303 John Hood  
 CANADA: MSC Electronics, Ltd., 254 Wildcat Rd., Downsview, Ont., Canada M3J 2N5 (416) 861-4180 David Lafrenais

**Shook Electronic Enterprises, Inc.**, 6640 Topper Pkwy., San Antonio, TX 78233  
**Shure Brothers Inc.**, 222 Hartrey Ave., Evanston, IL 60204  
 Glenn Schrader, V.P./Sales (312) 866-2200

**Siecor Corp.**, 489 Siecor Park, Hickory, NC 28603  
**Siegel Electronics**, Box 33421, San Diego, CA 92103  
**Sigma Electronics, Inc.**, 1830 State St., East Petersburg, PA 17520  
**Sigmacom Systems Inc.**, 111 Industrial Dr., Whitby, Ont., Canada L1N 5Z9  
**SIMTEE**, 4657 Abargo St., Woodland Hills, CA 91364  
**Singer Broadcast Products, Inc.**, 875 Merrick Ave., Westbury, NY 11590  
 Alan Singer, Gen. Mgr. (516) 683-3000

**Sintronic Corp.**, See Singer Broadcast Products  
**Si-Tex Marine Electronics**, Box 6700, Clearwater, FL 33518  
**Skirpan Lighting Systems, Inc.**, 19030 72nd Ave. S., Kent, WA 98032

**Skotel Corp.**, 1445 Provencher, Bros-sard, Que. Canada J4W 1Z3  
**Smith Electronics, Inc.**, 8200 Snow-ville Rd., Cleveland, OH 44141  
**Smith-Victor Corp.**, 301 N. Colfax St., Griffith, IN 46319  
**Warren R. Smith Co.**, Drawer C, Ocean Gate, NJ 08740

**Solid Electronics Labs**, 220 Brook-thorpe Circle, Broomall, PA 19008  
**Solid State Logic**, Churchfields, Stonesfield, Oxford, England OX7 2PW  
**Soll, Inc.**, 401 East 74th St., New York, NY 10021

**H. A. Solutec Ltd.**, 4360 Iberville St., Montreal, Que., Canada H2H 2L8  
**Sonar Radio Corp.**, 3000 Stirling Rd., Hollywood, FL 33021  
**Sono-Mag Corp.**, 1833 W. Hovey Ave., Normal, IL 61761  
**Sonosax**, Ch. du Croset 9, CH-1024 Ecublens/Lausanne, Switzerland  
**Sony Corp. of America**, 9 W. 57th St., New York, NY 10019

**REGIONAL SALES CONTACTS:**  
 EAST: (201) 368-5085  
 MID-ATLANTIC: 201 368-5112  
 MIDWEST: (312) 773-6045  
 NORTHEAST: (201) 368-5112  
 SOUTHEAST: (404) 451-7671  
 SOUTHWEST: (214) 659-3600  
 WEST: (213) 841-8711  
**Sony Professional Audio**, Sony Dr., Park Ridge, NJ 07656  
 George Currie, V.P. & Gen. Mgr. (201) 930-1000

**REGIONAL SALES CONTACTS:**  
 CA: Sony Corp., Digital Audio, 700 W. Artesia Blvd., Compton, CA 90220 (213) 537-4300 C. Chan  
 CA: Sony Corp., Pro Audio Products, 1049 Allwell Court, Palo Alto, CA 94303 (415) 965-8700 J. Evans  
 IL: Sony Corp., Pro Audio Products, 500 Park Blvd., Itasca, IL 60143 (312) 635-6699 E. De LosSantos  
 NJ: Sony Corp., 15 Essex Rd., Paramus, NJ 07652 (201) 368-5000 G. Sinas-Digital Audio; M. Falkner-Pro Audio

TN: Sony Corp., Nashville Commerce Mail, 1717 Elm Hill Pike, Suite 8-S, Nashville, TN 37210 (615) 366-0333 R. Phillips-Digital Audio; G. Goodall-Pro Audio  
**Soper Sound Music Library, Soper Sound Media Music**, Box 498, Paio Alto, CA 94301  
**Sorensen Co., A Unit of Raytheon Co.**, 676 Island Pond Rd., Manchester, NH 03103  
**Sound Ideas, Sound Effects Library**, 86 McGill St., Toronto, Ont., Canada M5B 1H2  
**Sound Technology**, 1400 Dell Ave., Campbell, CA 95008  
 Kent McGuire (408) 378-6540

**REGIONAL SALES CONTACTS:**  
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 FL: Kelcar Int'l., Merritt Island, FL (305) 452-8855 Dan Carney  
 IL: Steffy Marketing, Northbrook, IL (312) 480-3575 Bill Steffy  
 IN: AV Marketing, Carmel, IN (317) 846-1034 Kurt Gish  
 MI: Ray Wright & Associates, Farmington Hills, MI (313) 477-7562 Ray Wright  
 MN: Resource Marketing, Minneapolis, MN (612) 333-1150 Pat Klise  
 NJ: Hartmann Sales, Maplewood, NJ (201) 761-0007 Dave Hartmann  
 PA: Elmark, Huntingdon Valley, PA (215) 947-0750 Brayton Robinson  
 TN: Evans Sales & Marketing, Nashville, TN (615) 297-7997 Richard Stevens  
 TX: Charles Lucas Sales, Dallas, TX (214) 330-8181 Sam Lucas

**Sound Workshop, Pro. Audio Products**, 1324 Motor Parkway, Hauppauge, NY 11788  
**Soundcraft Inc.**, 1517 20th St., Santa Monica, CA 90404  
 Wayne Freeman (213) 453-4591

**REGIONAL SALES CONTACTS:**  
 CANADA: Soundcraft Electronics Canada Inc., 1444 Hymus Blvd., Dorval, Que., Canada H9P 1J6 (514) 685-1610 Richard Lesmer  
 ENGLAND: Soundcraft Electronics Ltd., 5-8 Great Sutton St., London England EC1V 0BX (01) 251-3631 Phil Dunderidge

**Souder Electronics Inc.**, 21 Madrona St., Mill Valley, CA 94941  
**SoundScriber Magnetic, Recording Co., Inc.**, 116 Richards St., West Haven, CT 06516  
**Soundstream Inc.**, 2505 E. Parleys Way, Salt Lake City, UT 84109  
**Spar Aerospace Ltd., Satellite & Aerospace Sys. Div.**, 21025 Trans-Canada Hwy., Ste-Anne-Bellevue, Que., Canada H9X 3R2  
**Spectra Sonics**, 3750 Airport Rd., Ogden, UT 84403

**Spectrum Planning Inc.**, 1111 19th St. N.W., Suite 1050, Washington, DC 20036  
**Spectrum Planning Inc.**, Box 1360, Richardson, TX 75080  
**Spin Physics, Eastman Kodak**, 3099 Science Park Rd., San Diego, CA 92121  
**Stainless, Inc.**, Third & Montgomery Sts., North Wales, PA 19454  
 Jess C. Rodriguez, V.P. (215) 699-4871  
**Stancil Corp.**, 921 N. Highland, Hollywood, CA 90038  
**Standard Communications Corp.**, Box 92151, Los Angeles, CA 90009

**Standard Tape Laboratory, Inc.**, 26120 Eden Landing Rd. #5, Hayward, CA 94545  
 Frank Lennert, Pres. (415) 786-3546

**Stanton Magnetics Inc.**, Terminal Drive, Plainview, NY 11803  
 Pete Bidwell (516) 349-0023

**Stantron Div., Wyco Metal Products**, 6914 Beck Ave., No. Hollywood, CA 91605  
 Guy Tessier (213) 875-0800

**Star Case Mfg. Co. Inc.**, 15525 South 70th Court, Orland Park, IL 60462  
**Starex, Inc.**, Box 248, Kearney, NJ 07032

**Station Business Systems, Div. Control Data Corp.**, 600 W. Putnam Ave., Greenwich, CT 06830  
**Steenbeck, Inc.**, 9554 Vassar Ave., Chatsworth, CA 91311

**Stoner Communications Inc.**, 9119 Milliken Ave., Rancho Cucamonga, CA 91730  
**Storeel Corp.**, 2050-C Carroll Ave., Atlanta, GA 30341

**Straight Wire Audio, Inc.**, 2523 Wilson Blvd., Arlington, VA 22201  
**Strand Century, Inc.**, 18111 S. Santa Fe Ave., Rancho Dominguez, CA 90221

**Studer Revox America**, 1425 Elm Hill Pike, Nashville, TN 37210  
 Tom Mintner (615) 254-5651

**REGIONAL SALES CONTACTS:**  
 CA: Audio Engineering Associates, 1029 N. Allen Ave., Pasadena, CA 91104 (213) 798-9127 Wes Dooley  
 CA: Studer Revox America, Inc., 14046 Burbank Blvd., Van Nuys, CA 91401 (213) 780-4243 Thomas Jenny  
 CA: Studer Revox America, 954 Hawthorne Dr., Walnut Creek, CA 94596 Fred Lays  
 FL: Pro Audio General Store, 1378 N.W. 100th Ave., Coral Springs, FL 33065 (305) 752-0330 Bill Shute  
 IL: Bridgewater Custom Sound, 160th & So. Halsted, Harvey, IL 60426 (312) 596-0309 Jay Bridgewater  
 IL: Pro Audio, Ltd., 111 S. Dr., Tower Lake, Barrington, IL 60010 (312) 526-1660 Brian Tucker  
 IL: Studio Sonics, 1165 Tower Rd., Schaumburg, IL 60195 (312) 843-7400 Jim Stemke  
 MA: Cramer, 120 Hampton Ave., Needham, MA 02194 (617) 449-2100 Les Arnold  
 NY: Studer Revox America, Inc., 155 Avenue of the Americas, New York, NY 10013 (212) 255-4462 Nancy Byers  
 OK: Doug Brown Enterprises, 1703 E. Skelly Dr., Tulsa, OK 74105 (918) 747-3618 Doug Brown  
 TX: Studer Revox America, 910 S. Glasgow, Dallas, TX 75223 (214) 760-8647 Chris Ware

**Studio Film & Tape, Inc.**, 6670 Santa Monica Blvd., Hollywood, CA 90038  
**Studio Systems Inc.**, Box 67, Snowdon, Montreal, Que., Canada H3X 3T3

**Studio Technologies, Inc.**, 6666 N. Lincoln, Lincolnwood, IL 60645  
**Studiomaster Inc.**, 1365-C Dynamics St., Anaheim, CA 92806

**The Superior Electric Co.**, 383 Middle St., Bristol, CT 06010  
**Surcom Associates, Inc.**, 305 Wisconsin Ave., Oceanside, CA 92054  
 August Link, President (619) 722-6162

**Swagger Tower Corp.**, Box 656, Fremont, IN 46737

Manufacturers' addresses

**Swiderski Electronics**, 1200 Greenleaf Ave., Elk Grove Village, IL 60007  
**Swintek Enterprises, Inc.**, 1180 Aster Ave., Bldg. J, Sunnyvale, CA 94086

Darisa Hill (408) 249-5646

**REGIONAL SALES CONTACTS:**

**AUSTRALIA:** John Barry, 1905 Reserve Rd., Avataman, NSW 206 Sydney Australia (02) 439-6955 Bob Findlay  
**CANADA:** Cinequip, 275 Macpherson Ave., Toronto, Ont., Canada M4V 1A4 (416) 920-5424 Don Hall  
**CANADA:** Commercial Electronics, 1335 Burrard St., Vancouver, B.C., Canada V6Z 1Z4 (604) 669-5525 Henry Vontiesar-havs  
**ENGLAND:** Optical & Textile, 22-26 Victoria Rd., New Barnet, Herts England EN4 9PH (01) 441-2199 Ron Collins  
**SOUTH AMERICA:** Musicians Sound Center, 218 Commissioner St., 2001 Tohan-nesburg South America (001) 37-6556/9 Dennis Feldman

**Switchcraft Inc.**, 5555 N. Elston Ave., Chicago, IL 60630

**Sylvania Light/GTE**, Lighting Center, Danvers, MA 01923

**Symetrix Inc.**, 109 Bell St., Seattle, WA 98121

**Symtec Inc.**, 15933 W. 8-Mile Rd., Detroit, MI 48235

**Synchronous Communications, Inc.**, 1701 Fortune Dr., Suite O, San Jose, CA 95131

**System Wireless Ltd.**, 11250-14 Roger Bacon Dr., Reston, VA 22090

**T**

**TFT Inc.**, 3090 Oakmead Village Dr., Santa Clara, CA 95051

Dan Balte (408) 727-7272

**REGIONAL SALES CONTACTS:**

**CA:** Marcom, Box 66507, Scotts Valley, CA 95066 (408) 438-4273 Marty Jackson; Ted Tripp  
**CA:** Marcom, 21243 Ventura Blvd., Suite 145, Woodland Hills, CA 91364 (213) 703-0381 Doug Howland  
**CO:** Didier/Denver, Box 1599, Evergreen, CO 80439 (303) 674-6000 Steve or Herb Didier  
**FL:** Beattie & Associates, 3317 Barrow Hill Trail, Tallahassee, FL 32308 (904) 893-1382 Bob Beattie  
**GA:** Roscom, Inc., Box 1208, Roswell (Atlanta), GA 30077 (404) 992-2700 Bob Stewart; Ken Wilson  
**ID:** Hall Electronics, Box 5031, Boise, ID 83705 (208) 376-1663 Larry Hall  
**MD:** Wiltronk, Inc., Box 364, Washington Grove, MD 20880 (301) 258-7676 Dwight or Dave Wilcox  
**MI:** Dyer Electronics, 48647 Twelve Mile Rd., Novi, MI 48050 (313) 349-7910 Mike Dyer; Leo Rymarz  
**MN:** Emmons Associates, 1121 Riverwood Dr., Burnsville, MN 55337 (612) 890-8920 Keith Emmons  
**NJ:** Holzberg Associates, Box 322, Totowa, NJ 07512 (201) 256-0455 Herb Holzberg  
**NC:** EME I, Inc., 112 Buena Vista, High Point, NC 27260 (919) 869-3335 George Gold  
**PA:** TFT, Inc., 1355 Jeanette Way, Southampton, PA 18966 (215) 322-8911 Tom Creighton  
**TN:** Radford Associates, 1331 Otter Creek Rd., Nashville, TN 37215 (615) 373-0231 Ralph Hucaby  
**TX:** Parcom, 2460 Raintree Dr., Southlake, TX 76092 (817) 481-7221 Darryl Parker  
**VA:** EME IV Inc., 107 Richneck Dr., Williamsburg, VA 23185 (804) 253-0171 Ken Ward  
**WA:** Marcom, 216 Westlake Ave. N., Seattle, WA 98109 (206) 621-9633 Bill Wolfenbarger  
**CANADA:** MSC Electronics, 254 Wildcat Rd., Downsview, Ont., Canada M3J 2N5 (416) 661-4180 David LaFrenais; Anthony Sharpe  
**CENTRAL/SOUTH AMERICAN & PUERTO RICO:** Electrex Co., 18680 N.E. 2nd Ave., Miami, FL 33179 (305) 651-5752 Ben Ostrovsky

**TM Systems, Inc.**, 25 Allen St., Bridgeport, CT 06604

**TRW, LSI Products**, Box 2472, La Jolla, CA 92038

**TRW Semiconductor**, 14520 Aviation Blvd., Lawndale, CA 90260

**TTC-Television Tech. Div.**, 5970 West 50th Ave., Arvada, CO 80003

**TTC-Wilkinson Radio Div.**, 5970 West 50th Ave., Arvada, CO 80003

Bill Harland (303) 423-1652

**TTE, Inc.**, 2212-14 S. Barry Ave., Los Angeles, CA 90064

**Taber Mfg. & Eng. Co.**, 2468 Embarcadero Way, Palo Alto, CA 94303

**Tamron Co., Ltd.**, 17-11, 7-chome Takingogawa, Kita-ku, Tokyo, Japan 114

**Tandberg of America, Inc.**, 1 Labriola Court, Armonk, NY 10504

**William B. Tanner Co. Inc.**, 2714 Union Ext., Memphis, TN 38112

**Tape-Athon Corp.**, Cavox Stereo Productions, 502 S. Isis Ave., Inglewood, CA 90301

**TEAC Corp. of America**, 7733 Telegraph Rd., Montebello, CA 90640

Bill Mohrthoff (213) 726-0303

**Tech Laboratories Inc.**, Bergen & Edsall Blvds., Palisades Park, NJ 07650

Stanley Becker (201) 944-2221

**REGIONAL SALES CONTACTS:**

**CA:** C & W Component Sales, Box 3493, Granada Hills, CA 91344 (213) 368-4032 D. Crandall  
**CA:** Mollard Marketing, 3350 Scott Blvd., Bldg. 4, Santa Clara, CA 95051 (408) 727-2050 T. Mollard  
**CT:** NBS Associates, Main St., New Preston, CT 06777 (203) 868-0501 L. Nelson  
**GA:** Grady Duckett Sales, Box 29067, Atlanta, GA 30359 (404) 451-3529 W. Fanning  
**IL:** Crimson Engineering, Box 286, Glenview, IL 60025 (312) 470-0024 A. Hubbard  
**KS:** Midtec Associates, Inc., 7702 Mize Rd., DeSoto, KS 66018 (913) 441-6565 G. Yantis  
**MI:** Norwood Scroggs Co., 2221 Arbor Hills Rd., Jackson, MI 49201 (517) 750-1170 N. Scroggs  
**NJ:** Bob Cameron Associates, 99 Hampshire Hill Rd., Upper Saddle River, NJ 07458 (201) 825-1304 B. Cameron  
**NJ:** Gray Associates, 8 E. Mount Vernon Ave., Haddonfield, NJ 08033 (609) 429-5300 J. Shaw; F. Churchill  
**NY:** Haner Associates, Box 463, Huntington Station, NY 11746 (516) 242-7855 J. Edelman  
**NY:** Net Sales Co., 14 Chipping Ridge, Fairport, NY 14450 (716) 467-4538 R. Murray  
**OH:** Pato & Associates, Box 31135, Cincinnati, OH 45231 (513) 931-3311 W. Paterson  
**PA:** Verhill Associates, 3550 Laketon Rd., Pittsburgh, PA 15235 (412) 241-5202 R. Verhill  
**TX:** Southwest Electronics, 9226 Markville Dr., Dallas, TX 75243 (214) 690-9881 J. Stanfield  
**WA:** SPS Electronics, Box 22438, Seattle, WA 98112 (206) 323-4140 T. Moore  
**CANADA:** Solid State Engineering Co., Station N.D.G., Box 355, Montreal Que., Canada H4A 3P7 (514) 481-3313 J. Bohm

**Technical Projects Ltd.**, Rampart House, 63 Victoria St., Windsor Berks, England SL4 1EH

**Tektronix Inc.**, Box 1700, Delivery Station Y3-314, Beaverton, OR 97075

Art Johnson (503) 642-8929

**Tel-Mar Corp.**, R.R.1 Box 212, Makanda, IL 62958

**Telaudio Centre**, Box 921, Beverly Hills, CA 90213

**Telcom Research**, 1163 King Rd., Burlington, Ont., Canada L7R 3X5

**Tele-Cine Corp.**, Div. of Schneider Corp. of America, 400 Crossways Park Dr., Woodbury, NY 11797

Bob Jones (516) 496-8500

**Tele-Engineering Corp.**, 2 Central St., Framingham, MA 01701

**Tele-Measurements Inc.**, 145 Main Ave., Clifton, NJ 07014

**Telectro Systems Corp.**, 96-18 43rd Ave., Corona, NY 11368

**Teledac Inc.**, 1575 Taschereau, Longueuil, Que., Canada J4K 2X8

**Teledyne Energy Systems**, 110 W. Timonium Rd., Timonium, MD 21093

**Telemet Div., A Gettel Co.**, 185 Dixon Ave., Amityville, NY 11701

Robert Griffiths, VP/Sales (516) 842-2300

**REGIONAL SALES CONTACTS:**

**CA:** Tri-Tronics, Inc., 2921 W. Alameda Ave., Burbank, CA 91505 (213) 843-2170 Chuck Huber  
**DC:** Comex Corp., Dulles Int'l. Airport, Box 17011, Washington, DC 20041 Jack Rickel  
**FL:** Comex Corp., 1645 N.W. 79th Ave., Miami, FL 33126 Russ Thom  
**FL:** Global Video Communications Corp., 744 W. Church St., Orlando, FL 32805 (305) 423-8356 David Antoniak, Pres.  
**FL:** Richard Kaulfer (Int'l.), Box 2336, Miami, FL 33140 Richard Kaulfer  
**FL:** Tropical Video Exporters, Inc., 7100 Biscayne Blvd., Miami, FL 33128 Jay Mathis  
**GA:** Radford Associates, 3203 Lanier Dr., Atlanta, GA 30319 (404) 237-6097 Lew Radford  
**HI:** E.M.C. Corp., 550 Paiea St., Honolulu, HI 96819 Wayne Christensen  
**HI:** Omega Pacific, 570 Auahi St., #204, Honolulu, HI 96813 (808) 533-7655 Mark Morrison, Owner  
**IL:** Harris Corp., Broadcast Products Div., Box 4290, Quincy, IL 62301 Juanita Berry  
**IL:** NEC America, 130 Martin Lane, Elk Grove Village, IL 60007 Motoyuki Tajima  
**IL:** Roscor Corp., 6160 W. Oakton St., Morton Grove, IL 60053 Steven Detch  
**IL:** Swiderski Electronics, Inc., 1200 Greenleaf Ave., Elk Grove Village, IL 60007 (312) 364-1900 Joseph Swiderski III  
**MD:** Pearce-PHELPS, 12288 Wilkens Ave., Rockville, MD 20852 Fred Bergstrasser  
**MD:** Professional Products, Inc., 4964 Fairmount Ave., Bethesda, MD 20814 (301) 657-2141 Carter Kaufmann  
**MA:** Comark Communications, Inc., Box 267, Rt. 57, Southwick, MA 01077 Jeffrey Hamilton  
**MA:** P.V.S. Inc., 1616 Soldiers Field Rd., Boston, MA 02131 (617) 254-2101 Will Morin, Pres.  
**MA:** Townsend Associates, Inc., 79 Mainline Dr., Westfield, MA 01085 George Townsend  
**MI:** Complete Communications, 30310 Woodgate Dr., Southfield, MI 48076 Richard Strauss  
**NJ:** H.M. Holzberg Associates, Inc., Box 322, Totowa, NJ 07511 Herbert Holzberg, Pres.  
**NJ:** Phillips Television Systems, Inc., 900 Corporate Dr., Mahwah, NJ 07430 Robert Bacchier  
**NJ:** RCA Corp., Broadcast Systems, Bldg. 2-3, Camden, NJ 08102 Gary Passanante  
**NM:** Dyma Engineering, 213 Pueblo del Sur, Box 1697, Taos, NM 87571 (505) 758-8686 Carroll Cunningham, Pres.  
**NY:** Argil Int'l. Ltd., 50 West 17th St., New York, NY 10011 Ana Farina  
**NY:** The Camera Mart Inc., 456 West 55th St., New York, NY 10019 Paul Meistrich  
**NY:** Sonocrast Corp., 360 West 36th St., New York, NY 10001 (212) 760-9300 Fred Lissa  
**PA:** Alpa Video & Electronics Co., 28 E. Mall Plaza, Carnegie, PA 15106 Henry Lassige  
**TN:** Radford Associates, 1331 Otter Creek Rd., Nashville, TN 37215 (615) 373-0231 Ralph Hucaby

*TX:* Electro Systems Engineering, 10520 Plano Rd., Suite 206, Dallas, TX 75238 Terry Muncey  
**CANADA:** M.S.C. Electronics Ltd., 254 Wildcat Rd., Downsview, Ont., Canada M3J 2N5 David LaFrenais

**Telemetrics Inc.**, 300 Rt. 17 North, Upper Saddle River, NJ 07458

**Telescript, Inc.**, 445 Livingston St., Norwood, NJ 07648

**Telesource Communication Services**, Box 7132, Phoenix, AZ 85011

**Television Equipment Associates**, Box 393, South Salem, NY 10590

**Telex Communications, Inc.**, 9600 Aldrich Ave. S., Minneapolis, MN 55420

**Telfax Communications**, Box 31, Webster City, IA 50595

**Telton Corp.**, 10801 120th Ave. N.E., Kirland, WA 98033

**Tennaplex Systems Ltd.**, 34 Bentley Ave., Ottawa, Ont., Canada K2E 6T8

**Tentel**, 1506 Dell Ave., Campbell, CA 95008

**Teppo Corp.**, Box 680, Rapid City, SD 57709

**Terminal Display Systems Ltd.**, Philips Rd., Whitebirk Ind. Estate, Blackburn, Lancs, England BB1 5TH

**TEST/Tanner Electronics, Systems Technology, Inc.**, 16130 Stagg St., Van Nuys, CA 91409

**Texar Inc.**, 7175 Saltburg Rd., Pittsburgh, PA 15235

**Texas Electronics**, Box 7225, Dallas, TX 75209

**Texscan**, 2960 Grand Ave., Phoenix, AZ 85017

**Texscan Corp.**, 2446 N. Shadeland, Indianapolis, IN 46219

**Theatre Service & Supply Corp.**, 1792 Union Ave., Baltimore, MD 21211

**Theatre Techniques Inc.**, 60 Connolly Parkway, Hamden, CT 06514

**Theatrical Services Inc.**, 128 S. Washington, Wichita, KS 67202

**Thermodyne International Ltd.**, 20850 S. Alameda St., Long Beach, CA 90810

**Thomson-CSF Broadcast, Inc.**, 2075 Brownhouse Rd., Stamford, CT 06902

**Thomson CSF Components Corp.**, Electron Tube Div., 301 Rt. 17 North, Rutherford, NJ 07070

**3M Co., Broadcast & Related Products Div.**, 3M Center, Bldg. 225-3S, St. Paul, MN 55144

**3M Co., Magnetic A/V Products Div.**, 3M Division Center, Bldg. 223-5, St. Paul, MN 55144

**Tiffen Mfg. Corp.**, 90 Oser Ave., Hauppauge, NY 11788

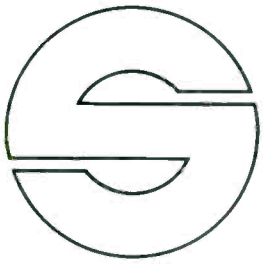
Tom Grosso (516) 273-2500

**Times Fiber Communications**, Box 384, Wallingford, CT 06492

**Times One**, 305 East 46th St., New York, NY 10017

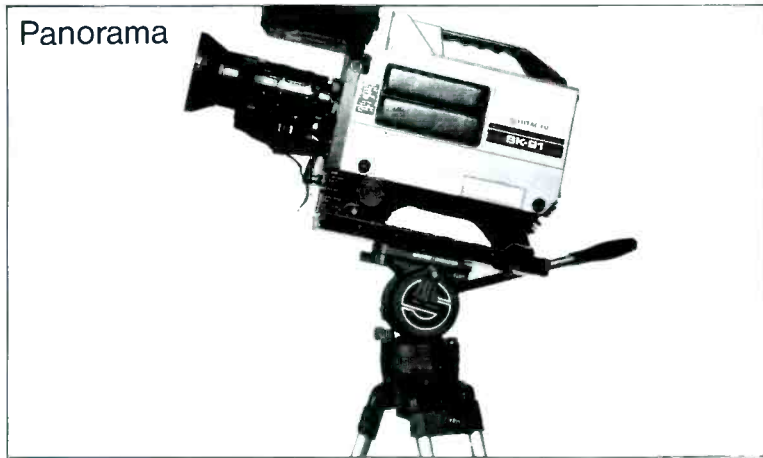
**Tiner Communication Services, Inc.**, 616 Six Flags Dr., Suite 136, Arlington, TX 76011

**Topaz**, 9192 Topaz Way, San Diego, CA 92123

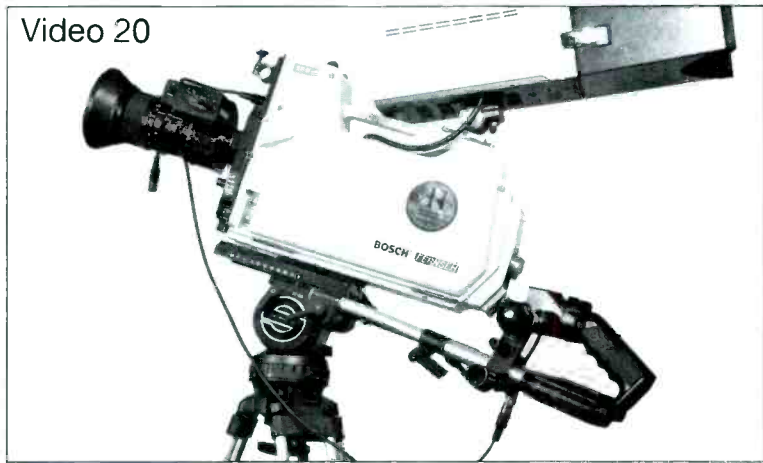


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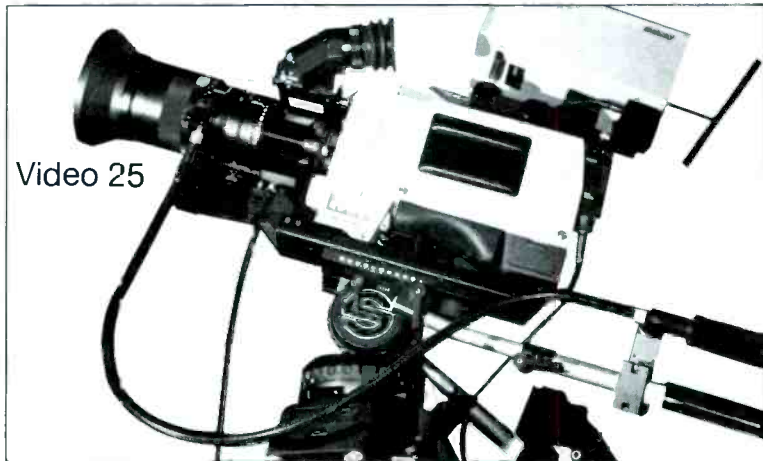
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**Townsend Associates, Inc.**, 79 Mainline Dr., Westfield, MA 01085

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**REGIONAL SALES CONTACTS:**

CA: Townsend Associates, Inc., 1080 Los Molinos Way, Sacramento, CA 95825 (916) 972-9969 Warren Trumbly  
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CANADA: Comad Communications, Ltd., 91 Kelfield St., Unit #5, Rexdale, Ont., Canada M9W 5A3 (416) 245-1734 Emil Adamyk  
THAILAND: Townsend Associates, Inc., Nana Post Office, Box 11-1240, Bangkok Thailand 190112 Wayne McMahon

**Tracor Inc., Industrial Instruments Div.**, 6500 Tracor Lane, Bldg. 27-4, Austin, TX 78721

**Transist-O Sound Inc.**, 728 Yosemite Dr., Indianapolis, IN 46217

**Transtector Systems Div., Konic International Corp.**, Box 1299, Post Falls, ID 83854

**Tri-Tronics Prof. Elec., Inc.**, Highway 210 N., Box 1067, Lillington, NC 27546

**Trident (USA) Inc.**, 652 Glenbrook Rd., Stamford, CT 06906

**Triple Crown Electronics, Inc.**, 4560 Fieldgate Dr., Mississauga, Ont., Canada L4W 3W6

**Trompeter Electronics, Inc.**, 8936 Comanche Ave., Chatsworth, CA 91311

**True Time**, 3243 Santa Rosa Ave., Santa Rosa, CA 95401

Victor Kunkel (707) 528-1230

**REGIONAL SALES CONTACTS:**

AL: Scientific Devices, 904 Bob Wallace Ave., Huntsville, AL 35801 (205) 536-1969 Bob McGuire  
AZ: Scientific Devices, 3920 E. Indian School Rd., Phoenix, AZ 85018 (602) 957-0401 Ron Green  
CA: Scientific Devices, 360 E. Washington Ave., Escondido, CA 92025 John Hall  
CA: Scientific Devices, 3662 Katella Ave., Los Alamitos, CA 90720 (213) 598-7678 Dave Orahoad  
CA: Scientific Devices, 3484 Steven Creek Blvd., San Jose, CA 95117 (408) 554-0455 Hector Membreno  
CO: Scientific Devices, 2760 29th St., Boulder, CO 80301 (303) 449-9466 Joe Evans  
FL: Scientific Devices, 806 26th St., Orlando, FL 32805 (305) 841-8180 John Jones  
FL: Scientific Devices, 47 Mugs Dr., Shalimar, FL 32579 (904) 651-4407 Bob Jones  
GA: Scientific Devices, 375 Freyer Dr. N.E., Marietta, GA 30066 (404) 427-8660 Randy Jones  
NM: Scientific Devices, 3000 Aztec N.E. #256, Albuquerque, NM 87107 (505) 293-3494 Jim Vermillion  
NC: Scientific Devices, 3148 Shannon Dr., Winston-Salem, NC 27106 (919) 765-5776  
PA: Scientific Devices, Box 201, Plymouth Meeting, PA 19462 (215) 825-9515 Ron Smith  
TX: Scientific Devices, Box 18988, Austin, TX 78760 (512) 442-6215 Jim Phelps  
TX: Scientific Devices, 614 Ridge St., Houston, TX 77009 (713) 864-1711 Mike Poindexter  
TX: Scientific Devices, 312 N. Centra Expwy., Richardson, TX 75080 (214) 231-8106 Harvey Evans  
VA: Scientific Devices, 6514 W. Langley Lane, McLean, VA 22101 (703) 893-6513 Ed Phillips

**Tungstone Batteries Inc.**, 18 Billings St., Sharon, MA 02067

**Turner Engineering**, 14 Morris Ave., Mountain Lakes, NJ 07046

**Tweed Audio USA Inc.**, 12 Ilex Dr., Newbury Park, CA 91320

**U**

**UHF Associates**, 5625 State Farm Dr. #4, Rohnert Park, CA 94928

**UMC Electronics Co., Broadcast Products Div.**, 460 Sackett Point Rd., No. Haven, CT 06473

**U.S. Instrument Rentals, Inc.**, 2988 Campus Dr., San Mateo, CA 94403

**UTE Microwave, Inc.**, 3500 Sunset Ave., Asbury Park, NJ 07712

**ULTIMATE Corp., Vlahos-Gottschalk Research Corp.**, 18607 Topham St., Reseda, CA 91335

**Ultra Audio Pixtec**, Box 921, Beverly Hills, CA 90213

**Uni-Set Corp.**, 449 Ave. A, Rochester, NY 14621

**Unicord**, 89 Frost St., Westbury, NY 11590

**Union Connector Co., Inc.**, Box H, Roosevelt, NY 11575

**United Media, Inc.**, 4075 Leaverton Court, Anaheim, CA 92807

Anders Madsen (714) 630-8020

**United Research Lab Corp.**, 16 East 52nd St., New York, NY 10022

**Unitel**, 80 Rue d'Arcueil, Gentilly Cedex, France 94257

**UREI Inc.**, Box 2200, Northridge, CA 91329

Ken Lopez (213) 893-8411

**URSA MAJOR, Inc.**, Box 18, Belmont, MA 02178

**Utah Scientific, Inc.**, 1685 West 2200 South, Salt Lake City, UT 84119

C. Gary La Munny, Western Reg. Sales Mgr. (801) 973-6840

**REGIONAL SALES CONTACTS:**

MA: Lake Systems Corp., Box 65, Newton, MA 02160 (617) 244-6881 Walt Kelly  
UT: Utah Scientific, Inc., Int'l. Sales, 1685 West 2200 South, Salt Lake City, UT 84119 (801) 973-6840 Scott Bosen  
VA: Utah Scientific, Inc., Eastern Regional Sales, Fox Hill Rd., Lynchburg, VA 24503 (804) 384-7001 Eric King

**Utility Tower Co.**, Box 12369, Oklahoma City, OK 73157

**V**

**VMI-Visual Methods Inc.**, Box 644, Westwood, NJ 07675

**VSA/Videographics**, 520 Madison Ave., 24th Floor, New York, NY 10022

**Thomas Valentino Inc.**, 151 West 46th St., New York, NY 10036

**Valley People, Inc.**, 2820 Erica Place, Nashville, TN 37204

**Valtec, Subs. of U.S. Philips**, 99 Hartwell St., West Boylston, MA 01583

**Vamco**, 11104 East 56th St., Tulsa, OK 74145

**Vanner, Inc.**, 745 Harrison Dr., Columbus, OH 43204

**Varian Associates, Inc., Electron Device Group**, 611 Hansen Way, Palo Alto, CA 94303

**REGIONAL SALES CONTACTS:**

CA: Varian Associates, EIMAC Div., 301 Industrial Way, San Carlos, CA 94070 (415) 592-1221 George Hansell  
CA: Varian Associates, Microwave Tube Div., 611 Hansen Way, Palo Alto, CA 94303 (415) 493-4000 J. Driscoll  
CA: Varian Associates, Microwave Tube Div., 3200 Patrick Henry Dr., Santa Clara, CA 95050 (408) 496-6273 M. Wytshyn  
UT: Varian Associates, EIMAC Div., 1678 S. Pioneer Rd., Salt Lake City, UT 84104 (801) 972-5000 W. Brunhart

**Vector Electronic Co., Inc.**, Box 4336, Sylmar, CA 91342

**VIA Video, Inc.**, 292 S. LaCienega Blvd., Suite 210, Beverly Hills, CA 90211

**Vica Associates**, 4622 Eberline Ct., Stone Mountain, GA 30083

**Vidaire Electronics Mfg. Corp.**, Box 788, Freeport, NY 11520

**Video Aids of Colorado**, 1930 Central Ave., Boulder, CO 80301

**Video Associates Labs, Inc.**, 2304 Hancock Dr. #1-F, Austin, TX 78756

**Video Data Systems**, 205 Oser Ave., Hauppauge, NY 11787

**Video Int'l.**, 1280 Sunrise Highway, Copiague, NY 11726

**Video Masters, Inc.**, Box 1963, Kansas City, MO 64141

**Video Rentals, Inc.**, 100 Stonehurst Court, Northvale, NJ 07647

**Videomagnetics, Inc.**, 155 San Lazaro Ave., Sunnyvale, CA 94086

**Videomedia, Inc.**, 211 Weddell Dr., Sunnyvale, CA 94089

**Videotek, Inc.**, 125 N. York St., Pottstown, PA 19464

Peter Choi (215) 327-2292

**REGIONAL SALES CONTACTS:**

AZ: Videotek, Inc., 925 North 21st Dr., Phoenix, AZ 85021 (602) 997-7523 Emery Grady

**VideoTeleCom**, 1428 N. Ontario St., Burbank, CA 91505

**VideoTeleCom**, 1305 Pratt Court, Raleigh, NC 27606

**VIF International**, Box 1555, Mountain View, CA 94042

**W. Vinten Ltd.**, Western Way, Bury St. Edmunds, Suffolk, England

**Viscount Industries Ltd.**, 105 East 69th, Vancouver, B.C., Canada V5X 2W9

**Visual Information Institute**, 719 Lower Bellbrook Rd., Xenia, OH 45385

**Vital Industries Inc.**, 3700 NE 53rd Ave., Gainesville, FL 32601

**VIZ Mfg. Co.**, 335 E. Price St., Philadelphia, PA 19144

**W**

**WSI Corp.**, Box B, Bedford, MA 01730

**Wallach & Associates Inc.**, Box 18167, Cleveland, OH 44118

**Ward-Beck Systems Ltd.**, 841 Progress Ave., Scarborough, Ontario, M1H 2X4 Canada

Richard Chalk (416) 438-6550

**REGIONAL SALES CONTACTS:**

MA: Ward-Beck Systems Ltd., 755 Washington St., Annisquam, MA 01930 (617) 283-7507 Bill McFadden  
TX: Ward-Beck Systems Ltd., 4012 Mendenhall Dr., Dallas, TX 75234 (214) 247-5999 Duke McLane  
AUSTRALIA: G.E. Direct Marketing, Box 233, Doncaster, Victoria 3108 Australia 842-7799 Claude Grech

**Waters Mfg. Inc.**, Longfellow Center, Wayland, MA 01778

**Wavetek Indiana, Inc.**, 5808 Churchman, Beech Grove, IN 46107

**Western Electronic Products Co.**, 107 Los Molinos, San Clemente, CA 92672

**Western Union, Video Services**, One Lake St., Upper Saddle River, NJ 07458

**Westinghouse Electric Corp., Ind. & Gov't Tube Div.**, Westinghouse Circle, Horseheads, NY 14845

**Westinghouse Electric Corp., Semiconductor Div.**, Youngwood, PA 15697

**Westlake Audio, Professional Products Mfg. Group**, 2696 Lavery Court, Unit 18, Newbury Park, CA 91320

**Westrex Div., Litton Industries**, 2629 W. Olive Ave., Burbank, CA 91505

**Wheilit, Inc.**, Box 7350, Toledo, OH 43615

**Wide Band Engineering Co., Inc.**, Box 21652, Phoenix, AZ 85036

**Wide Range Electronics**, 2119 Schuetz Rd., St. Louis, MO 63141

**Wilk Power & Video Inc.**, 16255 Ventura Blvd., Suite 1001, Encino, CA 91436

**The Will-Burt Co., TMD Div.**, Box 126, Wooster, OH 44691

**Winsted Corp.**, 9801 James Circle, Minneapolis, MN 55431

G. R. Hoska (612) 888-1957

**Wireworks Corp.**, 380 Hillside Ave., Hillside, NJ 07205

**Wolf Coach Inc.**, 7 'B' St., Auburn, MA 01501

**Frank Woolley & Co.**, 529 Franklin St., Reading, PA 19602

**World Tower Co. Inc.**, Box 405, Mayfield, KY 42066

**World Video Inc.**, Box 117, Boyertown, PA 19512

**X**

**Y**

**Yamaha International Corp., Combo Div.**, Box 6600, Buena Park, CA 90622

Robert Shomaker (714) 522-9125/9262

**Yardney Battery Div.**, 82 Mechanic St., Pawcatuck, CT 06379

**Z**

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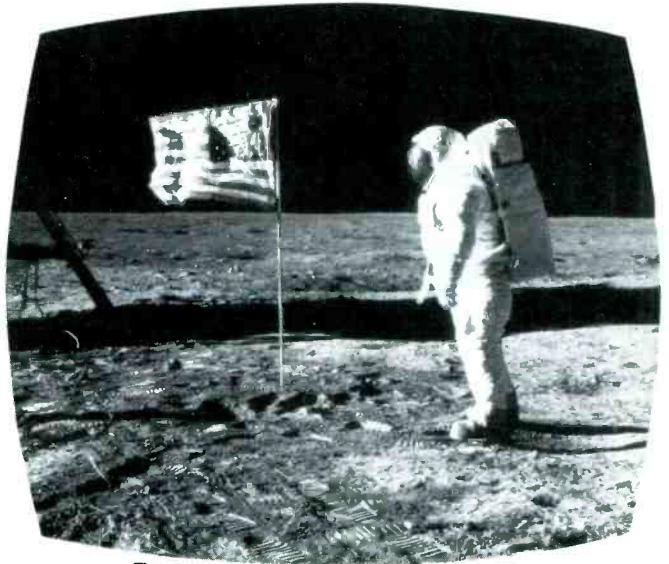
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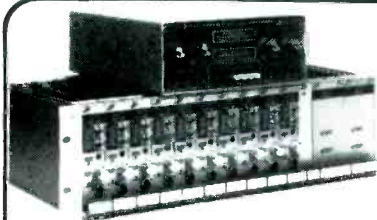
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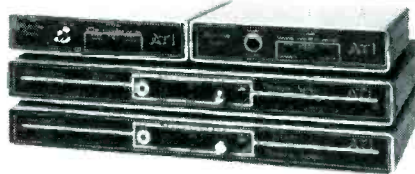
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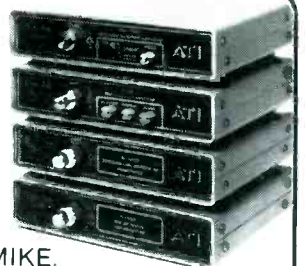
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3

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**Model 240/250 Audio DA**

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**Model 500 Series Util. Switcher**

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# Broadcast product dealers/distributors

For your reference, **Broadcast Engineering** has designed this *Broadcast Product Dealers/Distributors* section to provide close-to-home purchasing assistance. Use it, with other sections in the *Buyers' Guide*, to plan new facilities and equipment expansion or upgrading. This directory identifies addresses and telephone numbers, products handled, and territory served for broadcast product dealers/distributors.

## Typical listing

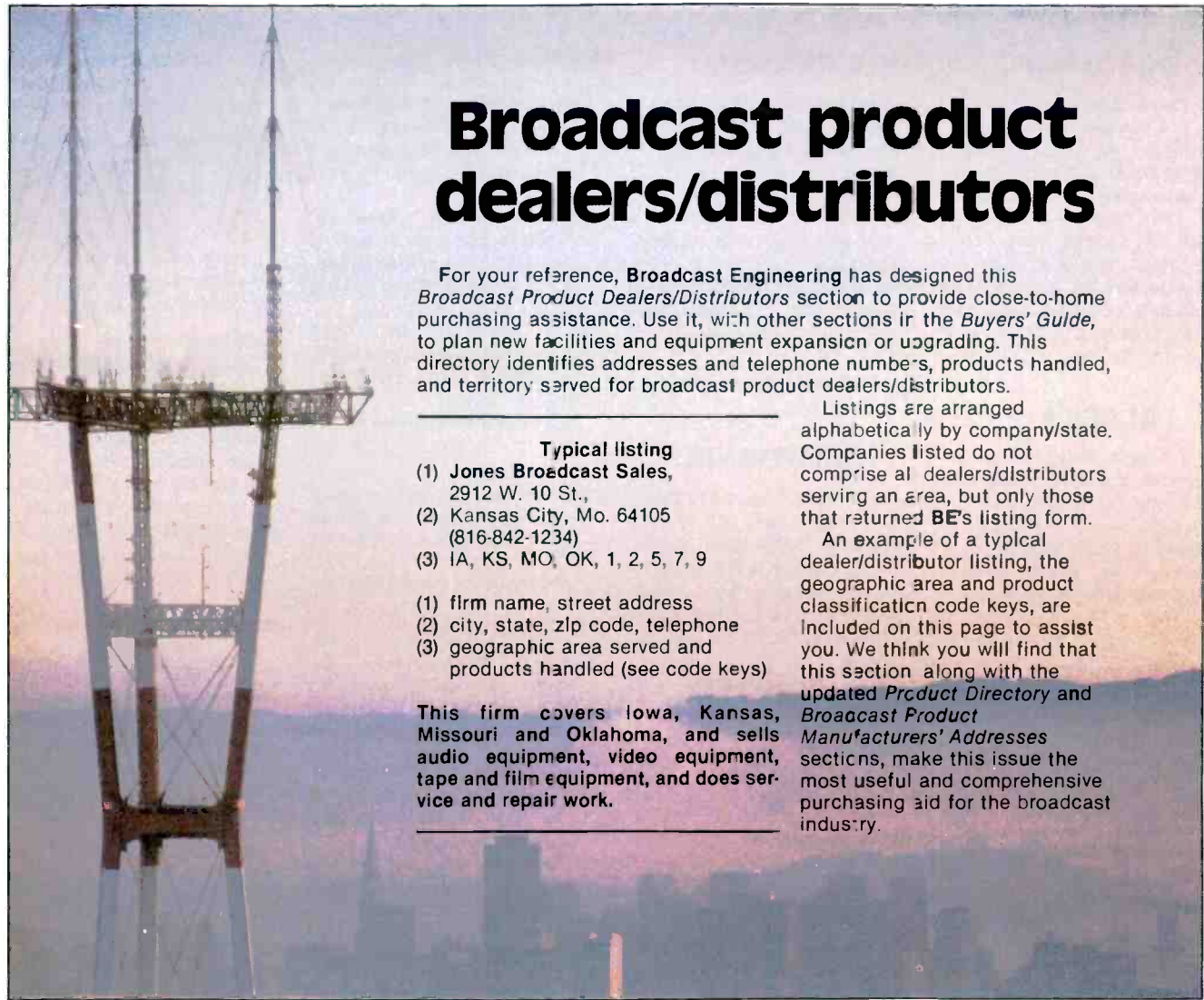
- (1) **Jones Broadcast Sales,**  
2912 W. 10 St.,
- (2) Kansas City, Mo. 64105  
(816-842-1234)
- (3) IA, KS, MO, OK, 1, 2, 5, 7, 9

- (1) firm name, street address
- (2) city, state, zip code, telephone
- (3) geographic area served and products handled (see code keys)

This firm covers Iowa, Kansas, Missouri and Oklahoma, and sells audio equipment, video equipment, tape and film equipment, and does service and repair work.

Listings are arranged alphabetically by company/state. Companies listed do not comprise all dealers/distributors serving an area, but only those that returned **BE's** listing form.

An example of a typical dealer/distributor listing, the geographic area and product classification code keys, are included on this page to assist you. We think you will find that this section along with the updated *Product Directory* and *Broadcast Product Manufacturers' Addresses* sections, make this issue the most useful and comprehensive purchasing aid for the broadcast industry.



## Key to product numerical code

- 1 **AUDIO EQUIPMENT** (including recorders, microphones, mixers, consoles, cart machines, turntables, processing devices, etc.)
- 2 **VIDEO EQUIPMENT** (including cameras, videotape recorders, production switchers, monitors, lights, etc.)
- 3 **TEST AND MEASUREMENT EQUIPMENT** (audio and video)
- 4 **TRANSMITTERS, ANTENNAS AND TRANSMISSION SYSTEMS** (including towers ATS, STL, MDS, etc.)
- 5 **TAPE** (including video and audio recording tape, etc.)
- 6 **VACUUM TUBES** (including video camera, transmitter, TWT, etc.)
- 7 **FILM EQUIPMENT** (including cine cameras, processing equipment, film projectors, etc.)
- 8 **VANS AND ACCESSORIES**
- 9 **SERVICE AND REPAIR**
- 10 **SYSTEM DESIGN** (including studio installation, etc.)
- 11 **USED EQUIPMENT** (including leasing, rent, etc.)

## Key to geographical area code

AK	Alaska	MS	Mississippi
AL	Alabama	MT	Montana
AR	Arkansas	NC	North Carolina
AZ	Arizona	ND	North Dakota
CA	California	NE	Nebraska
CO	Colorado	NH	New Hampshire
CT	Connecticut	NM	New Mexico
DC	District of Columbia	NV	Nevada
DE	Delaware	NY	New York
FL	Florida	OH	Ohio
GA	Georgia	OK	Oklahoma
GU	Guam	PA	Pennsylvania
HI	Hawaii	PR	Puerto Rico
IA	Iowa	RI	Rhode Island
ID	Idaho	SC	South Carolina
IL	Illinois	SD	South Dakota
IN	Indiana	TN	Tennessee
KS	Kansas	TX	Texas
KY	Kentucky	UT	Utah
LA	Louisiana	VA	Virginia
MA	Massachusetts	VI	Virgin Islands
MD	Maryland	VT	Vermont
ME	Maine	WA	Washington
MI	Michigan	WI	Wisconsin
MN	Minnesota	WV	West Virginia
MO	Missouri	WY	Wyoming

## (Abbreviations for Canadian provinces)

ALTA	Alberta
BC	British Columbia
MAN	Manitoba
NB	New Brunswick
NF	Newfoundland
NS	Nova Scotia
ONT	Ontario
PEI	Prince Edward Island
QUE	Quebec
SASK	Saskatchewan
YUK	Yukon Territory



## ALABAMA

**Gray Communications Consultants, Inc.**, 209 Oxmoor Circle, Suite 708, Birmingham, AL 35209 (205-942-2824) AL 1, 2, 5, 7, 8, 9, 10

**Gray Communications Consultants, Inc.**, 2866 Dauphine St., Suite A, Mobile, AL 36606 (205-476-2051) AL 1, 2, 5, 7, 8, 9, 10

**Sonics Associates, Inc.**, 237 Oxmoor Circle, Suite 101, Birmingham, AL 35209 (205-942-9631) AL, FL, GA, LA, MS, TN, TX 1, 3, 5, 10, 11

## ALASKA

**Harry J. Lang & Associates**, 1371 Hillcrest Dr. # 303, Anchorage, AK 99503 (907-279-5741) AK 1, 3, 4, 5

**NVS Systems, Inc.**, 8300 King St., Anchorage, AK 99502 (907-349-3523) AK 1, 2, 3, 4, 5, 7, 9, 10

## ARIZONA

**Arunta Satellite Telecommunications**, 3111 E. Thomas Rd., Phoenix, AZ 85016 (602-956-7042) AL, AK, AZ, CA, CO, FL, GA, HI, IL, IN, IA, KS, KY, MA, MI, MN, MS, MO, MT, NE, NV, NJ, NM, NY, NC, ND, OH, OK, OR, PA, SC, SD, TN, TX, UT, VA, WA, WV, WI, WY, Alta., BC, Man., NS, Ont., PEI, Que., Sask. 1, 2, 4

**Jensen Tools Inc.**, 7815 South 46th St., Phoenix, AZ 85040 (602-968-6241) U.S.A. 9

**ROH'S Inc.**, 4553 E. Broadway, Tucson, AZ 85711 (602-795-8573) AZ, NM 1, 2, 5, 9, 10

**Spencer Broadcast, Inc.**, 316 E. El Camino Dr., Phoenix, AZ 85020 (602-242-2211; 800-221-6941) AZ, CA, CO, NV, NM, TX, UT 1, 3, 4, 5, 9, 10, 11

**Telesource Communication Services, Inc.**, 730 E. Highland Ave., Box 7132, Phoenix, AZ 85011 (602-265-1232) U.S.A. 2

## ARKANSAS

**Custom Products**, 107 E. Calhoun, Magnolia, AR 71753 (501-234-7399) AR, LA, MS, OK, TN, TX 1, 3

**McCullough Satellite Equipment, Inc.**, Rt. 5, Box 97, Salem, AR 72576 (501-895-3167 or 3318) Worldwide 2, 4

**Radcom, Inc.**, 28 Fairmount, Eureka Springs, AR 72632 (501-253-8702/8556) Worldwide 1, 4, 5, 10, 11

See advertisement on this page

## CALIFORNIA

**Accurate Sound Corp.**, 3515 Edison Way, Menlo Park, CA 94025 (415-365-2843) U.S.A., Canada, GU, PR, VI 1, 3, 4, 5, 6, 7, 9, 10, 11

**Advanced Marketing**, Box 97, Redwood City, CA 94064 (415-365-3944) CA, NV, OR, WA 1, 2, 3, 7, 8

**Audio Engineering Associates**, 1029 N. Allen Ave., Pasadena, CA 91104 (213-798-9127) Southern-CA 1

**Audiolab Electronics, Inc.**, 3725 Esperanza Dr., Sacramento, CA 95825 (916-485-0500) Worldwide 1, 3, 4, 5

**A-Vidd Electronics Co.**, 2210 Bellflower Blvd., Long Beach, CA 90815 (213-598-0444; 714-821-0870) Southern-CA 2, 5, 9, 10, 11

**A-Vidd Electronics Co.**, 4930 Campus Dr., Newport Beach, CA 92660 (213-598-0444; 714-821-0870) Southern-CA 2, 5

**A-Vidd Electronics Co.**, 1126 W. Foothill Blvd., Upland, CA 91786 (714-981-8884; 213-966-4586) Southern-CA 2, 5, 9, 10, 11

**Bardwell & McAlister, Inc.**, 7051 Santa Monica Blvd., Hollywood, CA 90038 (213-466-9361) CA 2, 7

**Birns & Sawyer, Inc.**, 1026 N. Highland Ave., Los Angeles, CA 90038 (213-466-8211) Worldwide 2, 7, 9, 11

**Broadcast Audio Corp.**, 11306 Sunco Dr., Rancho Cordova, CA 95670 (916-635-1048) Worldwide 1

**Broadcast Cartridge Service**, 15131 Triton Lane, Suite 108, Huntington Beach, CA 92649 (714-898-7224) U.S.A. 5, 9

**Richard W. Burden Associates**, 20944 Sherman Way, Canoga Park, CA 91303 (213-340-4590) AK, AZ, CA, CO, HI, ID, NV, NY, OR, UT, WA, WY 1, 3, 4, 9, 10

**Calvert Electronics, Inc.**, 1355 Redondo Ave., Suite 6, Long Beach, CA 90804 (213-498-3504) Worldwide 2, 6

See advertisement on page 20

**Cara Int'l. Ltd., Inc.**, 22642 Greenwood Ave., Torrance, CA 90505 (213-325-6522) AZ, CA, NV, UT 1, 3

See advertisement on this page

**Cartwright Communications Co.**, 1525 E. Acequia St., Visalia, CA 93291 U.S.A. 3, 4

**Communications Co., Inc.**, 3940 Noell St., San Diego, CA 92110 (619-297-3261) CA 1, 3

**Davis Electronics Co.**, Box 128, Sierra Madre, CA 91024 (213-355-6909) CA, HI 4, 9, 10

**ECD Industries, Inc.**, 2034 Armacost Ave., Los Angeles, CA 90025 (213-820-3009; 800-421-7152) U.S.A. and Canada 6

**E-N-G Corp.**, Box 367, Concord, CA 94518 (415-798-4060) Worldwide 2, 4, 8

**Feathercam Inc.**, 7240 Valjean Ave., Van Nuys, CA 91406 (213-989-5222) CA, CO, FL, NV, TX, BC, Ont. 2, 7

**Interface Data Systems**, 2990 E. La Jolla St., Anaheim, CA 92806 (714-630-8030) CA, NY 2

**Interface Television Systems**, 2990 E. LaJolla St., Anaheim, CA 92806 (714-630-8030) AZ, CA, NV, NM, OR, WA 1, 2, 3, 4, 5, 8, 10

**J.N.D. Inc.**, 462 Cascade; Box 606, Fairfax, CA 94930 (415-459-3186) CA, NV 1

**Lakeside Associates, Inc.**, 27939 Chicalana, Mission Viejo, CA 92692 (714-855-3171) U.S.A. and Canada 1, 2, 10

**Lang Video Systems Corp.**, 700 Warrington Ave., Redwood City, CA 94063 (415-364-1287) U.S.A. 1, 2, 3, 4, 8, 9, 10, 11

**MARCOM**, Box 66507, Scotts Valley, CA 95066 (408-438-4273) AK, AZ, CA, HI, NV, OR, WA 1, 2, 3, 4, 6, 10, 11

**MARCOM**, 21243 Ventura Blvd., Suite 145, Woodland Hills, CA 91364 (213-703-0381) AK, AZ, CA, HI, NV, OR, WA 1, 2, 3, 4, 6, 10, 11

**Marshall Electronics, Mogami Products Div.**, Box 2027, Culver City, CA 90230 (213/836-4288) U.S.A. 1, 2

**Martel Electronics, Inc.**, 970 E. Orangethorpe # A, Anaheim, CA 92801 (714-871-7102) U.S.A. 1, 9

**Meyer, Ross & Fleming, Inc.**, 1485 Rollins Rd., Burlingame, CA 94010 (415-348-6800) CA, HI, NV, CA, HI, NV 1, 2, 3, 5

**Omega Video Inc.**, 14326 Isis Ave., Lawndale, CA 90260 (213-679-9021) AZ, CA, HI, NV, OR, WA 1, 2, 3, 5, 8, 9, 10

**Pacific Coast Marketing**, 14125 Capri Dr., Los Gatos, CA 95030 (408-370-3505) CA, NV 1, 2, 3, 4

**Pacific Recorders & Eng. Corp.**, 2070 Las Palmas Dr., Carlsbad, CA 92008 (619-438-3911) U.S.A. and Canada 1, 10

**Pioneer Marketing Corp.**, 1021 N. Lake St., Burbank, CA 91502 (213-842-7165) AK, AZ, CA, CO, HI, ID, KS, MT, NE, NV, NM, OK, OR, SD, TX, UT, WA, WY; Alta, BC, Man. 7

**RPS Electronics Inc.**, 6230 Descanso Ave., Buena Park, CA 90620 (714-521-5230) Southern-CA 1, 3, 5, 6

**The Real World Technologies Group, Inc.**, 3176 Pullman St., Suite 106, Costa Mesa, CA 92626 (714-957-1061) CA 1, 2, 3, 8, 9, 10

**Restoration**, 15904 Strathern St. # 12, Van Nuys, CA 91406 (213-994-6602) AZ, CA, FL, GU, HI, IL, MI, MN, NE, NJ, NY, NC, PA, PR, TN, TX, VI, Alta., B.C., Ont., Que. 1, 5, 9

**Richardson Electronics West**, 21243 Ventura Blvd., Woodland Hills, CA 91364 (800-348-5580) U.S.A. 6

See advertisement on page 210

**Shoreline, Ltd.**, 3459 Cahuenga Blvd. W., Hollywood, CA 90068 (213/851-1236) CA 1, 2, 3, 4, 6

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22642 Greenwood Ave., Torrance, CA 90505 (213) 325-6522



**Skaggs Video Sales**, 2029 Century Park E., Suite 4220, Los Angeles, CA 90067 (213-556-2133) CA, NV 1, 2, 3, 5, 8, 10

**Sound Genesis**, 2001 Bryant St., San Francisco, CA 94110 (415-285-8900) AK, AZ, CA, CO, HI, ID, MT, NV, NM, OR, UT, WA 1, 3, 5, 9, 10, 11

**Sound Investment Enterprises**, Box 4139, Thousand Oaks, CA 91359 (213-991-3400) AL, AZ, AR, CA, CC, FL, HI, IL, IN, IA, KS, LA, MI, MS, MO, NV, NM, NC, OK, OR, SC, TN, TX, UT, WY 1, 3, 5

**Studio Film & Tape Inc.**, 6670 Santa Monica Blvd., Hollywood, CA 90038 (213-466-8101) U.S.A. and Canada 3, 5

**Studiobuilders**, 919 N. Victory Blvd., Burbank, CA 91502 (213-842-9526) CA 1, 2, 10

**System Associates**, 5801 Uplander Way, Culver City, CA 90230 (213-641-2042) North America 2, 5, 11

**Television Associates, Inc.**, 2410 Charleston Rd., Mountain View, CA 94040 (415-967-6040) Northern-CA 1, 2, 3, 5, 9, 10, 11

**TriTronics, Inc.**, 2921 W. Alameda Ave., Burbank, CA 91505 (213-843-2170 In CA=800-232-2141; Outside CA=800-423-3640) AZ, CA, CO, HI, NV, NM, OR, TX, UT, WA 1, 2, 3, 5, 6, 8, 9, 10, 11

**Video Communications Corp.**, 333 Paseo Tesoro, Walnut, CA 91789 (714-594-2442) AZ, CA, NV 1, 2, 4, 8, 10

**Videomedia, Inc.**, 211 Weddell Dr., Sunnyvale, CA 94089 (408-745-1700) AZ, CA, CO, ID, MT, NV, NM, OR, UT, WY 1, 2, 3, 5, 8, 9, 10, 11

**Videotape Products, Inc.**, 7165 Sunset Blvd., Hollywood, CA 90046 (213-874-7711) Worldwide 2, 5

**Western Broadcast Systems Inc.**, 10707 Amulet Place, Cupertino, CA 95014 (408-749-0900) AK, CA, HI, NV, OR, WA 1, 2, 3, 4, 5

**Westlake Audio, Professional Audio Sales Group**, 7265 Santa Monica Blvd., Los Angeles, CA 90046 (213-851-9800) Worldwide 1, 3, 5, 10

**Davis Audio-Visual, Inc.**, 1801 Federal Blvd., Denver, CO 80204 (303-455-1122) AZ, CO, KS, NE, NM, OK, UT, WY 1, 2, 3, 5, 7, 8, 9, 10, 11

**Didier/Denver, Inc.**, Box 1599, Evergreen, CO 80439 (303-674-6000) CO, ID, KS, MT, NE, NM, UT, WY 1, 2, 3, 4, 10

**Film/Video Equipment Service Co.**, 1875 S. Pearl St., Denver, CO 80210 (303-778-8616) AK, AZ, CA, CO, DC, FL, KS, LA, MN, MS, MO, MT, NE, NV, NM, ND, SD, TN, TX, UT, WY 1, 2, 7, 8, 9, 11

**J.F. Hurlbut Co.**, 622 Gardenia Ct., Golden, CO 80401 (303-279-7796) AZ, CO, MT, NM, UT, WY 2, 3, 8

**Skaggs Video Sales**, 7006 Alton Way, Bldg. B, Englewood, CO 80112 (303-740-9031) AZ, CO, NM 1, 2, 3, 5, 8, 9, 10

## CONNECTICUT

**Audiotechniques Inc.**, 652 Glenbrook Rd., Stamford, CT 06906 (203-359-2312; Sales: 800-243-2598) CT, DE, DC, ME, MD, MA, NJ, NY, PA, RI, VT, VA 1, 3, 5, 9, 10, 11

**National Video Services**, Commerce Park, Finance Dr., Danbury, CT 06810 (203-792-3862) CT, DC, ME, MA, NH, NJ, NY, PA, RI, VT 2, 5, 9, 10

**Trident (USA) Inc.**, 652 Glenbrook Rd., Stamford, CT 06906 (203-357-8337) Mid-Atlantic, Mid-West, North East 1

## DISTRICT OF COLUMBIA

**Comex Corp.**, Box 17011, Dulles Int'l. Airport, Washington, DC 20041 (703-471-4215) South America 1, 2, 3, 4, 5, 6, 7, 8

**Instrucom, Inc.**, 1629 'K' St N.W., Suite 500, Washington, DC 20006 (202-223-1759) DE, DC, MD, NC, VA, WV 1, 2, 3, 4

## FLORIDA

**Barbizon Delta Corp.**, 1125 N. 53rd Ct., Australian Industrial Park, West Palm Beach, FL 33407 (305-844-5973) AL, CT, DE, DC, FL, GA, IL, IN, KY, ME, MD, MA, MI, MS, NH, NJ, NY, NC, OH, PA, RI, SC, TN, VT, VA, WV, WI 2

**Beattie & Associates, Inc.**, 3317 Barrow Hill Trail, Tallahassee, FL 32312 (904-893-1382) AL, FL, GA 1, 2, 3, 4

*See advertisement on this page*

**Bencsik Associates Inc.**, 3730 N.E. 42nd Ave., Ocala, FL 32670 (904-732-9775) FL, PR 1, 3

**Broadcast International, Inc.**, 1229 N.E. 37th St., Ft. Lauderdale, FL 33334 (305-564-4422) Worldwide 1, 3, 4, 5, 6, 9, 10, 11

**Comad Inc.**, Box 10667, Pensacola, FL 32504 (904-438-6900) U.S.A. 2, 4

**Controll Technology, Inc.**, 2322 Davie Blvd., Ft. Lauderdale, FL 33312 (305-587-2716; Outside FL=800-327-4121) USA 1, 4, 5, 10, 11

**Design Line Inc.**, 6204 Benjamin Rd., #209, Tampa, FL 33614 (813-884-1461) U.S.A 1, 9, 10, 11

**Electrex Co.**, 18680 Northeast 2nd Ave., Miami, FL 33179 (305-651-5752) U.S.A. and Latin America 1, 2, 3, 4, 5, 6, 10

*See advertisement on page 120*

**Ellis Tower Co., Inc.**, Box 23217, Ft. Lauderdale, FL 33307 (305-566-6432) AL, AR, CT, DE, DC, FL, GA, IL, IN, IA, KY, LA, ME, MD, MA, MI, MN, MS, MO, NH, NJ, NY, NC, OH, PA, PR, RI, SC, TN, TX, UT, VA, WV, WI 4

**Gray Communications Consultants, Inc.**, 1657 N.W. 79th Ave., Miami, FL 33126 FL 1, 2, 5, 7, 8, 9, 10

**Gray Communications**, 1605 S. Bumby Ave., Orlando, FL 32806 (305-896-7414) FL 2, 5, 8, 9, 10

**Gray Communications Consultants, Inc.**, Box 24336, Tampa, FL 33623 (813-885-1411) FL 1, 2, 5, 7, 8, 9, 10

**Hubbard Communications, Inc.**, 10383 Oak St., N.E., Suite 5, St. Petersburg, FL 33702 (813-577-7759) FL, PR, VI 1, 2, 3, 4, 5, 7, 8, 10

**International Wholesalers of Miami, Inc.**, 17866 Ipco Rd., No. Miami, FL 33162 (800-327-0596) U.S.A., PR 1, 2

**Lauderdale Electronic Labs**, 16 S.W. 13th St., Ft. Lauderdale, FL 33315 (305-764-7755; Orders only=800-327-3793) U.S.A. and Canada 1, 3, 5, 6

**Lita Broadcasting Distributors**, 7154 N.W. 72nd Ave., Miami, FL 33166 (305-887-1223) FL, Central & South America, Caribbean 1, 4, 5, 6

**Media Concepts, Inc.**, 559 49th St. S., St. Petersburg, FL 33707 (813-321-2122) U.S.A. and Int'l. 1, 2, 5, 9, 10

**Midwest Corp., Communications Systems Div.**, 3331 Northwest 82nd Ave., Miami, FL 33122 (305-592-5355) AL, FL, GA 1, 2, 3, 4, 5, 9, 10

**Midwest Corp., Communications Systems Div.**, 6302 Benjamin Rd., Suite 403, Tampa, FL 33614 (813-885-9308) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

**Pro Audio General Store, Inc.**, 1378 NW 100th Ave., Coral Springs, FL 33065 (305-752-0330) AL, AZ, AR, CO, DC, FL, GA, IL, IN, IA, KY, LA, MI, MN, MS, MO, MT, NE, NY, NC, ND, OH, OK, SC, TN, TX, UT, VA, WV, WI 1, 4, 5, 9, 10

**Recording Studio Equip. Co.**, 14205 N.E. 18th Ave., No. Miami, FL 33182 (305-945-9774) U.S.A. 1, 2, 5, 7, 10

**Southeast Electronics, Inc.**, 1125 Roselle St., Box 41308, Jacksonville, FL 32203 (904-356-3007) AL, FL, GA 1, 2, 3, 4, 5, 6, 9, 10, 11

**Stage Equipment & Lighting, Inc.**, 12231 N.E. 13th Court; Box 61000F, Miami, FL 33161 (305-891-2010) AL, FL, GA, Caribbean, Central & South America 2, 9, 10, 11

## GEORGIA

**Allied Broadcast Equipment**, 4405 Mall Blvd., Suite 314, Union City, GA 30291 (404-964-1464) Worldwide 1, 3, 4, 5, 6, 9, 10

**Crescendo Associates**, 125 Simpson St. N.W., Atlanta, GA 30313 (404-223-0108) AL, FL, GA, MS, NC, SC, TN 1, 10

**Gary Communications Consultants, Inc. (Headquarters)**, Box 3229, Albany, GA 31708 (912-883-2121)

## COLORADO

**Audities/2001**, 2377 E. Mississippi Ave., Denver, CO 80210 (303-777-4595) AZ, CO, ID, MT, UT, WY 1, 2, 5

**Colorado Magnetics**, Box 713, Colorado Springs, CO 80901 (800-338-4206) AZ, CA, CO, FL, ID, KS, MO, MT, NE, NV, NM, ND, OH, OK, OR, SD, TX, UT, WA, WY 1, 3, 5

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**Dealers/distributors...continued** (see page 207 for key to listings)

**Gray Communications Consultants, Inc.**, 3684 Clearview Ave., Doraville-(Atlanta), GA 30340 (404-455-3121) AL, GA, NC, SC, TN 1, 2, 5, 7, 8, 9, 10

**Midwest Corp., Communications Systems Div.**, 522 Armour Circle, N.E., Atlanta, GA 30324 (404-875-3753) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

**Radford Associates**, 3203 Lanier Dr., Atlanta, GA 30319 (404-237-6097) AL, FL, GA, KY, MS, NC, SC, TN, WV 1, 2, 4, 7

**Siboney Audio Visual Products, Inc.**, 6649 Peachtree Industrial Blvd., Atlanta/Norcross, GA 30092 (404-441-3300) AL, AR, CA, CO, FL, GA, MS, MO, OK, TN, TX 1, 2, 5, 7, 8, 9, 10, 11

**Technical Industries Inc. of Georgia**, 6000 Peachtree Rd., N.E., Atlanta, GA 30341 (404-455-7610) GA, SC 1, 2, 3, 4, 9, 10, 11

**Technical Video Systems, Inc.-GA**, 2035 Will Ross Ct., Atlanta, GA 30341 (404-458-1387) FL, GA 1, 2, 3, 4, 5, 7, 9, 10, 11

**Vica Associates**, 4622 Eberline Ct., Stone Mountain, GA 30083 (404-292-7506) AL, FL, GA, MS, NC, SC, TN 1, 2, 4

**HAWAII**

**Broadcast Services Inc.**, 2877 Kala-kaua Ave., Honolulu, HI 96815 (808-521-6311) HI 1, 4, 6, 9, 10, 11

**John J. Harding Ltd.**, 2825 Ualena St., Honolulu, HI 96819 (808-836-0941) HI and Pacific area 1, 2, 3, 4, 5, 9, 10

**Hawaii Broadcast Associates**, Box 1344, Honolulu, HI 96807 (808-947-7470) HI and U.S. Possessions in the Pacific 4

**J.C. Electronics**, 2344 Kam Hwy., Honolulu, HI 96819 (808-841-7477) HI 1, 2, 3, 10

**Omega Pacific**, 222 Kaelepulu Dr., Kailua, HI 96734 (808-533-7655) HI 2, 3, 4

**Prorop Hawaii Corp.**, 1346 Makaikoa St., Honolulu, HI 96921 (808-732-0639) HI 1, 3

**IDAHO**

**Hall Electronics**, Box 5031, Boise, ID 83705 (208-336-5894) CO, ID, MT, UT, WY 1, 3, 4, 5, 6, 10, 11

**ILLINOIS**

**Allied Broadcast Equipment**, 5097 N. Elston Ave., Chicago, IL 60630 (312-794-0224) IL, MI, MN, WI 1, 3, 4, 5, 6, 9, 10

**Anixter Communications-Mark Antennas**, 2180 S. Wolf Rd., Des Plaines, IL 60018 (312-298-9420) U.S.A., Canada, AK, HI, Europe, Mexico 4

**Audio Files**, 475 Frontage Rd., Suite 208, Burr Ridge, IL 60521 (312-920-9165) IL, IN, MI, WI 1

**Broadcast Electronics, Inc.**, 4100 N. 24th St.; Box 3606, Quincy, IL 62305 (217-224-9600) U.S.A., Canada, PR, VI 1, 3, 4, 5

**Center Video Center**, 5565 N. Elston Ave., Chicago, IL 60630 (312-637-1600; Outside IL = 800-621-4353) U.S.A. 1, 2, 3, 5, 9, 10, 11

**Columbia Video Systems**, The Columbia Bldg., Laurel & 2nd, Highland Park, IL 60035 (312-433-6010) IL, IN, IA, MI, WI 2, 3, 5, 7, 10

**J. Deerwester Communications, Broadcast Supply Div.**, Rt. 3 Cabintown Rd., Bloomington, IL 61701 (309-828-9143 this # will change Nov. '83) AL, AZ, AR, CA, CO, CT, DE, DC, FL, GA, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, SC, SD, TN, TX, UT, VT, VA, WA, WV, WI, WY 1, 4, 5, 10, 11

**Victor Duncan, Inc.**, 661 N. LaSalle, Chicago, IL 60610 (312-943-7300) U.S.A. and Canada 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

*See advertisement on page 262*

**GO Video Sales, Inc.**, 1195 S. Wilson Dr., Lake Forest, IL 60045 (312-295-6726) IL, Davenport-IA, MN, ND, SD, WI 2

**Harris Corp., Broadcast Group**, Box 4290, Quincy, IL 62305 (217-222-8200) U.S.A. and Canada 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

**Joseph Electronics**, 8830 Milwaukee Ave., Niles, IL 60648 (312-297-4200) IL, IN, WI, Nat'l. Mail Order 1, 2, 3, 4, 5, 6

**Leedal, Inc.**, 1918 S. Prairie Ave., Chicago, IL 60616 (312-842-6588) U.S.A. and Canada 1

**Modular Sound Systems Inc., DBA-Bag End**, Box 488, Barrington, IL 60010 (312-382-4550) IL 1

**Ottawa Equipment Co.**, 6838 N. Ottawa Ave., Chicago, IL 60631 (312-774-5115) IL, IN, WI, Export 1, 4, 5, 6, 10

**Pro Audio General Store, Inc.**, 746 Cypress Lane, Carol Stream, IL 33065 (312-231-7120) AL, AZ, AR, CO, DC, FL, GA, IL, IN, IA, KY, LA, MI, MN, MS, MO, MT, NE, NY, NC, ND, OH, OK, SC, SD, TN, TX, UT, VA, WV, WI 1, 4, 5, 9, 10

**Richardson Electronics, Ltd.**, 3030 N. River Rd., Franklin Park, IL 60131 (800-323-1770) U.S.A. 6

*See advertisement on this page*

**Roscor Corp.**, 6160 Oakton, Morton Grove, IL 60053 (312-966-3010; 539-7700) IL, IA, KY, MI, OH, WI 1, 2, 3, 5, 7, 8, 9, 10, 11

**Swiderski Electronics, Inc.**, 1200 Greenleaf Ave., Elk Grove Village, IL 60007 (312-364-1900) IL, IN, IA, MI, MO, WI 1, 2, 3, 5, 6, 7, 8, 9, 10, 11

**INDIANA**

**Allied Broadcast Equipment, #One**, 635 South E St., Richmond, IN 47374 (317-962-8596) Worldwide 1, 3, 4, 5, 6, 9, 10

**Midwest Corp., Communications Systems Div.**, 8455 Keystone Crossing, Suite 101, Indianapolis, IN 46240 (317-251-5750) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10

**PRO Marketing Systems, Inc.**, 9628 Day Dr., Indianapolis, IN 46280 (317-846-9591) North-IL, IN, KY, East-WI 1, 2, 3, 7, 10, 11

**IOWA**

**Kimian Sales, Inc.**, Box 503; 1804 Sycamore St., Atlantic, IA 50022 (712-243-1626) IL, IA, KS, MO 1, 2

**Sitler's Supplies, Inc.**, 702 E. Washington; Box 10, Washington, IA 52353 (319-653-2123) U.S.A. 7

*See advertisement on page 240*

**Telfax Communications**, Box 31, Webster City, IA 50595 (515-832-1263) U.S.A. 1

**Triangle Audio Visual**, 6336 Hickman Rd., Des Moines, IA 50322 (515-278-2929) IA, MN, NE, ND, SD 1, 2, 3, 5, 6, 7, 9, 10, 11

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**Richardson West**  
21243 Ventura Blvd.  
Woodland Hills, CA 91364  
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## KANSAS

**BMA-Broadcasting Marketing Associates**, 13417 West 78th Place, Shawnee Mission, KS 66216 (913-631-3439) IA, KS, MO, NE 1, 2, 3, 4, 5, 7, 9

**Business Communications, Inc.**, 1140 Cambridge Circle Dr., Kansas City, KS 66103 (913-342-4000) AR, IA, KS, MC, NE, OK 1, 2, 5, 9, 10, 11

**RSC Electronics, Inc.**, 131 Laura; Box 1220, Wichita, KS 67201 (316-267-5213) KS, OK 1, 2, 3, 5, 6

See advertisement on this page and page 210

**Steve Smith Audio-Visual, Inc.**, 623 Kansas Ave.; Box 1216, Topeka, KS 66601 (913-235-3481) KS, Western-MO including St. Joseph and K.C. 1, 2, 4, 5, 9, 10, 11

**Theatrical Services Inc.**, 128 S. Washington, Wichita, KS 67202 (316-263-4415) AZ, AR, CO, IA, KS, MO, NE, OK, TX 2, 10

## KENTUCKY

**Bruce L. Dawson & Associates**, Central American Terminal-Bowman Field, Louisville, KY 40205 (502-456-6666, 6693) IN, KY, OH, West-PA, WV 1, 2, 4

**Midwest Corp., Div. Headquarters**, One Sperti Dr., Edgewood, KY 41017 (606-331-8990) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

**Midwest Corp., Communications Systems Div.**, 2035 Regency Rd., Lexington, KY 40503 (606-277-4994) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

**Midwest Corp., Communications Systems Div.**, 1804 Cargo Court, Louisville, KY 40299 (502-491-2888) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

## LOUISIANA

**Wm. B. Allen Supply Co., Inc.**, Allen Sqr., 300 Block N. Rampart St., New Orleans, LA 70112 (504-525-8222; 800-535-9593; LA only = 800-462-9520) Nationwide 1, 2, 3, 4, 5, 6

**Audiomedia Associates**, Box 29264, New Orleans, LA 70189 (504-586-0140) AL, AR, FL, LA, MS, TX 1, 3, 4, 5, 9, 10

See advertisement on this page

**Gray Communications Consultants, Inc.**, 5441 Pepsi St., New Orleans, LA 70123 (504-733-7265) LA 1, 2, 5, 7, 8, 9, 10

## MARYLAND

**Associated Sales Reps, Inc.**, 8969 B Yellow Brick Rd., Baltimore, MD 21237 (301-574-0550) DE, DC, MD, NJ, PA, VA 1, 2, 3, 5

**David H. Brothers Co., Inc.**, 19 Old Court Rd., Baltimore, MD 21208 (301-764-7189) DC, MD, VA 1, 2, 5, 6

**Midwest Corp., Communications Systems Div.**, 4720-B Boston Way (Washington D.C.), Lenham, MD 20706 (301-577-4903) North America 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

**Music Sound Distributors**, 6730 Santa Barbara Court, Baltimore, MD 21227 (301-796-3984) U.S.A. and Canada 1, 2, 5

**Peirce-Phelps, Inc.**, 12288 Wilkins Ave., Rockville, MD 20852 (301-984-7979) U.S.A., GU, PR, VI 1, 2, 3, 5, 8, 9, 10

**Professional Products Inc.**, 4964 Fairmont Ave., Bethesda, MD 20814 (301-657-2141) DC, MD, VA 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

**RCI-Recording Consultants Inc.**, 8550 Second Ave., Silver Spring, MD 20910 (301-587-1800) DE, DC, MD, PA, VA, WV 1, 5, 9, 10, 11

See advertisement on this page

**Sel-Tronics, Inc.**, 721 Ellsworth Dr., Silver Spring, MD 20910 (301-589-3391) DC, MD, VA 1, 2, 3

**Theatre Service & Supply Corp.**, 1792 Union Ave., Baltimore, MD 21211 (301-467-1225) U.S.A. 1, 2, 7, 9, 10, 11

**Wiltronix, Inc.**, 16850 Oakmont Ave., Washington Grove, MD 20880 (301-258-7676) DE, DC, KY, MD, PA, VA, WV 1, 2, 3, 4, 10

## MASSACHUSETTS

**Barbizon Light**, 3 Draper St., Woburn, MA 01801 (617-935-3920) AL, CT, DE, DC, FL, GA, IL, IN, KY, ME, MD, MA, MI, MS, NH, NJ, NY, NC, OH, PA, RI, SC, TN, VT, VA, WV, WI 2

**Cramer Video/Audio Systems**, 120 Hampton Ave., Needham, MA

02194 (617-449-2100; Outside MA = 800-343-5800) All U.S.A., primarily CT, ME, MA, NH, RI, VT, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

**Lake Systems Corp.**, 55 Chapel St., Newton, MA 02160 (617-244-6881) CT, ME, MA, NH, RI, VT 1, 2, 3, 5, 8, 9, 10, 11

**Landy Associates, Inc.**, 801 Water St., Framingham, MA 01701 (617-877-9570) CT, DE, DC, ME, MD, MA, NH, NJ, NY, PA, RI, VT, VA 1, 2, 3, 5, 6, 7, 8, 10, 11

See advertisement on page 212

**M. P. Video, Inc.**, 3 Huron Dr., Natick, MA 01760 (617-965-5405) CT, ME, MA, NH, RI 1, 2, 3, 5, 9, 10, 11

**Professional Recording & Sound, Inc.**, 1616 Soldiers Field Rd., Boston, MA 02135 (617-254-2101) CT, ME, MA, NH, RI, VT 1, 3, 5, 9, 10, 11

**Professional Video Systems**, 1616 Soldiers Field Rd., Boston, MA 02135 (617-254-2101) CT, ME, MA, NH, RI, VT 2, 3, 5, 8, 9, 10, 11

**QSI Systems, Inc.**, 12 Linscott Rd., Woburn, MA 01888 (617-938-1403) U.S.A. 2, 3, 5, 10

## MICHIGAN

**Audio Broadcast Group, Inc.**, 2342 S. Division Ave., Grand Rapids, MI 49507 (616-452-1596) U.S.A. 1, 3, 4, 5, 10, 11

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**CM Sales**, 2221 Lakeshire, West Bloomfield, MI 48033 (313-626-2397) MI 1, 2, 3

**Victor Duncan, Inc.**, 32380 Howard St., Madison Hgts., MI 48071 (313-589-1900) U.S.A. and Canada 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

**H. M. Dyer Electronics, Inc.**, 48647 Twelve Mile Rd., Novi, MI 48050 (313-478-2157) IL, IN, IA, MI, MN, MO, OH, WI 1, 2, 3, 4

**Midwest Corp., Communications Systems Div.**, 1328 Wheaton Ave., Troy, MI 48084 (313-689-9730) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

**Sound Solutions Inc.**, 5701 Canton Center Rd., Canton, MI 48187 (313-453-6586) IL, IN, MI, OH 1, 2, 3, 4, 5, 10

**Thalner Electronic Labs, Inc.**, 7235 Jackson Rd., Ann Arbor, MI 48103 (313-761-4506; Area 313 only = 800-552-5275) MI, OH, 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

**V F Sales Inc.**, 41940 Joy Rd., Plymouth, MI 48170 (313-453-8720) MI 1, 2, 3

## MINNESOTA

**Color Video Services, Inc.**, 5459 Woodlawn Circle S.E., Prior Lake, MN 55372 (612-447-4453) IA, MN, MT, NE, ND, SD, WI, WY 1, 2, 10

**Emmons Associates, Inc.**, 1121 Riverwood Dr., Burnsville, MN 55337 (612-890-8920) IA, MN, ND, SD, WI 1, 2, 4, 9, 11

**T. R. Plitts Co.**, 501 W. 5th St., Box 57, Winona, MN 55987 (507-452-2629; Outside MN = 800-533-8092) ALL IL, IN, IA, KS, KY, MI, MN, MO, NE, OH, SD, WI, Parts of MT 1, 2, 3, 4, 5, 8, 9, 10

**Todd Communications Inc.**, 6545 Cecilia Circle, Minneapolis, MN 55435 (612-941-0556) IA, MN, NE, ND, SD, WI 1, 2, 3, 4, 5, 7, 9, 10, 11

**Video Midwest, Inc.**, 5050 West 78th St., Minneapolis, MN 55435 (612-831-2248) IA, MN, ND, SD, WI 1, 2, 3, 5, 7, 9, 10, 11

## MISSISSIPPI

**Central School Supply**, 310 Airport Rd., Jackson, MS 39208 (601-932-1901) AL, AR, LA, MS, TN 1, 2, 4, 5, 6, 7, 9, 10, 11

**Fultec Engineering Services**, 4672 Nisqually Rd., Jackson, MS 39206 (601/362-2697) AL, AR, DC, FL, GA, KY, LA, MD, MS, MO, NC, OK, SC, TN, TX, VA, WV 9, 10, 11

**Centurian Marketing Associates**, 124 Manchester Rd.; Box 1011, Ballwin, MO 63011 (314-227-7229) Southern-IL, IA, KS, MO, NE 1

**Delcom Corp. of St. Louis**, 2349 Griscom, St. Louis, MO 63146 (314-432-1164; 800-331-5461) Continental U.S. 2, 3, 5, 8, 9, 10

**Dytec/South Inc.**, 11657 Adie Rd., Maryland Hts., MO 63043 (314-569-2990) AR, IL, IA, KS, MO, NE, OK 1, 3, 4, 6, 11

**Television Engineering Corp.**, 580 Goddard Ave., Chesterfield, MO 63017 (314-532-4700) CO, IL, IA, KS, MS, MO, NE, OH, TN 1, 2, 3, 5, 6, 7, 8, 9, 10, 11

**Video Masters, Inc.**, Box 1963; 1616 Broadway, Kansas City, MO 64141 (816-474-8530) AR, IL, IA, KS, MO, NE 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

## MONTANA

**The Source Inc.**, 320 6th St. So.; Box 2487, Great Falls, MT 59403 (406/761-2420) MT, Northern-WY 1, 2, 3, 5, 6, 9, 10, 11

## NEVADA

**Cinema Services**, 3050 Sheridan St., Las Vegas, NV 89102 (702-876-4667) AZ, NV, NM, UT 2, 7, 11

## NEW HAMPSHIRE

**Associated Systems**, Box 5211, Manchester, NH 03108 (603-472-2297) CT, ME, MA, NH, NY, RI, VT 1, 2, 3

**Video Lab**, 250 Derry Rd., Hudson, NH 03051 (603-880-1896) ME, MA, NH, VT 1, 2, 3, 5, 9, 10, 11

## NEW JERSEY

**A.F. Associates**, 100 Stonehurst Ct., Northvale, NJ 07647 (201-767-1000) Worldwide 2, 3, 7, 8, 10

**Avtec Industries, Inc.**, 39 Industrial Ave., Teterboro, NJ 07608 (201/288-6130) USA, Egypt, Nigeria, Saudi Arabia 1, 2, 3, 4, 5, 6, 7, 9, 10

**Broadcast Video Marketing Corp.**, 275 Rt. 18, East Brunswick, NJ 08816 (201-390-0770) CT, DE, DC, MD, NJ, NY, PA, VA 2, 3, 8

**Calvert Electronics Inc.**, 1 Branca Rd., East Rutherford, NJ 07073 (Outside NJ = 800-526-6362; In NJ = 201-460-8800) Worldwide 2, 6  
*See advertisement on page 20*

**Cinecraft Int'l., Inc. Export Agents**, 11 Caesar Place, Moonachie, NJ 07074 (201-939-0875) Worldwide 1, 7, 9, 11

**Comprehensive Video Supply Corp.**, 148 Veterans Dr., Northvale, NJ 07647 (201-767-7990) Worldwide 1, 2, 3, 5, 8

**H. M. Holzberg Associates, Inc.**, Box 322, Totowa, NJ 07511 (201-256-0455) CT, DE, DC, ME, MD, MA, NH, NJ, NY, PA, RI, VT 1, 2, 3, 4, 5, 6, 7, 8, 10  
*See advertisement on this page*

**Landy Associates, Inc.**, 1890 E. Marlton Pike, Cherry Hill, NJ 08003 (609-424-4660) CT, DE, DC, ME, MD, MA, NH, NJ, NY, PA, RI, VT, VA 1, 2, 3, 5, 6, 7, 8, 9, 10, 11  
*See advertisement on this page*

**Tele-Measurements, Inc.**, 145 Main Ave., Clifton, NJ 07014 (201-473-8822) CT, DE, NJ, NY, PA 8, 9, 10, 11

**Thor Electronics Corp.**, 321 Pennsylvania Ave., Linden, NJ 07036 (201-486-3300) Worldwide 6

**Turner Engineering**, 14 Morris Ave., Mountain Lakes, NJ 07046 (201-263-0023) CT, DE, NJ, NY, PA 1, 2, 3, 4, 5, 6, 8, 9, 10, 11  
*See advertisement on page 213*

**Vision-Sound Pro-Audio**, 20 N. Dean St., Englewood, NJ 07631 (201-871-4101) CT, DE, DC, ME, MA, NH, NJ, NY, PA, RI, VT 1, 3, 5, 10, 11

## NEW MEXICO

**DYMA Engineering, Inc.**, Box 1535, Los Lunas, NM 87031 (505-865-6700) AZ, CA, CO, KS, NV, NM, OK, TX, UT 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

## NEW YORK

**Acoustilog, Inc.**, 19 Mercer St., New York, NY 10013 (212-925-1365) CT, NJ, NY; #10-Worldwide 1, 5, 9, 10, 11

**Adcom Communications Inc.**, 555 West 57th St., New York, NY 10019 (212-265-1760) CT, NJ, NY 2, 3, 5, 9, 10, 11

**Adwar Video Corp.**, 335 West 35th St., New York, NY 10001 (212-947-4040; 800-344-1414) Worldwide 1, 2, 3, 5, 6, 9, 10, 11

**Audio-Video Corp.**, 213 Broadway, Menands (Albany), NY 12204 (518-449-7213) CT, MA, NY, North-PA, VT 1, 2, 3, 5, 9, 10, 11

**Audiotechniques Inc.**, 1619 Broadway, 4th Flr., New York, NY 10019 (212-586-5989; Sales: 800-223-2486) CT, DE, DC, ME, MD, MA, NJ, NY, PA, RI, VT, VA 1, 3, 5, 9, 10, 11

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**Avtech Electronics Inc.**, (formerly Team Electronics), 24-16 Queens Plaza South, Long Island City, NY 11101 (212-937-9200; 800-221-1300) U.S.A. and Canada 1, 2, 5, 6, 7

**David Bain Associates**, 11 Orchard Farm Rd., Port Washington, NY 11050 (516-883-4818) CT, NJ, NY 1, 3, 4, 5

**Barbizon Electric Co., Inc.**, 426 West 55th St., New York, NY 10019 (212-586-1620) AL, CT, DE, DC, FL, GA, IL, IN, KY, ME, MD, MA, MI, MS, NH, NJ, NY, NC, OH, PA, RI, SC, TN, VT, VA, WV, WI 2

**Boynton Studio Inc.**, Melody Pines Farm, Morris, NY 13808 (607-263-5695) U.S.A.; BC, MAN, NB, NS, ONT, PEI, QUE, SASK 1, 3, 4, 5, 9, 10, 11

**Richard W. Burden Associates**, 342 Lexington Ave., Mount Kisco, NY 10549 (914-666-3730) U.S.A. 10

**The Camera Mart, Inc.**, 456 West 55th St., New York, NY 10019 (212-757-6977) CT, ME, MA, MI, NH, NJ, NY, OH, PA, VT 1, 2, 3, 5, 7, 9, 11

**Ceco Communications Inc.**, 2115 Avenue X, Brooklyn, NY 11235 (212-646-6300; 800-221-0860) Worldwide 1, 2, 6

*See advertisement on page 102 and page 252*

**Darmstedter Associates**, 41 R. Oswego St., Baldwinsville, NY 13027 (315-638-1261) NY 1

**D.O. Industries**, 317 E. Chestnut St., East Rochester, NY 14445 (716-385-4920) U.S.A. and Canada 1

**R F Gain, Ltd.**, 116 S. Long Beach Rd., Rockville Centre, NY 11570 (516-536-8868; 800-645-2322) Worldwide 6

**Henry Grossman Associates**, 519 South 5th Ave., Mount Vernon, NY 10550 (914-664-5393 or 337-4260) CT, DE, DC, FL, ME, MD, MA, NH, NJ, NY, PA, VT, VA 1, 2, 3, 4, 5, 6, 7, 10

**Koppe Raden Corp.**, 34 S. Broadway, White Plains, NY 10601 (914-682-8038) Caribbean, Central America, South America 1, 2, 3, 4, 5, 6, 7, 8

**Laumic Co., Inc.**, 306 East 39th St., New York, NY 10016 (212-889-3300) CT, DE, DC, ME, MD, MA, NH, NJ, NY, PA, RI, VT, VA 1, 2, 3, 5, 6, 7, 8, 9, 10, 11

**Levit Electronics, Inc.**, 200 Park Ave. S., New York, NY 10003 (212-777-5517; 800-221-2945) Worldwide 6

**MM Editing Systems, Inc.**, 118 East 25th St., New York, NY 10010 (212-460-8810) AL, AR, CT, DE, DC, FL, GA, IL, IN, KS, LA, ME, MD, MA, MI, MN, MS, MO, NE, NH, NJ, NY, NC, OH, OK, PA, PR, RI, SC, TN, VT, VA, WI 2, 7, 11

**MPCS Video Industries, Inc.**, 514 West 57th St., New York, NY 10019 (212-586-3690) U.S.A. 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

**Martin Audio/Video Corp.**, 423 West 55th St., New York, NY 10019 (212-541-5900) CT, DE, DC, ME, MD, MA, NH, NJ, PA, RI, VT 1, 2, 3, 5, 9, 10

**Microphonics**, Box 37, Brooklyn, NY 11204 (212-438-6400; 800-431-3232) U.S.A. Nationwide 1, 2, 5, 6

**L. Matthew Miller Associates Ltd.**, 48 West 21st St., 11th Floor, New York, NY 10010 (212-741-8011; 800-221-9328) U.S.A., PR 1, 2, 3, 5, 9, 10, 11

**Northeast Broadcast Lab., Inc.**, 15 Charles St.; Box 1176, S. Glens Falls, NY 12801 (518-793-2181) CT, ME, MA, NH, NY, RI, VT 1, 3, 4, 5, 8, 9, 10, 11

**Posthorn Recordings**, 142 West 26th St., 10th Flr., New York, NY 10001 (212-242-3737) U.S.A. 1, 5, 11

**RMS Electronics, Inc.**, 50 Antin Place, Bronx, NY 10462 (Collect NY Only = 212-892-6700; Outside NY = 800-223-8312) Nationwide by telephone sales 4

**RadioCom**, 335 East 70th St., New York, NY 10021 (212-794-9702) U.S.A. and Canada 10

**Richardson Electronics East**, 116 S. Long Beach Rd., Rockville Centre, NY 11570 (800-645-2322) U.S.A. 6

*See advertisement on page 210*

**The Ken Schaffer Group, Inc.**, 21 West 58th St.-Penthouse, New York, NY 10019 (212-371-2335) Worldwide 1, 4, 9, 10, 11

**Sharoubim Int'l. Co.**, 192-08 90th Ave., Hollis, NY 11423 (212-479-3011) Worldwide 1, 2, 3, 6

**Singer Products Co., Inc.**, 875 Merrick Ave., Westbury, NY 11590 (516-683-3000) Worldwide except U.S.A. and Canada 1, 2, 3, 4, 6, 10

**Sonocraft Corp.**, 360 West 31st St., New York, NY 10001 (212-760-9300) NJ, NY 1, 2, 5, 7, 9, 10, 11

**Stage Lighting Distributors**, 346 West 44th St., New York, NY 10036 (212-489-1370) U.S.A. and Canada 10

**Tape City Int'l. Inc.**, 404 Park Ave. S., New York, NY 10016 (212-679-1606; 800-223-1586) CT, NJ, NY, Mail Order in U.S.A. 1, 2, 5, 9, 11

**Temtron Electronics Ltd.**, 15 Main St., East Rockaway, NY 11518 (516-599-6400; 800-645-2300) U.S.A. 5, 6

**Tiffen Mfg. Corp.**, 90 Oser Ave., Hauppauge, NY 11788 (516-273-2500) U.S.A. and Canada 7

**United Research Lab Corp.**, 16 East 52nd St., New York, NY 10022 (212-751-4663) Worldwide 1, 3, 5, 9

**Videotape Services Inc.**, 855 Avenue of the Americas, New York, NY 10001 (212-695-6606) Worldwide 5, 7, 11

## NORTH CAROLINA

**Broadcast Services Co.**, Rt. 3 Box 45-E, Four Oaks, NC 27524 (919-934-6869) NC, SC, VA 1, 4, 5, 9, 10

*See advertisement on this page*

**Electronic Merchandising Enterprises, Inc.**, 112 Buena Vista, High Point, NC 27260 (919-869-3335) East-KY, NC, SC, East-TN, VA, WV 1, 2, 3, 4

**Midwest Corp., Communications Systems Div.**, 2848 Suite E, Interstate 85 S., Charlotte, NC 28208 (704-399-6336) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

**Southern Coastal Marketing Services, Inc.**, 800 N. Polk St., Pineville, NC 28134 (704-889-4508) NC, SC, VA 1, 2, 3, 4, 5, 9

**Studloworks**, 1018 Central Ave., Charlotte, NC 28204 (704-375-1053; Outside NC = 800-438-5921) U.S.A. For MCI products only NC, SC, VA, WV 1, 2, 3, 5, 9, 10, 11

**Technical Video Systems, Inc.**, 215 N. Broad St., Winston-Salem, NC 27101 (919-748-0916) NC, SC, TN 1, 2, 3, 4, 5, 7, 9, 10, 11

## NORTH DAKOTA

**Audiovisual Inc. Formerly Known As OMF Audiovisual, Inc.**, 1818 E. Broadway, Bismarck, ND 58501 (701-258-6360) MN, MT, ND, SD 1, 2, 3, 5, 7, 9, 10, 11

## OHIO

**Audio Marketing Association**, 9470 Whitewood Rd., Brecksville, OH 44141 (216-526-2426) OH, PA, WV 1, 3

**Cartwright Communications Co.**, 7812 Red Sky Dr., Cincinnati, OH 45242 (513-489-1755; Outside OH = 800-543-8614; OH = 800-582-2641) U.S.A. AK, HI, 3, 4

**Cercone Vincent Associates, Inc.**, 5020 Richmond Rd., Bedford Heights, OH 44146 (216)/292-2550 IN, OH, PA, WV 1, 2, 10, 11

**KAVCO, Inc.**, 3931 Image Dr., Dayton, OH 45414 (513-898-2003) AZ, IL, IN, KY, MI, OH, WV 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

**Midwest Corp., Communications Systems Div.**, 7500 Wall St., Cleveland, OH 44125 (216-447-9745) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

**Midwest Corp., Communications Systems Div.**, 4410 Westerville Rd., Columbus, OH 43229 (614-476-2800) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

**Midwest Corp., Communications Systems Div.**, 1540 Bowman Ave., Dayton, OH 45409 (513-298-0421) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

**J.B. Parent Co.**, 4701 Clentangy River Rd., Columbus, OH 43214 (614-459-5947) OH, West-PA, WV 1, 2

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**Pinzone Communications Products Inc.**, 10142 Fairmount Rd., Newbury, OH 44065 (304-296-4493) Worldwide 3, 4

## OKLAHOMA

**Walter S. Brewer Co., Inc.**, 2216 East 56th Place, Tulsa, OK 74105 (918-749-9894) Worldwide 2, 10

**Doug Brown Enterprises, Inc.**, 1703 E. Skelly Dr., Tulsa, OK 74105 (918-747-3618) Worldwide 1, 3, 5, 9, 10, 11

**Delcom Corp.**, 6019 S. 66th E. Ave., Tulsa, OK 74145 (918-494-9500; Outside OK = 800-331-5461) Continental U.S. 2, 3, 5, 8, 9, 10

**Hill Radio Equipment Co.**, 203 Alawhe Rd., Rt. 8, Claremore, OK 74017 (918/341-5240) U.S.A. 1, 3, 4, 5  
*See advertisement on this page*

## OREGON

**Custom Video Systems of Oregon, Inc.**, 1963 N.W. Kearney St., Portland, OR 97209 (503-295-6963) OR 1, 2, 3, 5, 8, 9, 10, 11

**United Radio Supply Inc.**, Box 14040, Portland, OR 97214 OR, WA 3, 6

**Videocons Inc.**, 821 Southeast 14th Ave., Portland, OR 97214 (503-232-4632) ID, MT, OR, WA 1, 2, 3, 5, 7, 8, 9, 10, 11

## PENNSYLVANIA

**Audio Associates**, 814 W. Broad St., Bethlehem, PA 18018 (215-856-6013) U.S.A. 1, 3, 4, 5, 6, 10, 11

**Cercone Vincent Associates, Inc.**, 2741 Noblestown Road, Pittsburgh, PA 15205 (412-922-0900) IN, OH, PA, WV 2, 7, 10, 11

**Eagle Hill Electronics Inc.**, 41 Linden Ave., Rutledge, PA 19070 (215-544-8879) Worldwide 1, 4, 6, 9

**Electromedia, Inc.**, 610 Melwood Ave., Pittsburgh, PA 15213 (412/683-5424) DC, MD, NY, OH, PA, VA, WV 1, 2, 3, 5, 9, 10, 11

**EMCEE Broadcast Products**, Box 68, White Haven, PA 18661 (717-443-9575) Worldwide 4

**LPB Inc.**, 28 Bacton Hill Rd., Frazer, PA 19355 (215-644-1123) U.S.A. and Canada and U.S. Possession in the Pacific 1, 3, 4, 10

**Lerro Electrical Corp.**, 3125 N. Broad St., Philadelphia, PA 19132 (215-223-8200) DE, DC, MD, NJ, PA, VA 1, 2, 3, 5, 6, 8, 9, 10, 11

**Midwest Corp., Communications Systems Div.**, Box 415, Gibsonia, PA 15044 (412-781-7707) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

**P.A.G.E. Co.**, R.D. 8, Box 41, Allentown, PA 18104 (215-395-3456) DE, DC, MD, NJ, NY, OH, PA, VA 4, 8, 9

**Richard S. Pass Associates, Inc.**, 27 Oxford Dr., Langhorne, PA 19047 (215-757-6100) DE, DC, MD, Southern-NJ, Eastern-PA, VA 1, 3

**Peirce-Phelps, Inc.**, 490 S. St. Johns, Camp Hill, PA 17011 (717-761-0240) U.S.A., GU, PR, VI 1, 2, 3, 5, 7, 8, 9, 10, 11

**Peirce-Phelps, Inc.**, 2000 North 59th St., Philadelphia, PA 19131 (215-879-7171) U.S.A., GU, PR, VI 1, 2, 3, 5, 7, 8, 9, 10, 11

**Performance Lighting & Production Services**, 2741 Noblestown Rd., Pittsburgh, PA 15205 (412-922-0900) IN, OH, PA, WV 2, 7, 10, 11

**Radio Systems Inc.**, 5131 W. Chester Pike, Edgemont, PA 19028 (215-356-4700) U.S.A. 1, 4, 10

**Steinberg Electronics Inc.**, 2520-22 N. Broad St., Philadelphia, PA 19132 (215-223-9400; 800-523-0894) Worldwide 1, 2, 3, 5, 6  
**Val-Tronics, Inc.**, Penn Park Bldg., Pittston, PA 18640 (717-655-5937) U.S.A. 1, 3, 4, 5, 6

## RHODE ISLAND

**WRH Productions**, 5 Industrial Way, Riverside, RI 02915 (401-434-6272) CT, ME, MA, NH, NY, RI, VT 1, 4, 5, 10, 11

## SOUTH CAROLINA

**Doug Cook & Associates Inc.**, One Executive Ct., Lake Wylie, SC 29710 (803-831-2442; 800-845-2665) AL, FL, GA, OH, West-PA, TN, WV 1, 2, 3, 5, 10

## TENNESSEE

**Broadcast Equipment & Supply Co., Inc.**, Box 3141, Bristol, TN 37625 (615-878-2531) U.S.A. 1, 4, 5

**Centel Systems, Inc.**, 3675 New Getwell Rd., Suite 12, Memphis, TN 38118 (901-365-1361) AR, MS, TN 1, 2, 5, 9, 10

**Gray Communications Consultants, Inc.**, 901 E. Summitt Hill, Knoxville, TN 37915 (615-523-3107) NC, TN 1, 2, 5, 7, 8, 9, 10

**Gray Communications Consultants, Inc.**, 115 Spence Lane, Nashville, TN 37210 (615-883-9175) TN 1, 2, 5, 7, 8, 9, 10

**Midwest Corp., Communications Systems Div.**, A7-156 Space Park S., Antioch Pike, Nashville, TN 37211 (615-331-5791) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

**Redwood Marketing**, 820 Redwood Dr., Nashville, TN 37220 (615-331-4743) North and South America 1, 3

**Wilson Audio Sales, Inc.**, 6602 Hwy. 100, Suite 205, Nashville, TN 37205 (615-356-0372) AL, GA, MS, NC, SC 1

## TEXAS

**Allied Broadcast Equipment**, 1201 East 15th, Suite 309, Plano, TX 75074 (214-423-8667) Worldwide 1, 3, 4, 5, 6, 9, 10

**Anderson Associates/Waretronics**, 1109 Airport Circle S., Euless, TX 76039 (817-267-3301) AR, KS, LA, MS, MO, OK, TX 1, 3, 4, 5, 10, 11

**Broadcast Systems Inc.**, 8222 Jamestown Dr., Austin, TX 78758 (800-531-5232) U.S.A. 1, 2, 3, 4, 5, 7, 8, 9, 10

**CFA-Media Specialties, Inc.**, Box 34567, San Antonio, TX 78265 San Antonio Only = 512-657-5997; Dallas = 214-644-6479; Houston = 713-528-6012) LA, NM, OK, TX, 1, 2, 9, 10, 11

**Crouse-Kimzey Co.**, Box 9830, Ft. Worth, TX 76107 (817-737-9911) U.S.A. 1, 3, 4, 5

**Victor Duncan, Inc.**, 6305 N. O'Connor, Irving, TX 75039 (214-869-0200) U.S.A. and Canada 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11  
*See advertisement on page 262*

**Fitzco Sound, Inc.**, 204 N. Midkiff, Midland, TX 79701 (915/684-0861) U.S.A. 1, 2, 3, 5, 9, 10, 11

**G.P. Enterprises, Inc.**, Box 912, Arlington, TX 76010 (817-467-2990; 467-0051) AZ, AR, CO, IA, KS, LA, MO, MT, NE, NM, OK, TX, WI, WY 1, 2, 3, 4, 11

**Int'l. Equipment & Services Corp.**, 2124 Barton Hills Dr., Austin, TX 78707 (512-447-6903) U.S.A. and Canada 1, 2, 3, 4, 5, 6, 7, 8, 10, 11

**Jenel Consultants Corp.**, 10307 Bernardin, Dallas, TX 75243 (214-680-0502) U.S.A. 8, 10

**Linrose Electronics Corp.**, 202 W. Nakoma, San Antonio, TX 78216 (512/342-8849) Worldwide 1, 2, 3, 4, 5, 6, 9, 10, 11

**MZB&Assoc.**, 4203 Beltway, Dallas, TX 75234 (214-233-5535) AR, LA, NM, OK, TX 1, 2, 3, 4, 5, 7, 8, 9, 10, 11

**MZB&Associates**, 16502 Northchase Dr., Suite E, Houston, TX 77060 (713-448-0881) AR, LA, NM, OK, TX 1, 2, 3, 4, 5, 7, 8, 9, 10, 11

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**Peregrine Southwest Reps**, 5800 Corporate, D-5, Houston, TX 77036 (713-772-6765) AR, LA, MS, OK, West-TN, TX 1

**Professional Audio Services**, 3837 East Loop 820 South, Ft. Worth, TX 76119 (817-451-7643; 800-433-7668) Worldwide 1, 3, 5, 9

**SAVCO**, Box 427, Richardson, TX 75080 (214-234-1841) AL, AR, KS, LA, MI, MO, OK, TX 1, 2, 3, 4, 5, 7, 10

**Southwest Pro Audio, Inc.**, 1500 Summit St., Austin, TX 78741 (TX only = 800-252-7014; Outside TX = 800-531-5113) Nationwide 1, 3, 5, 9, 10, 11

**The Gene Sudduth Co., Inc.**, 5675 Roadrunner Lane, Beaumont, TX 77708 (409-899-1341) AR, LA, OK, TX 1, 2, 3

**The Gene Sudduth Co., Inc.**, Box 1116, Paris, TX 75460 (214-785-5764) AR, LA, OK, TX 1, 2, 3

**Tenicki & Associates**, 5719 Kirby, Suite 17, Houston, TX 77005 (713-528-2005) AR, LA, OK, TX 1, 2, 5

**UAR Professional Systems**, 8535 Fairhaven, One studio Center, San Antonio, TX 78229 (512-690-8888) U.S.A. 1

## UTAH

**Phoenix Systems, A Product of Briner Chase Group**, 4685 Highland Dr., #208, Salt Lake City, UT 84117 (801-272-8601) Worldwide 10

**RIA Corp.**, 50 E. Malvern, Salt Lake City, UT 84115 (801-486-8822 or 484-1701) AZ, CA, CO, ID, LA, MS, MO, MT, NV, OK, TX, UT, WY 1, 2, 3, 4, 5, 7, 8, 9, 10, 11

**Skaggs Video Sales**, 5181 Amelia Earhart Dr.; Box 27477, Salt Lake City, UT 84127 (801-539-1420) AZ, ID, MT, NV, UT, WY 1, 2, 3, 4, 5, 8, 9, 10

## VIRGINIA

**Alpha Audio**, 2049 W. Broad Street, Richmond, VA 23220 (804/358-3852) DC, MD, NC, VA, WV 1, 5, 10

**David Green Broadcast Consultants Corp.**, Box 590, Leesburg, VA 22075 (703-777-8660) U.S.A., Canada, GU, PR, VI 1, 3, 4, 5, 6, 9, 10, 11

**Hoppmann Corp.**, Box 601, Chantilly, VA 22021 (703-631-2700) U.S.A. 1, 2, 7, 10

**Midwest Corp., Communications Systems Div.**, 1395 Air Rail Ave., Virginia Beach, VA 23455 (804-464-6256) AL, DE, DC, GA, MD, NC, SC, VA 1, 2, 4, 5, 8, 9, 10

**Old Dominion Broadcast Eng. Service**, 1101 Front St., Richmond, VA 23222 (804-321-4506) Worldwide 1, 3, 4, 5, 6, 9, 10, 11

**Robert Slye Electronics**, 3415 N. Washington Blvd., Arlington, VA 22201 (703-525-7272) DC, MD, VA 1, 2, 3, 10

## WASHINGTON

**Allied Broadcast Equipment**, 1112 South 344th St., Suite 312, Federal Way, WA 98003 (206-927-4337) Worldwide 1, 3, 4, 5, 6, 9, 10

**Broadcast Supply West**, 7012 27th St. West, Tacoma, WA 98466 (206-565-2301) Worldwide 1, 3, 4, 5

**Custom Video Systems, Inc.**, 17521 15th Ave. N.E., Seattle, WA 98155 (206-365-5400) AK, WA 1, 2, 3, 5, 8, 9, 10, 11

**IGM Communications**, 4041 Home Rd., Bellingham, WA 98226 (206-733-4567) U.S.A. 1

**MARCOM**, 2862 S. McClellan St., Seattle, WA 98144 (206-722-2636) AK, AZ, CA, HI, NV, OR, WA 1, 2, 3, 4, 6, 10, 11

**Northshore Marketing**, 1800 N.E. 75th St., Seattle, WA 98115 (206-524-8672) AK, ID, MT, OR, WA 1, 3

**Northwest Broadcast Systems**, 1718 N.E. 98th St., Seattle, WA 98115 (206-525-6974) AK, ID, MT, OR, WA 1, 4, 10

*See advertisement on this page*

## WEST VIRGINIA

**Midwest Corp., CATV Sales Office**, 307 Sandy Blvd., Clarksburg, WV 26301 (304-624-5459) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

**Midwest Corp., Communications Systems Div.**, 300 First Ave., Nitro, WV 25143 (304-722-2921) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

## WISCONSIN

**Electronic Industries Inc.**, 19 E. Irving Ave., Oshkosh, WI 54901 (414-235-8930; 800-558-0222) U.S.A. 1, 3, 4, 5, 6, 9, 11

**Full Compass Systems, Ltd.**, 6729 Seybold Rd., Madison, WI 53719 (608-271-1100; Outside WI = 800-356-5844; WI = 800-362-5445) U.S.A. 1, 2, 3, 5, 9, 10, 11

**Video Images**, 12200 W. Adler Lane, West Allis, WI 53214 (414-475-0111) WI 1, 2, 5, 7, 9, 10, 11

## CANADA

**BCB Electronic Sales**, 12295 Highway 50; Box 315, Bolton, Ont., Canada LOP 1A0 (416-857-0790) Canada 2

**Black & McDonald Ltd.**, 101 Parliament St., Toronto, Ont., Canada M5A 2Y7 (416-366-2541) Canada 4

**Caveco Equipment Ltd.**, 1121 Bellamy Rd. N., Unit 10, Scarborough, Ont., Canada M1H 3B9 (416-438-6230) Canada 1, 2, 3, 4, 5, 6, 9, 10

**Comad Communications**, 1535 Meyerside Dr., Unit 1, Mississauga, Ont., Canada L5T 1M9 (416-676-9171) Canada 1, 2, 4, 5, 9, 10

**Glentronix (1977) Ltd.**, 160 Duncan Mill Rd., Don Mills, Ont., Canada M3B 1Z5 (416-444-8497) U.S.A. and Canada 1, 2, 3

**Incospec Electronics, Inc.**, 4651 Boul des Grandes Prairies, St. Leonard, Que., Canada H1R 1A5 (514-322-5540) Canada 3, 10

**Lumitrol, Ltd.**, 253 Merton St., Toronto, Ont., Canada M4S 1A7 (416-485-4817 or 4826) Canada 2, 10

**Nortec West Ltd.**, 7056-B Farrell Rd. S.E., Calgary, Alta, Canada T2H 0T2 (403-252-8141) Alta, B.C., Man., Sask. 1, 2

**Pineway Electronics Ltd.**, 1875 Leslie St., Unit 7, Don Mills, Ont., Canada M3B 2M5 (416-449-1343) Northeast U.S.A. ME, NY, VT, Canada 1, 3, 4, 5, 6, 9, 11  
*See advertisement on this page*

**Sigmacom Systems Inc.**, 111 Industrial Dr., Whitby, Ont., Canada L1N 5Z9 (416-666-1661) Canada 1, 4, 9, 10

**Studio Systems, Inc.**, Box 67, Snowdon, Montreal, Que., Canada H3X 3T3 (514-861-7440; 800-325-8957) AR, CT, DE, DC, FL, GA, IL, IN, KS, KY, ME, MD, MA, MI, MS, MO, NH, NJ, NY, NC, ND, OH, PA, SC, TN, TX, VT, VA, WV, all Canada 1, 2, 4, 5, 8, 10

**Tele-Tech Electronics Ltd.**, 920 Denison St., Unit 11, Markham, Ont., Canada L3R 3K5 (416-499-3242) Canada 1, 2, 3, 5, 7, 9, 10, 11

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**Thomas E. Mintner** has been promoted to director, Studer Products. In his new position, Mintner will assume responsibility for administration of the Studer Revox America division throughout the United States, including sales, marketing and technical areas.

EEV has announced the appointment of **Michael Kirk** as marketing manager, UHF TV klystrons. He will be responsible for the marketing and sale of those products to the broadcast market.

Various Harris Corporation divisions have announced personnel additions and promotions. **James D. Lakin**, formerly president and chief executive of Frederick Electronics Corporation, Frederick, MD, has been appointed vice president/general manager of the Satellite Communications Division. **Dave Hershberger**, inventor of Harris' linear AM stereo system, will act as a consultant for AM stereo for the Broadcast Group. **Richard Lawrence** has been appointed director of marketing, Harris Broadcast Microwave.

**Joseph J. Wozniak** has been appointed national sales manager, Acrodyne Industries. Before his appointment with Acrodyne, Wozniak was a senior application engineer in the power systems marketing department for Exide Electronics in Philadelphia.

**Dave Friedley**, executive vice president of the Grass Valley Group, a subsidiary of Tektronix, has been named general manager of Tek's Communications Division. Friedley served as GVG's executive vice president since 1978.

**Charles Dages** has been appointed director of development for the engineering and development department, CBS Broadcast Group. Dages will be responsible for planning, implementing and managing TV technology development projects.

**David Newborg**, in broadcasting and television since 1937, has retired as manager, antenna engineering, RCA Corporation. He has formed David Newborg and Associates, a radio and TV consulting firm.

Datatron has announced that **S. Douglas Sorensen** has been appointed northeast regional sales manager for the Video Systems Division. Sorensen will be based in the Boston area and will be responsible for the territory including Illinois, Indiana, Ohio, West Virginia, Maryland, Delaware, the District of Columbia, as well as the northeastern states.

**Roy H. Ekrom**, vice president and general manager of the Garrett Corporation's Pneumatic Systems Division has been named president and chief executive officer of Ampex. The company also appointed **Edwin W. Engberg** as business manager of audiotape products for its Magnetic Tape Division.

Vital Industries has named **Jim Moneyhun** senior vice president. Moneyhun has spent 20 years in the application of computers or digital technology to the broadcast industry. The company also named **Gordon Peters** national sales manager. He has been with Vital since 1975.

**Hans R. Groll**, technical director of the Robert Bosch

Television Systems Division in Darmstadt since 1971, retired on reaching his 60th birthday at the end of last year. He worked in the division for almost 32 years. Groll is continuing to work for Bosch after his retirement. He is responsible for technical coordination between the Television Systems Division and Fernseh, Bosch's American subsidiary company in Salt Lake City.

Leader Instruments Corporation has announced two appointments: **William F. Schmidt**, as product marketing manager, and **John White**, as product marketing manager, video and audio test instruments.

Sony Broadcast Products Company has named **Raymond E. Harding** manager of market development and **Holmes F. Ives** western regional manager, MCI/Sony.

**Glenn T. Herb** has been named vice president of Engineering at BTX, filling a newly created position. He will be responsible for all new product development, quality control and service.

The board of directors of Orrox Corporation (ASE-ORR) has accepted the resignation of **William H. Orr** as chairman of the board and as a director of the company. Orr will serve as a consultant to the board of directors of the company for two years.

**David O. Fairley** has been appointed director of marketing for Nurad. He was a founding vice president of Farinon Video and most recently was director of engineering with Mosely Associates.

**Bob Pariser**, formerly manager of sales training for RCA Consumer Products Division and manager, Special Products Division for Panasonic, has joined Victor Duncan as sales representative, responsible for video sales in the southwestern United States.

**Ernest W. Pappenfus** has moved from Cetec Corporation's Vega Division to a corporate staff position, and Gary Stanfill has been named to succeed him as Vega general manager.

NBC has announced the appointment of **Thomas C. Sawyer** as its vice president, Washington Operations. Sawyer was formerly executive vice president of the Ohio Association of Broadcasters.

Dolby Laboratories of San Francisco has announced the appointment of **Bill Jasper**, formerly executive vice president, as president and chief operating officer. Jasper will report to company founder **Ray Dolby**, who now assumes the title of chairman and chief executive officer.

ISI has announced the expansion of its national marketing staff. **Doug Akers** has been appointed national sales manager. Replacing Akers as eastern representative is **John Saurenman**. **Mark Peterson** will be covering the western region.

**Frank F. Heyer** has been appointed manager, sales and engineering, graphic displays and broadcast monitors, for Ikegami Electronics (USA). Heyer will cover the western region for broadcast monitors and all of the United States west of the Mississippi for computer graphic displays.



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**John James Bielawski** recently joined Artel Communications Corporation as sales manager, telecommunications. He will assume responsibility for all domestic and international sales of Artel's line of fiber-optic telecommunication systems.

**Richard M. Galkin** has been elected senior vice president, Programming, Satellite Television Corporation (STC), with overall responsibility for acquiring the programming for STC's planned multichannel direct broadcast satellite (DBS) service.

**Karl Renwanz**, most recently director of engineering at WNEV-TV, Channel 7, Boston, has been named vice president of engineering and operations for the station.

**Bruce Storch** has been appointed director of sales for Leader Instruments Corporation. Storch will be responsible for the management of the company's US domestic sales force, as well as factory representatives and distributors.

**Joseph L. Leon** has been appointed marketing director for professional markets, 3M's Magnetic Audio/Video Products Division. Before this appointment, he had been the division's sales director.

**Bill Van Doren** has joined Digital Entertainment Corporation (DEC) as regional manager for the newly established West Coast office in Hollywood. Van Doren will be responsible for all sales and support activities for DEC in the western states.

**Christine Lalonde** has been named vice president of sales for Reeves Teletape.

**George F. Currie** has been named vice president and general manager, Sony Professional Audio Products. Currie, who began his career with Sony Corporation of America in 1973, most recently was central regional zone manager for the Communications Products Company.

**Steven A. Solomon** has joined Fuji Photo Film USA's Magnetic Product Division as national sales manager for computer products. Solomon will be responsible for the development of all sales, promotion and programs for the Fuji film floppy disc just launched in the United States.

The Studio Division of Harris Corporation's Broadcast Group has announced the appointment of **H. Kenneth Regnier** to vice president of video systems operation. Regnier most recently was with Ampex Corporation, where he was engineering manager for digital video systems.

BTX has appointed **James R. Lucas** manager of western area sales. Lucas will be responsible for all BTX sales and support activities in Arizona, California, Nevada, Oregon and Washington.

**Joseph A. Giordano** has been appointed product planning and development director for 3M's Magnetic Audio/Video Products Division. In this new position, Giordano will be responsible for advanced products and new worldwide business opportunities.

**Steve Sarafian** has been named product manager for 1-inch videotape recorder products by the Sony Broadcast Products Company. Sarafian has been a field engineer in Sony Broadcast's eastern region for the past three years.



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# Teletext:

## Progress & Videotex-'83

By Larry Padilla, director, videotex services, Graphic Media, Fairfield, NJ

The year 1983 may be remembered as the one in which the vertical blanking interval (VBI) became a valuable piece of real estate. The FCC has approved using the VBI for teletext, and many broadcasters that had been testing teletext now are ready to offer commercial service. However, it seems that the boom, if there is one, will take time to get here.

After the FCC approval, CBS began broadcasting teletext, then announced a 2-month hiatus in daily production of the service—presumably to wait for manufacturers to get their decoders to market. NBC, who was first on the air using the enhanced resolution graphics of NABTS (North American Broadcast Teletext Standard) teletext, began broadcasting this spring and continues to broadcast its teletext service.

For their testing, CBS and NBC used an early generation of French teletext hardware, limiting the graphics to coarse blocks called *mosaics*. The new equipment, based on NABTS, provides for creation of smoother pictures, using geometrics to produce various detailed shapes and textures. Videotex page creation terminals made by American Bell and Norpak can now be used for teletext graphics, because the North American teletext standard and the North American videotex standard provide for geometrics.

At this time, the lack of economical decoders in the homes of American TV viewers is delaying the spread of teletext. In this typical chicken/egg situation, advertisers will not begin to support the medium until they have an audience. And advertising dollars will pay for the service.

Meanwhile, NBC views its role much as it did in the early days of color television—to keep putting out programming until a critical mass of viewers is reached. The fact that the FCC refused to require cable operators to rebroadcast the VBI data is an additional complication. CBS, NBC and the NAB are contesting that decision.

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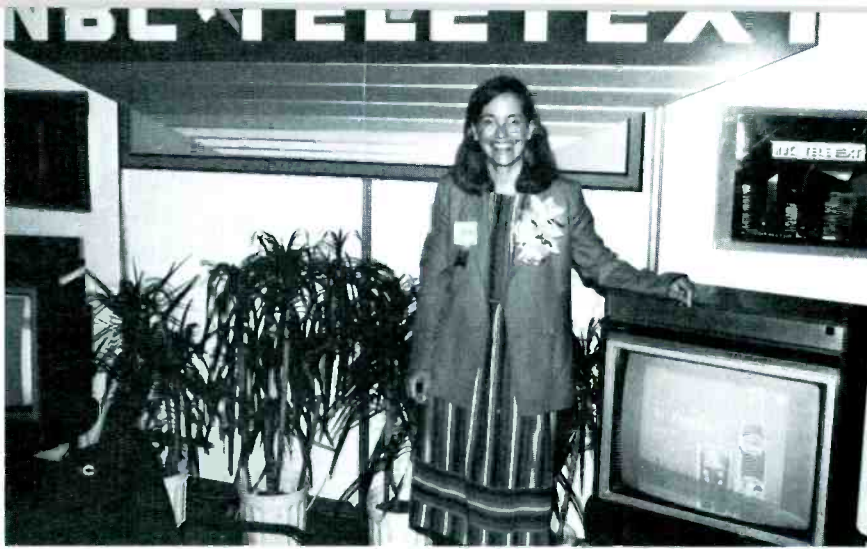
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Photo: Harmon Shragge, Jr.



Barbara Watson, general manager, NBC Teletext, demonstrates the network's teletext services at Videotex '83/New York.

### Videotex-'83

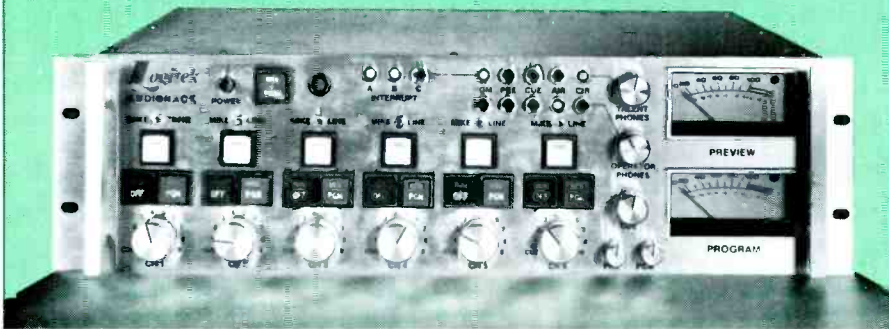
At Videotex-'83, held in New York in June, NBC Teletext had an exhibit that featured several monitors displaying the graphics of its service. The 50-page magazine, randomly accessed by a hand-held keypad, offers regularly updated news and features. NBC was represented on the speakers' program as well, with an illustrated presentation by NBC Teletext's general manager, Barbara Watson. CBS Teletext had neither exhibit nor speaker at the conference.

One of the most impressive demonstrations of teletext capability at the convention was the presentation given by Videographic Systems of America in a high tech theater module. There VSA's vice president of marketing, Gregory Harper, made effective use of NABTS graphic animation to illustrate the design of VSA's system. VSA offers teletext equipment and software to broadcasters and cablecasters with such features as automatic insertion and deletion of time-dependent pages, scheduling of advertisements and automatic acquisition of wire copy. VSA's diffuser, multiplexer inserter and databridge may be purchased as separate pieces or as one integrated unit. VSA now markets the Frame Creation System through an OEM arrangement with American Bell. NBC, CBS and WBTV (the CBS affiliate in Charlotte, NC) are currently using equipment from VSA. (ABC has shown little interest in teletext, except for its use of Line 21 of the VBI for closed captioning.)

Sony, Panasonic and Norpak each had separate exhibit rooms at Videotex-'83 and displayed luxury model teletext decoders. Sony's unit works with its Profeel Trinitron monitor with a multipage memory, captioning mode and ghost canceler system. The Panasonic decoder comes with variable character sizes and YS and YM terminals, used for greater legibility of captions. Norpak was showing its Teletext Video Decoder (TVD) as a rack-mounted unit with a wireless keypad.

Broadcasters have been curious, but less than enthusiastic about teletext. Right now it does not seem to be worth the cost. Some industry members are using the more economical World System teletext,

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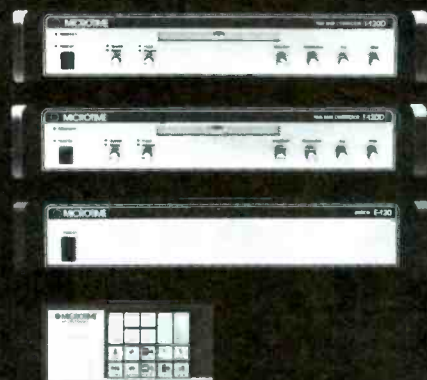
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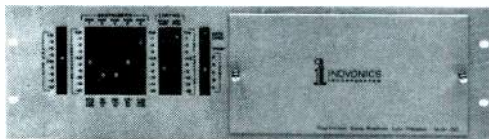
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based on technology used in the United Kingdom (mosaic). One such company, Taft Broadcasting, with its Electra service, broadcasts from its flagship station, WKRC in Cincinnati (a VHF ABC affiliate). The service uses a World System decoder by Zenith, priced at \$299. According to Terry Connelly, Taft's vice president for TV news: "...The exorbitant cost of the North American system will keep it from becoming the US standard...By getting our system out to the people for use, we hope to make it the teletext defacto standard."

Peter Winter, former executive editor of *Keyfax National Teletext*, another user of the World System, has been quoted as saying, "What has slowed the growth of teletext in the United States is the myth that enhanced graphics capability is vital to getting information or an advertising message across a TV screen." *Keyfax*, based in Chicago, is transmitted nationally on the VBI of WTBS-Atlanta by Satellite Syndicated Systems.

In Salt Lake City, KSL-TV has also made a deal with Zenith on decoders for its World System teletext service. KIRO-TV in Seattle has tested World System and explored NABTS. A decision on which standard to implement is pending.

Zenith, based in Chicago, has a 5-year agreement with the United Kingdom to produce receiving equipment for World System teletext. Only Zenith color TV sets with the "rediplug" for teletext (models since 1981) can use the new decoders, however. Magnavox and General Electric\* are said to be working on teletext decoders for their sets, as well.

*Time Teletext*, in a category unto itself with its full-channel cable teletext, attracted crowds at Videotex-83. On view were the colorful and ingenious electronic publications being transmitted by satellite to test homes in Orlando, FL, and San Diego. Service to cable subscribers to be accessed with decoders developed for *Time* by Panasonic will begin late in 1984. This intelligent terminal will be capable of scrolling headlines, programming sequences of frames and generating video game sounds.

By 1985, the price of NABTS decoders is expected to be a more comfortable \$250. If there is going to be a boom in teletext, it may start then.

\*The General Electric teletext set was privately demonstrated at the CES Convention in June 1983 in Chicago.







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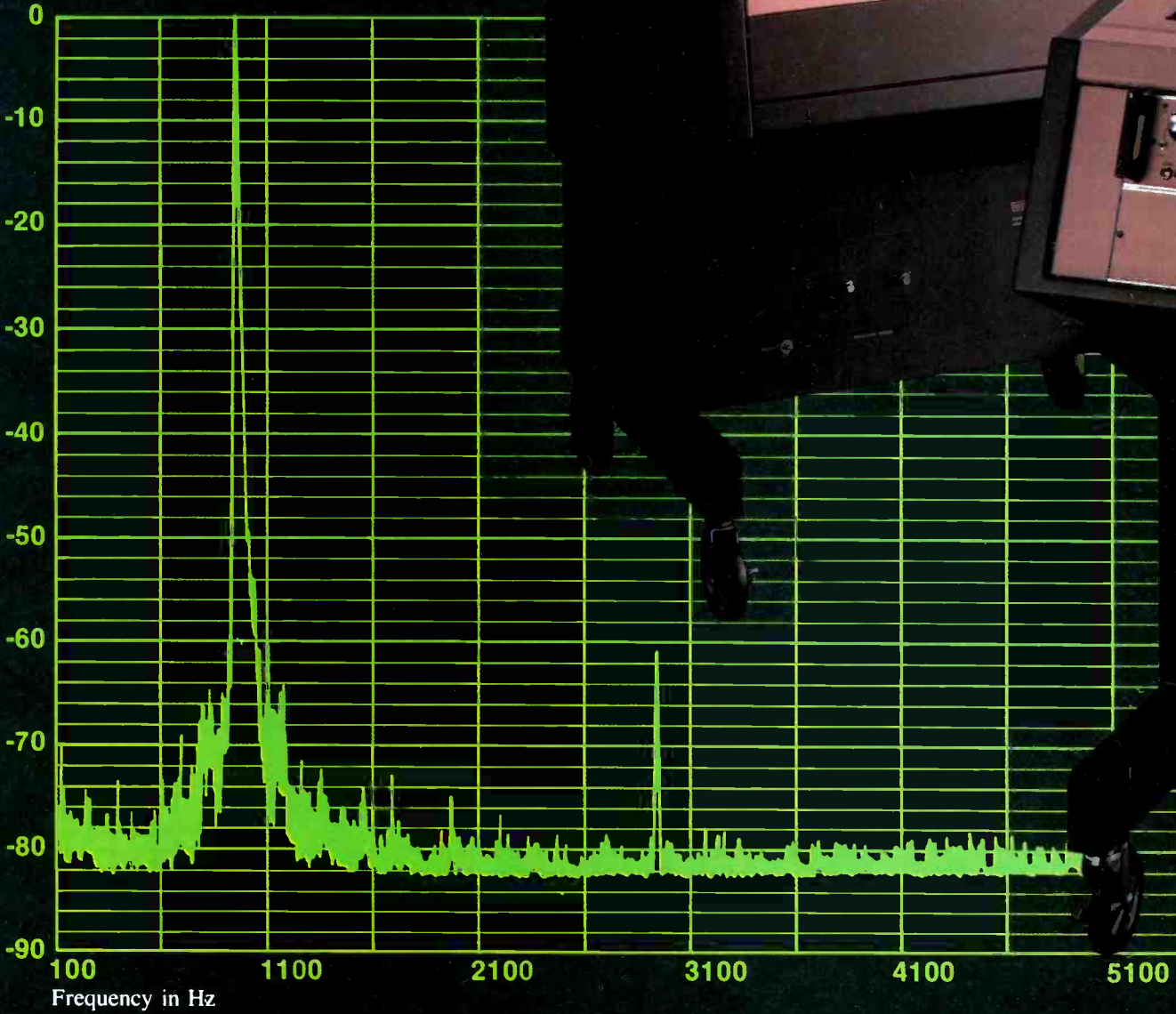
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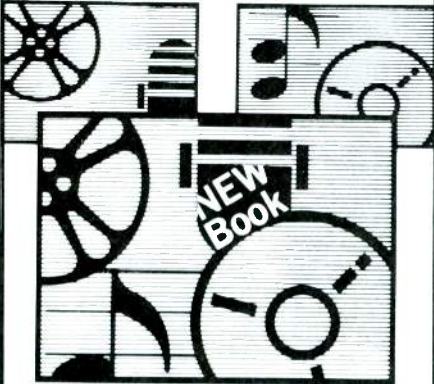
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## calendar

Sept. 19-23

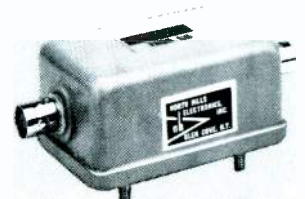
The *Third Annual Midwest/Carolina Video Show* will be held in various locations. On Sept. 19, it will be at the Carolina Inn in Columbia, SC; on Sept. 21, at the Holiday Inn Woodlawn in Charlotte, SC; and on Sept. 23, at the Howard Johnsons in Raleigh, NC. For more information, contact Elijah Midkiff at 1-804-464-6256.

Sept. 26-28

The *1983 International Electrical, Electronics Conference and Exposition* will be held at Exhibition Place in Toronto. The conference, whose theme is "Canada's Global Link...Technology and Communications," will feature more than 100 technical papers. For more information, contact Southex Exhibitions, 1450 Don Mills Road, Don Mills, Ontario M3B 2X7 Canada; 1-416-445-6641.

Sept. 26-30

The *14th Annual Video Expo New York* will be held at the New York



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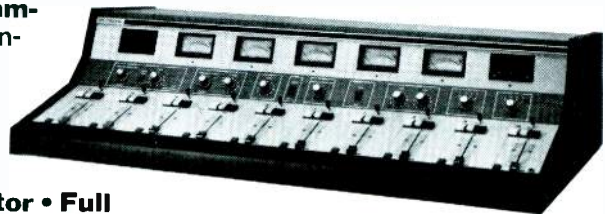
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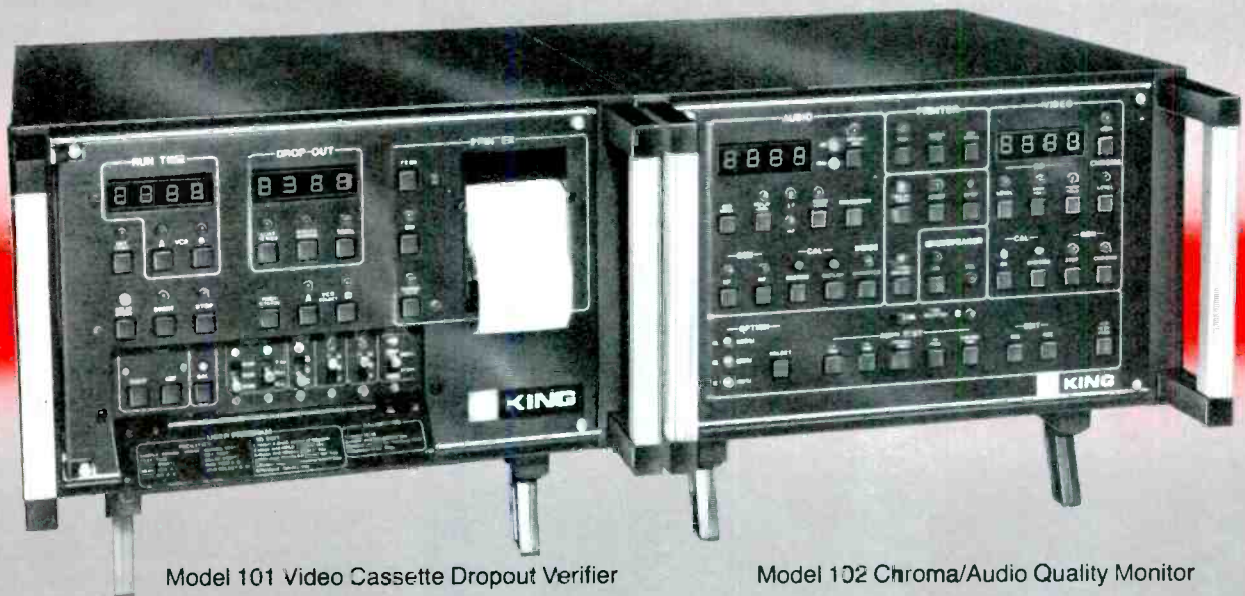
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#### Sept. 26-Oct. 2

Sonimag will take place in Barcelona, Spain. Topics covered include consumer electronics, communications (radio and TV broadcasting) and other related fields. The show occupies 54,000 square yards in which 400 exhibitors will show their products. It traditionally features several conferences and symposia on broadcasting, audio, video and film.

For more information, contact Sonimag, Plaza de España, Barcelona, Spain; (3) 223-3101.

#### Sept. 29-30

A seminar, *The Future of Satellites in Radio Broadcasting*, will be presented at the New Orleans Hilton. This program will examine how the radio industry can use satellite communications to increase profits. For more information, contact the seminar coordinator at 1-301-986-0666.

#### October-January

Synergistic Audio Concepts (Syn-

Aud-Con) will hold 2-day audio engineering seminars on these dates, at these locations: Oct. 6-7, New York; Oct. 18-19, Washington; Oct. 26-27, Atlanta; Nov. 7-8, Orlando, FL; Nov. 15-16, Dallas; Nov. 29-30, Houston; Dec. 13-14, Las Vegas, NV; and Jan. 18-19, 1984, Anaheim, CA. For more information, contact Synergistic Audio Concepts, P.O. Box 669, San Juan Capistrano, CA 92693; 1-714-496-9599.

#### Oct. 1

The NAB's department of minority and special services will conduct an *East Coast Hispanics in Telecommunications Symposium* at the New York Hilton Hotel. The conference, the last of three, will focus on Hispanic employment, ownership and programming opportunities. For more information, contact Dwight M. Ellis, NAB vice president, Minority and Special Services, at 1-202-293-3534 or 1-202-293-3584, or write to NAB Hispanic Symposium, 1771 N Street, NW, Washington, DC 20036.

#### Oct. 2-4

The International Trade Centre in Toronto will be the site of the *Broadcast Equipment Trade Show and Conference*. For more information, contact William R. Onn, exhibits manager, Central Canada Broadcast Engineers, CKEY Radio, 1 Yonge St., Toronto, Ontario M5E 1G1, Canada; 1-416-863-9985.

#### Oct. 2-5

The New Orleans Hilton will be the site of the *National Radio Broadcasters Association 1983 Convention and Exposition*. On Oct. 3, Walter Cronkite will receive the NRBA Golden Radio Award. Sessions and discussions will focus on management, sales, engineering, promotion and programming issues. For more information, contact NRBA, 1705 De Sales St., NW, Suite 500, Washington, DC 20036; 1-202-466-2030.

#### Oct. 3-5

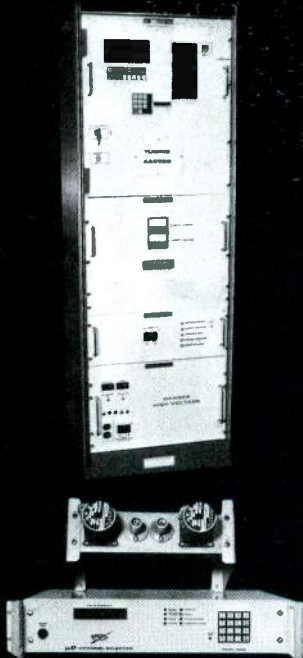
*Videotex: Implications for Marketing III* will be held at the Hyatt Regency Hotel in Columbus, OH. More than 20 speakers from across the country will discuss their experiences with videotex and its potential. For more information, contact W. Wayne Talarzyk, conference chairman, Ohio State University, 1775 College Road, Columbus, OH 43220; 1-614-422-5725.

#### Oct. 4-6

*LPTV-83 East*, to be held at the Sheraton Washington Hotel in Washington, DC, will feature more than 100 exhibits. Topics such as engineering, station management,

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construction, equipment selection, financing, station profiles and regulatory issues will be covered in the more than 50 sessions. For more information, write to LPTV East, Registration Department, Conference Management Corporation, 17 Washington St., P.O. Box 4990, Norwalk, CT 06856.

#### Oct. 8-12

The New York Hilton Hotel will be the site of the 74th AES Convention. The convention will include 80 technical papers from international authors, 10 workshops, compact disc demonstrations, sessions on motion picture and video sound, and a seminar on business operations of modern recording studios. An entire day, Oct. 8, will be devoted to sessions on digital technology. The AES technical exhibits will open on Oct. 9. For more information, contact the AES, 60 E. 42nd St., New York, NY 10165; 1-212-661-8528.

#### Oct. 10-14

Atlantic City, NJ, will be the site of FOC/LAN 83, the Fiber Optics and Local Area Network Exposition. The show will feature a conference program, exhibition, and courses and tutorials. For more information, call Paul Fitzgerald, exposition marketing

manager, at 1-617-739-2022.

#### Oct. 18-19

The Sixth Annual Newport Conference on Fiber-Optic Markets will be held at the Sheraton-Islander Inn, Newport, RI. It will include overviews of world markets for fiber-optic systems and the impact of such technology on microwave-transmission, copper-wire and coaxial-cable systems. For more information, contact the conference coordinator, Kessler Marketing Intelligence, 22 Farewell St., Newport, RI 02840; 1-401-849-6771.

#### Oct. 18-21

The Washington Hilton Hotel in Washington, DC, will be the site of the Eighth Annual Conference and Exposition of the Public Service Satellite Consortium and Services by Satellite (SatServ). Sessions will address such topics as: "The Business Case for Satellite Communications," "Teleconferencing," and "Emerging Technologies." For more information, contact Polly Rash, marketing director, PSSC and SatServ, 1660 L St., NW, Suite 907, Washington, DC 20036; 1-202-331-1154 or 1-202-331-1960.

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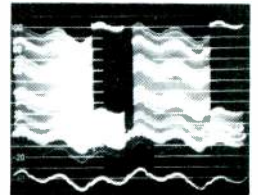
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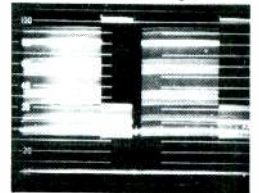
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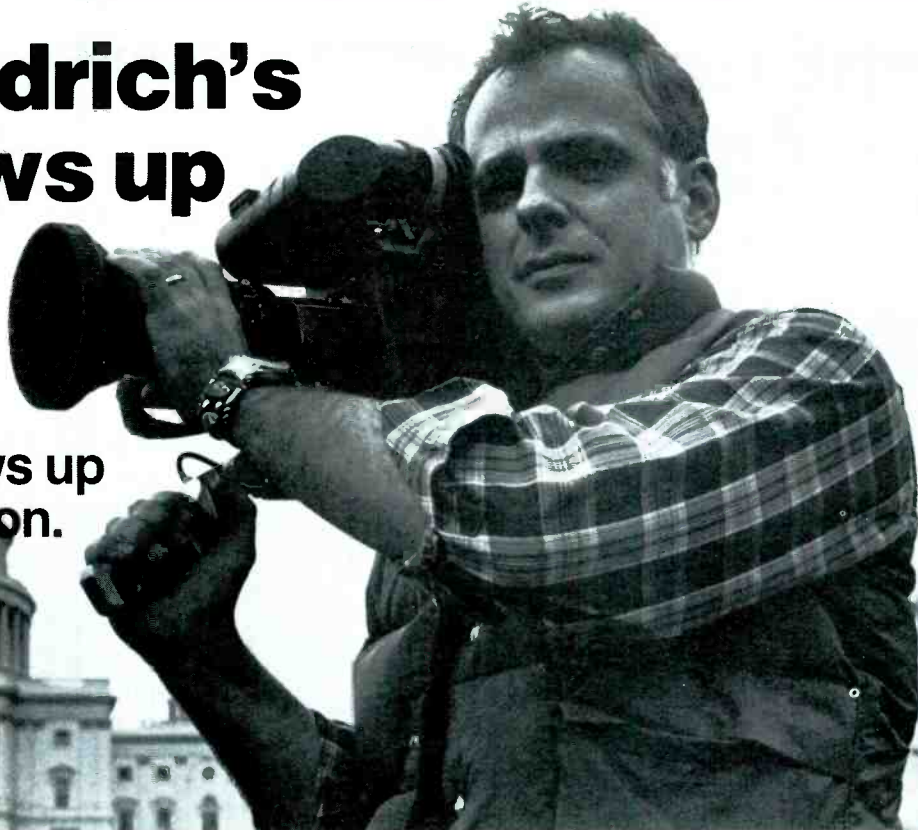
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The White House News Photographers Association named him "newsfilm photographer of the year" for 1982. (They did the same for 1981 and 1979.) And he received first place awards for spot and feature news in 1982 from the National Press Photographers Association.

Obviously, George Fridrich has his choice of lenses. For years, his choice has been Fujinon, exclusively. Here, in his words, are his reasons:

"Fujinon lenses deliver great performance and reliability. I use two of them, I abuse them and they hold up. They get knocked around and still perform often under the worst conditions. The fact is, you just can't go wrong with any Fujinon lens. On top of that, Fujinon's support and service are fantastic."

George's basic lens is a Fujinon 14X zoom with built-in 2X extender. When he can't get in close, the lens will and because its maximum F1.7 aperture stays flatter, farther, George can still get the brighter, higher contrast picture quality he demands. His second lens is Fujinon's exclusive 3.5x6.5 wide angle zoom. With an MOD under one foot, no assignment is ever missed because of tight quarters.

Incidentally, although George didn't receive the White House News Photographers' award for 1980, Pete Havel (WJLA, Washington) did. He won with Fujinon, too. It's not a coincidence. According to Pete, "90% of the ENG work in D.C. is Fujinon."

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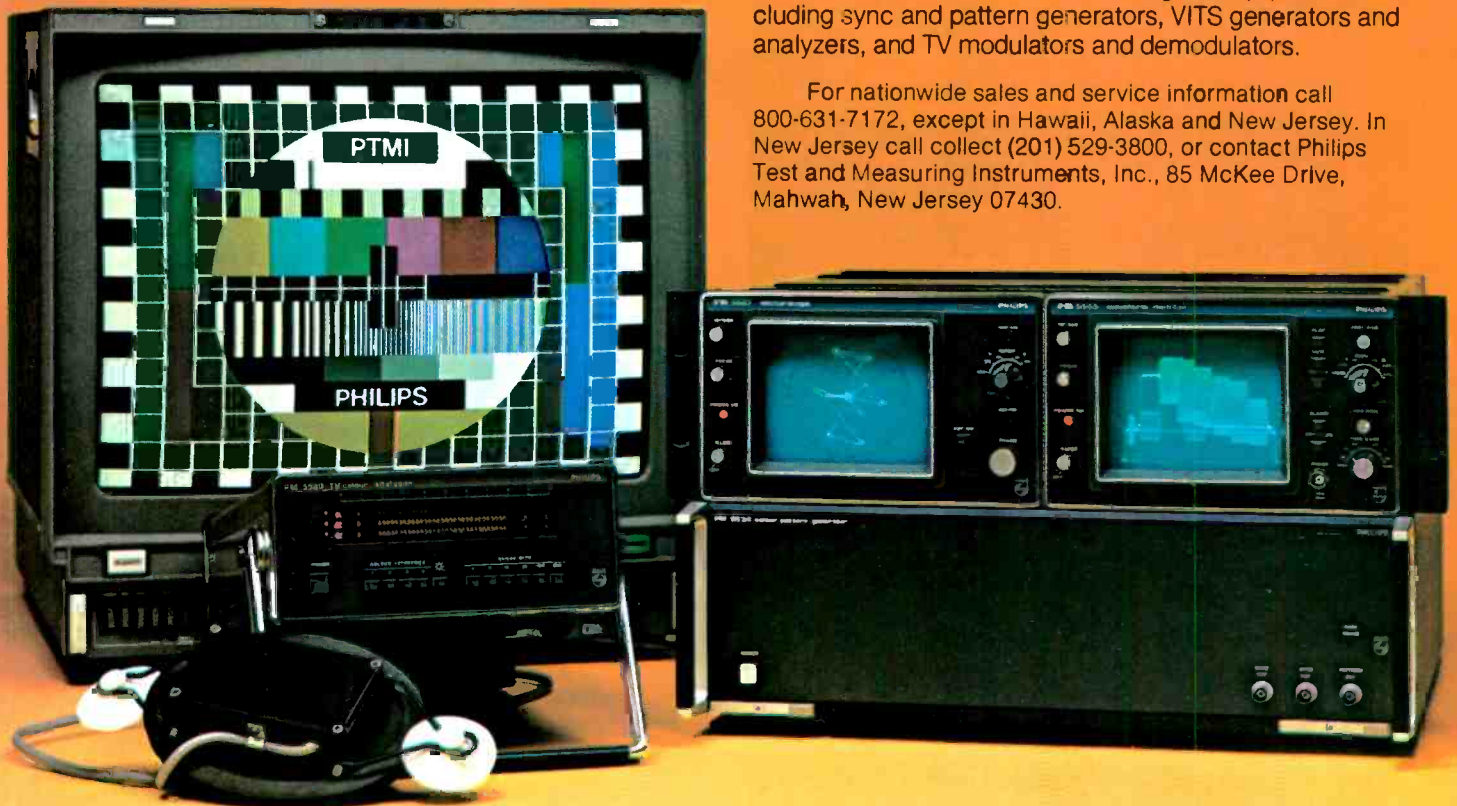
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## SMPTE

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### 1/4-inch Working Group to meet

The SMPTE has canvassed its membership and determined that a Working Group will be formed for standardizing a 1/4-inch video recording format. Demonstrations of two 1/4-inch systems were given at NAB-'83/Las Vegas by Bosch-Fernseh and Hitachi Denshi. These systems will be the initial focus of the group's activities toward forming a single standard.

### Digital video interface standard finalized

The SMPTE Working Group on Digital Video Standards recently completed its work on recommended video signals with the 525-line standard. This document shortly will ap-

pear in the *SMPTE Journal*. Its contents closely match those of a complementary EBU document concerning a 625-line digital interface. The documents together describe the practical implementation of CCIR Recommendation 601 and form the basis of further CCIR documentary inputs for the 1983 interim meetings. The two groups are now beginning the preparation of an all-serial interface standard for use where longer distances or large switching matrices are found.

### Component analog group establishes characteristics

The Working Group on Component Analog Video Standards has agreed on principal characteristics of the signal to be standardized for interconnection of TV equipment in analog component form at the studio level. The group decided that tentatively (pending public comment) the standard being developed will be based on these characteristics:

- Serial transmission over a signal cable using time division multiplexing techniques will be used.

The components will be time-compressed in a 2:1 ratio for luminance and 4:1 for each of two color difference signals.

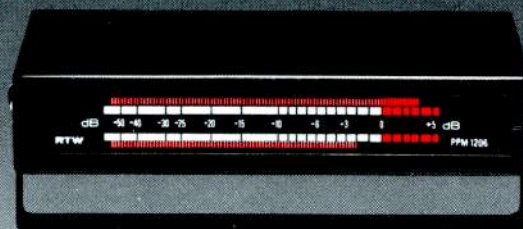
- The component axes used will be Y (luminance), R-Y and B-Y.
- The components will be normalized to equal amplitude ranges.
- The baseband bandwidths of the channels will be 5.5MHz for luminance (Y) and 2.75MHz for each color difference signal (R-Y and B-Y).
- The signal will be formulated for maximum compatibility with CCIR Recommendation 601 and CCIR Report 629, relating to the digital video signal standard.

## NRBA

National Radio Broadcasters' Association  
1705 De Sales Street, NW  
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1-202-466-2030

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operating relief and more equality to daytime radio stations has been introduced in the House and the Senate. A recent poll of the NRBA board of directors indicates clear support for the bills that would, among other things, give daytime stations authority to operate two hours before sunrise and two hours after sunset.

## SBCE

Society of Broadcast & Communications Engineers

P.O. Box 50844  
Indianapolis, IN 46250  
1-317-842-0836

### Convention to be held on Sept. 23

The 11th Annual Central New York Regional Convention will be held at the Syracuse Sheraton Centre in Syracuse, NY.

The hotel's new convention center will be used this year, with all functions accommodated on one floor. Technical presentations will be held from 9 a.m.-5 p.m. More than 60 exhibits representing at least 85 manufacturers will be featured. Exhibits will open at 10 a.m. and close at 6 p.m.



National Association of Broadcasters

1771 N Street, NW  
Washington, DC 20036  
1-202-293-3570

### Section 315/fairness doctrine should be repealed

The NAB said it thinks that the fairness doctrine and Communication Act's equal time provisions "are equally impermissible burdens of the First Amendment rights of broadcasters and cablecasters alike."

In a Notice of Proposed Rulemaking issued last May seeking to ease cable's burden of compliance with the fairness doctrine and equal time provisions, the FCC said that application of the two policies was more justified for broadcasters than for cable operators.

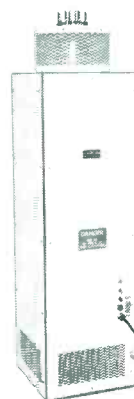
NAB said it supports the commission's efforts to repeal Section 315 and the fairness doctrine, but that repeal should apply to all electronic media.

### SCA teleconference answers questions

On July 20, 853 radio engineers and managers gathered in 21 cities to take part in SCA Day USA. The broadcast industry's first nationwide teleconference was hosted by the

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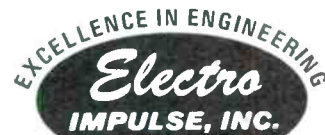


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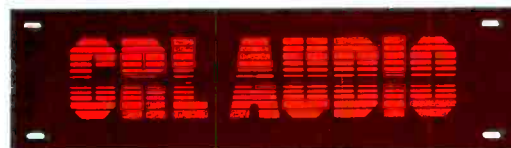
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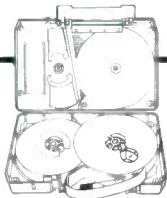


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Circle (171) on Reply

NAB radio department to answer questions regarding Subsidiary Communications Authorization (SCA) services available to FM and AM broadcast facilities. Questions from the receiving sites, called into the origination point in Washington, were fielded by members of four panels.

SCA services have been available for FM broadcasters for a number of years. However, regulatory changes by the FCC on April 8 of this year eased restrictions on SCA activity, making the service a possible source of income for broadcasters. Each standard FM channel can support two SCA subcarriers. Broadcasters who presently provide certain public service activities such as reading services for the blind must continue to do so on one subcarrier. However, they can use their second subcarrier for more lucrative purposes, such as voice, music and digital data signal transmissions. Utility load management through datastreams on an SCA signal interested many participants.


The SCA Day program was broken into four sessions, followed on a local level by a final question/answer period. Session topics included:

- "What Has the FCC Done?", an explanation of how the FCC has changed the rules regarding SCA operation;

- "A Basic Subcarrier Engineering Course," which answered questions and dispelled myths concerning SCA operation and normal broadcast operation;
- "Opportunities," which identified possible uses for SCA signals, financial possibilities and who might be interested in leasing a subcarrier; and
- "Ask the Experts," which recapped the first three panels and handled final questions.

A topic that came up during the panel sessions was AM stereo and the use of an AM subcarrier, created by AM carrier phase shift. The fact that AM subcarrier operation probably will be limited to low bit-rate data, such as used in utility load management, was disclosed. Although in theory a mono AM carrier should be able to support a datastream into the hundreds of bits/second or higher, practical applications are expected to show that a bit rate of less than 100 is more likely to work. It is questionable whether an AM subcarrier can work if stereo is also being transmitted.

Another topic, the radio common carrier, generated much interest. For paging services, such as the one originally proposed by NPR, the connection to the phone company and the clientele served is involved in whether




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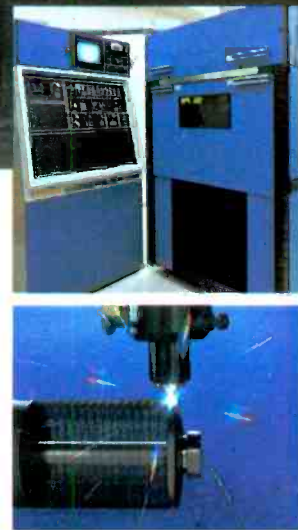
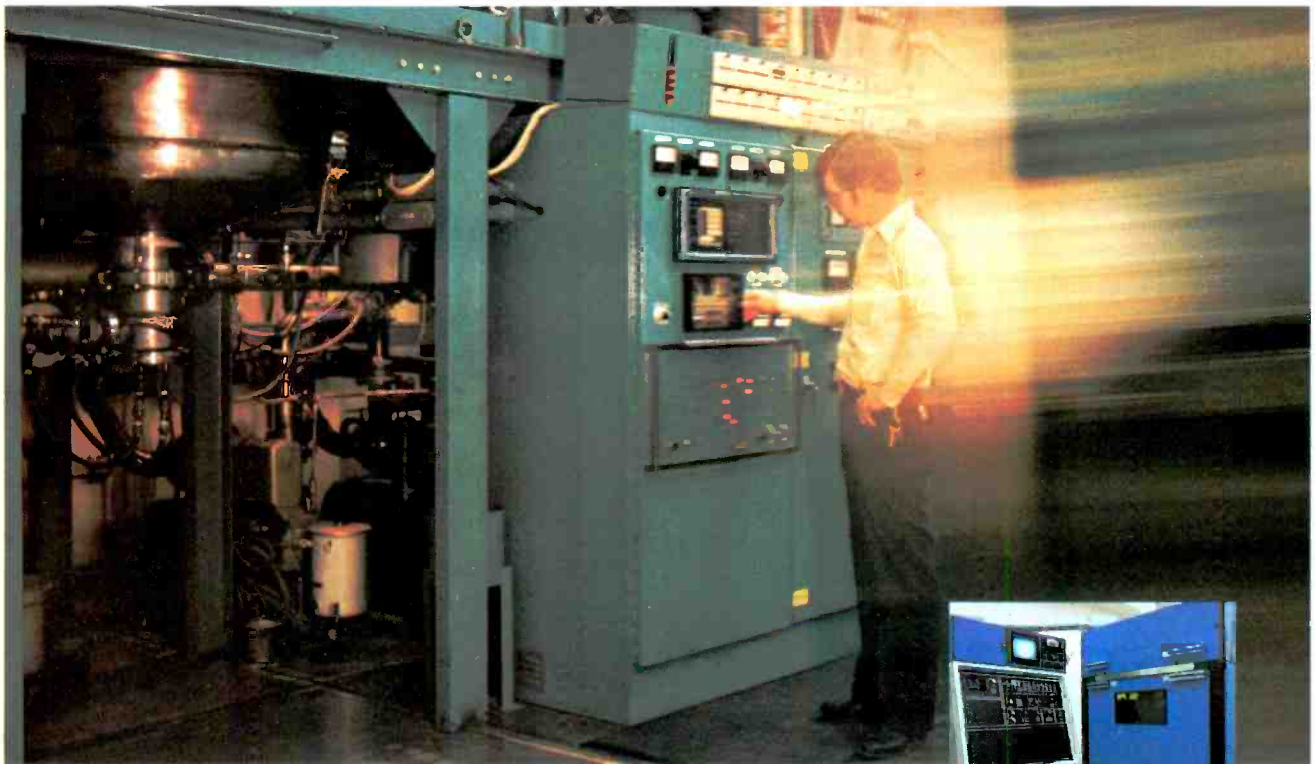
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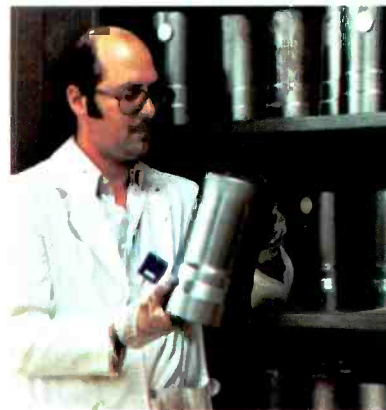
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the broadcaster is stepping into the common carrier market. The NAB has asked the commission to re-regulate that area as well, by changing or dropping remaining restrictions for SCA paging services.

The teleconference originated from BizNet and the US Chamber of Commerce. Receiving sites were coordinated through the Holiday Inn chain and the Hi Net Teleconferencing service. Assisting to make the teleconference possible were Emergency Alert Receiver (EAR), New York; David Green and Associates, Leesburg, VA; Johnson Electronics, Casselberry, FL; McGraw Edison, Carson, CA;

McMartin Industries, Omaha, NE; and TFT, Santa Clara, CA.

Each participant's packet of information contained a critique form for information to be used in planning future teleconferences on NAB subjects. To date the responses have been in favor of such information dissemination programs.

For additional information regarding SCA use, the NAB offers four phone numbers. For SCA questions on engineering, call 1-202-293-3557; for legal information, 1-202-293-3560; for SCA opportunities, 1-202-293-5109; and for general SCA information, 1-202-293-4955.

### New services should retain land mobile reserve spectrum

The NAB supports the proposed air-to-ground telephone system and a personal radio service, but believes they should be accommodated without gutting what remains of the land mobile reserve spectrum. The NAB said it foresees the telephone system primarily being used by business travelers rather than the general public and suggested that it operate above

## NAB briefs

Speaking before the Kentucky Broadcasters Association, Edward O. Fritts, NAB president, recently called on the FCC to immediately initiate a rulemaking to deregulate television.

The NAB Radio and Television Board of Directors have unanimously supported federal legislation to deregulate the broadcast industry at their semiannual meeting.

Belva B. Brissett has been named NAB's vice president, regulatory affairs, government relations department.

The NAB has reiterated its objections to an FCC proposal that would severely limit, if not preclude, televised broadcasts of live news events. It said that electronic newsgathering operations would be severely impaired by minimum path lengths, antenna system requirements, frequency coordination and related costs.

The FCC should deny Turner Broadcasting System's petition for expedited consideration of its request for a rulemaking to repeal the cable television "must carry" rules, the NAB said in an opposition filed May 20.

The NAB agrees with an FCC proposal to expedite station call letter assignments, but opposes complete elimination of the rules. It said the commission's regulatory function should not be given to local authorities. NAB said the FCC has a statutory obligation to ensure an efficient broadcast marketplace that depends heavily on rating services relying on station identification by means of call letters.

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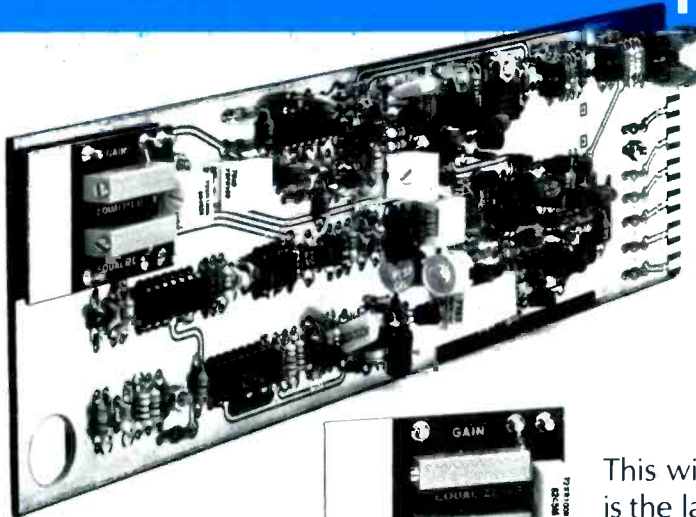
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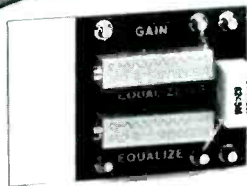


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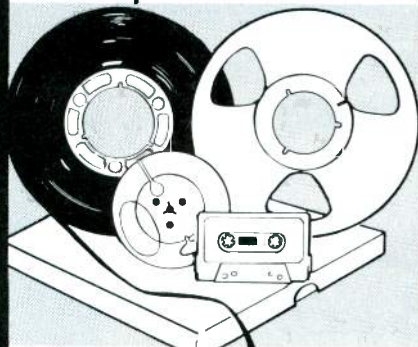
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1000MHz—requiring a slightly greater initial capital investment with resulting higher toll charges. However, the association said that the users would be willing to pay the price for the superior service.

NAB said a personal radio service should be in a small fraction of the 8MHz now proposed and should not duplicate other services such as cellular radio. It said the service should be closer to the original philosophy of CB—to provide a local mobile-to-mobile and mobile-to-base private radio service akin to a land mobile system, but available to anyone.

## No sharing of 900MHz unless definite need shown

The FCC should not allocate spectrum in the 900MHz range for government fixed services unless a compelling need is shown, according to the NAB. The commission has proposed government sharing of 932-935MHz and 943-946MHz with the hundreds of aural broadcast studio-to-transmitter links and intercity relay systems (STL stations).

The NAB said that no convincing proof has been offered to show that the needs of government and non-government fixed services can be met only by displacing existing users.

Broadcasters use STL stations to relay on-the-air programming, to control telemetry, for remote metering and for subsidiary communications from the studio location to the actual broadcasting site. NAB said sharing could cause interference to home receivers.

## ACT proposal called "Big Brother" concept

Edward O. Fritts, NAB president, has characterized a petition filed at the FCC by Action for Children's Television as a "1984 Orwellian prediction come true."

The petition asked the FCC to require TV stations and cable systems to transmit an electronic signal at the beginning and end of all advertising on children's programs. This would enable viewers to purchase equipment that could black out any commercial preceded by the electronic signal. Fritts said that virtually all TV programs, including children's programs, are made possible by advertising revenues.

He said: "Congress determined some 50 years ago that we would have a commercial system of broadcasting in this country. Most of the other countries of the world opted for a government system of broadcasting with all its inherent restraints on the free flow of information.

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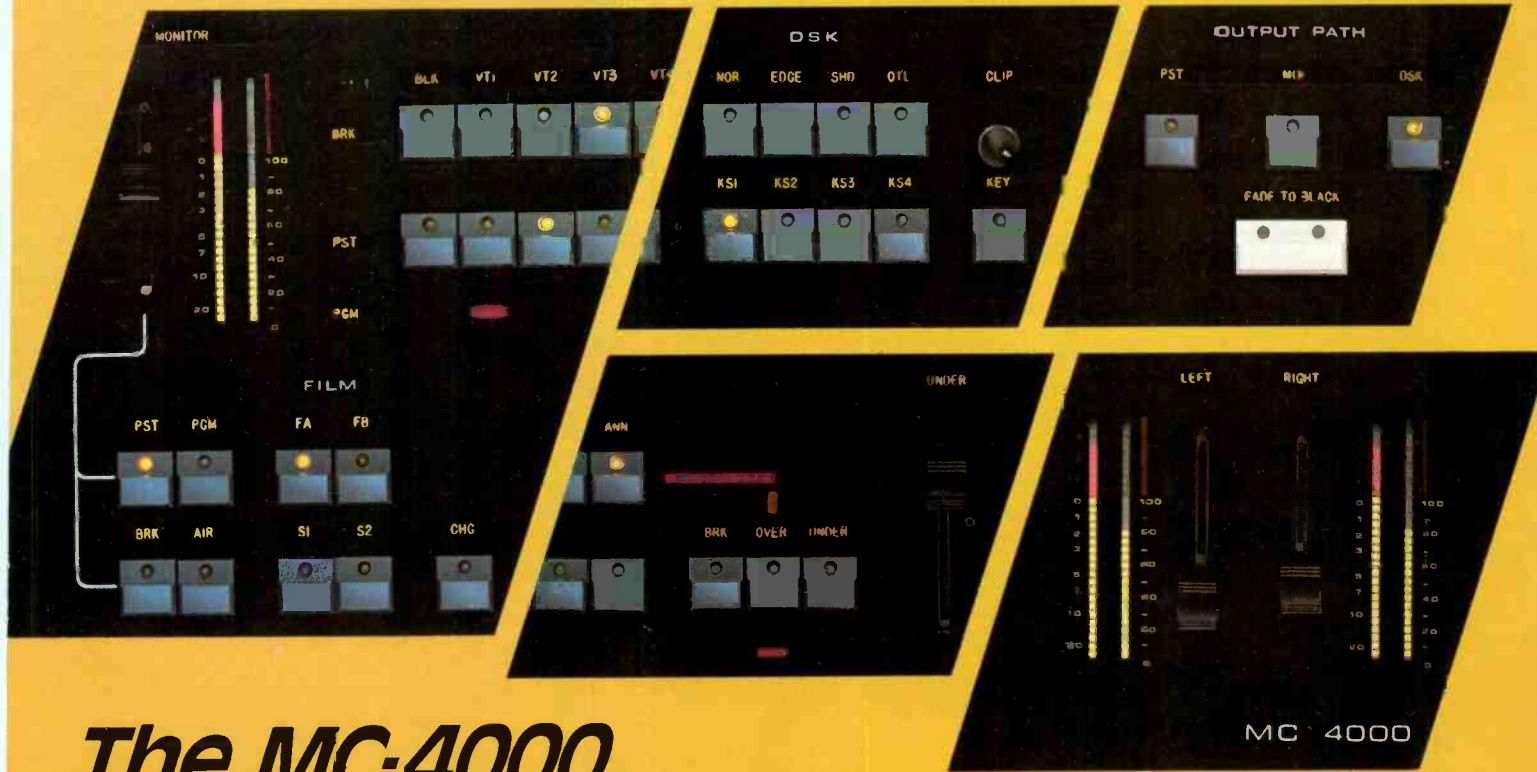
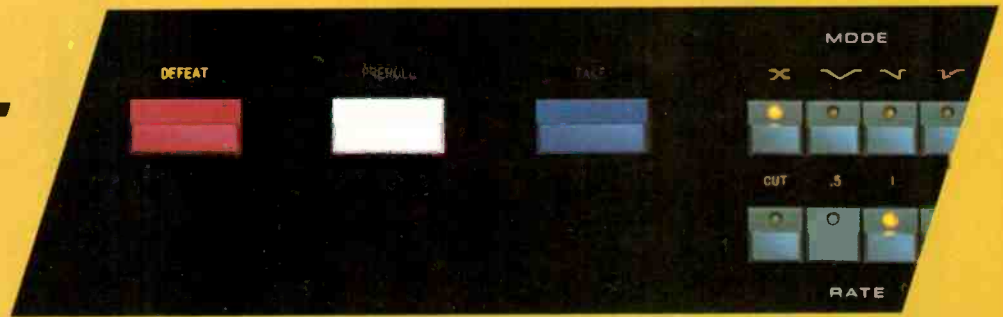
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"Mandating the transmission of a signal allowing the public to black out commercials would be tantamount to undermining the whole concept of a commercial system of broadcasting.

"This petition has broad ramifications which could ultimately lead to a governmental rather than a commercial system of broadcasting."

### Advisory group should consider FCC technical deregulation

The NAB has urged the FCC to establish a joint government-industry advisory group to review and evaluate present technical regulations. The commission has proposed a wide-ranging review of technical standards, to eliminate or replace those no longer useful or overly burdensome.

Responding to the FCC's notice, NAB said the agency "must continue to play a major role in areas of technical regulation where the marketplace on its own cannot produce desired results such as interference-free and universally available broadcast communications." It said the hasty deletion of technical regulations that control interference and ensure compatibility might invite marketplace and technical chaos, hinder competition and delay the introduction of new services.

### Justice Department approves release of financial data

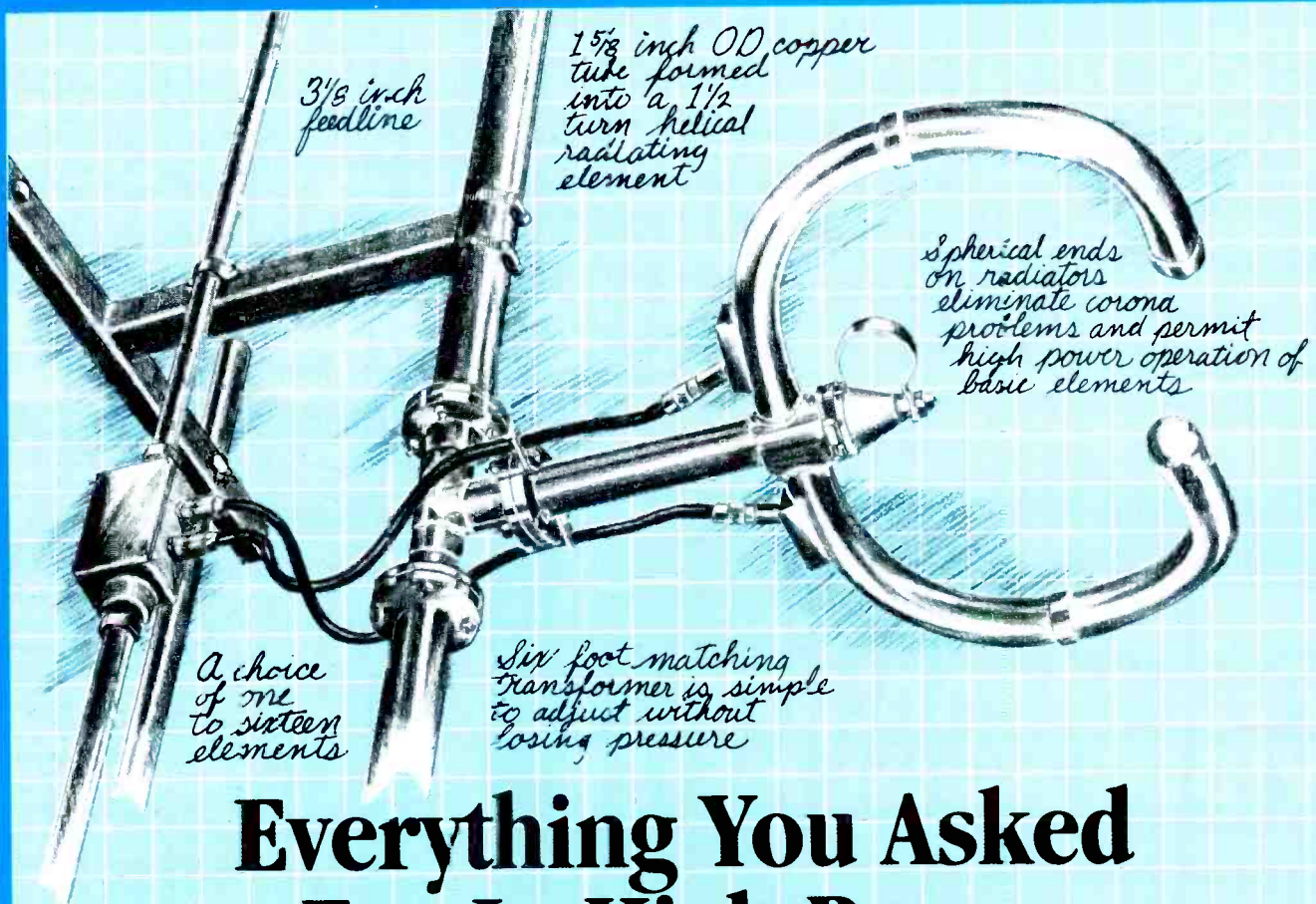
The NAB has won Justice Department approval to publish commercial TV station revenue and expense data by market. After the FCC dropped a similar program last year, NAB sought the department's opinion as to the conformance of NAB's program to gather and distribute market data with the Antitrust Division's enforcement policies.

The information reflects the preceding year's total time sales, revenues, expenses, income and barter transaction figures for TV stations aggregated on a market-by-market basis. Participation is voluntary and results are made available at no cost to participating stations, whether or not they are NAB members. Non-members and the general public will be charged a nominal fee.

### "Must carry" rules supported

The NAB has joined two of its member TV stations in saying that the FCC's "must carry" rules are valid under the First and Fifth Amendments. They have asked the US Court of Appeals for the District of Columbia to uphold the commission's decision requiring Quincy Cable TV to comply.

The Washington state cable operator was turned down by the FCC



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for an exemption from its rules, and, when the company stopped carrying Spokane TV stations on its own, the commission fined it \$5000. Quincy then asked the appellate court to declare the rules unconstitutional.

NAB, KREM-TV and KXLY-TV disputed Quincy's argument that it has a basic First Amendment right to retransmit broadcast signals. The brief said that legal precedents make clear that reasonable regulation of cable carriage of these signals does not violate free speech guarantees, and that the "must carry" rules play a key role in preserving local TV ser-

vice. NAB also said that Quincy's interpretation runs against the copyright law governing secondary transmission of broadcast signals by cable systems by creating a compulsory license.

### FCC asked to expand FM subcarrier deregulation

The NAB has asked the FCC to reconsider that part of its recent order on FM subcarrier (SCA) use concerning common carrier regulation. It said the commission should not impose common carrier regulation on certain subcarrier uses and should prohibit

state and local jurisdictions from doing so.

In its petition, NAB said that eliminating such regulation will permit enhanced, efficient use of the spectrum. Otherwise, the development of numerous potential SCA uses will be stifled. NAB said that the marketplace and public demand should determine which subcarrier services are developed—not artificial regulatory distinctions.

### Fritts urges policy favoring daytime-only stations

Commenting on the FCC's discussion regarding preferences for daytime-only AM radio stations. Edward O. Fritts, NAB president, said, "At yesterday's meeting of the commission, there was a recognition of the impact of new FM allocations on AM daytime-only stations. A suggestion was made that preferences be given to daytime-only stations seeking new FM facilities.

"This proposal is one that NAB has submitted to the commission on several occasions. I am asking the FCC today to issue a policy statement at the earliest possible time affording a preference to daytime-only AM stations seeking an FM facility in their community of license."

### FCC should reinstate local service policies

The FCC has been asked to modify and reinstate three policies ensuring that broadcasters provide local service. The NAB said the elimination of the suburban community policy, the Berwick doctrine and the de facto reallocation policy is in basic conflict with a provision of the Communications Act.

In its filing, the association also objected to the commission's proposed redefinition of "community" as an inadequate and unworkable substitute for the policies.

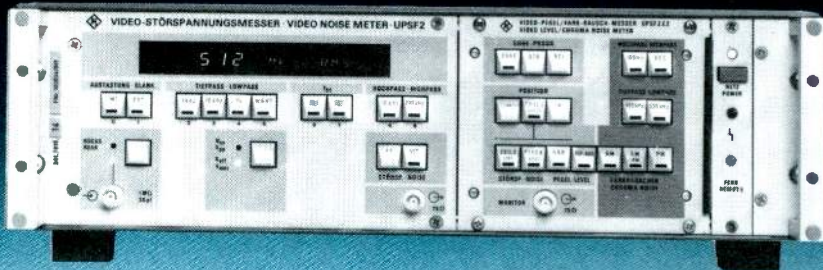
### FCC decisions supported

In response to the FCC's action on Docket 80-90, which provides for additional commercial FM stations, NAB President Edward O. Fritts said, "We are heartened by the commission's decision to maintain existing mileage separations among classes of existing stations. By taking this action, the Fowler commission has reduced the likelihood of interference that might have occurred had they adopted everything that was proposed by a former commission in 1980.

"Although we have not yet had an opportunity to examine the full text of the commission's decision, it appears that the commission has taken into

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consideration much of the engineering material submitted over the past three years by NAB and the NAB Task Force on Radio Allocations through the FCC's Advisory Committee on Radio Broadcasting. These studies had cautioned the FCC against adoption of the entire package of radio allocations schemes once suggested in the Docket 80-90 proposal.

"We are particularly encouraged by the commission's proposal to give preferences to daytime-only stations seeking new FM facilities. This is one of the goals NAB has set for daytime-only stations and we are pleased that it has been given favorable reception by the commissioners themselves."

### Booklet published by NAB

The NAB has published a 1-source guide containing basic facts and figures about radio, titled *Radio Is*. The 48-page booklet covers demographics, listeners, marketing, trends and history.

The booklet may be used as a tool for stations when selling potential clients on radio's versatility and impact, and as a source when speaking to community groups or schools.

The publication is available to members for \$1 and to non-members for \$3 (bulk prices on request). For information call NAB Services at 1-800-368-5644.

### ATSC holds organizational meeting

The Advanced TV Systems Committee (ATSC) held its first open meeting in May, concentrating on acquainting potential members and the public with the organization's purpose and proposed structure.

The committee was formed by members of the Joint Committee for Inter-Society Coordination (JCIC) to coordinate the development of voluntary national standards for advanced TV systems. The systems were described as ranging from improvements in the existing NTSC system to the development of a new system of high definition television. The JCIC is composed of the NAB, National Cable Television Association (NCTA), Electronic Industries Association (EIA), Institute of Electrical and Electronics Engineers (IEEE) and Society of Motion Picture and Television Engineers (SMPTE).

Dr. Richard Green, former director of development, CBS, has been appointed ATSC executive director. Green has been involved in TV broadcasting and related activities for 25 years.

The ATSC is seeking members. Application forms may be obtained from the Secretariat of the ATSC c/o NAB.)



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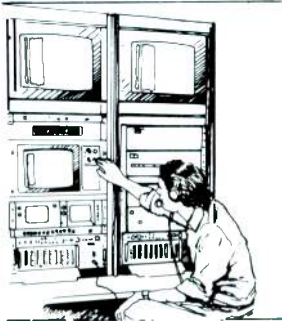
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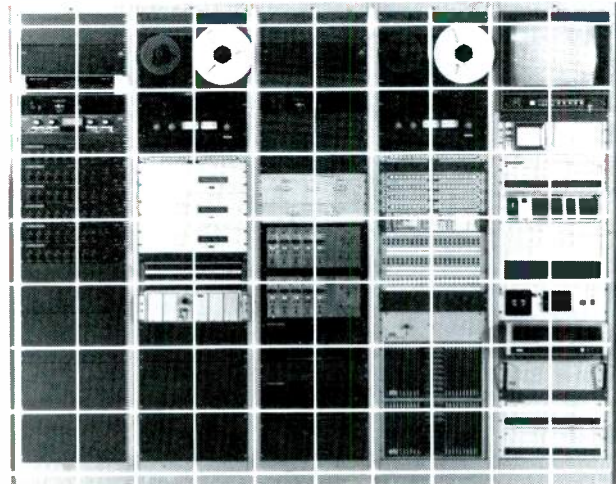
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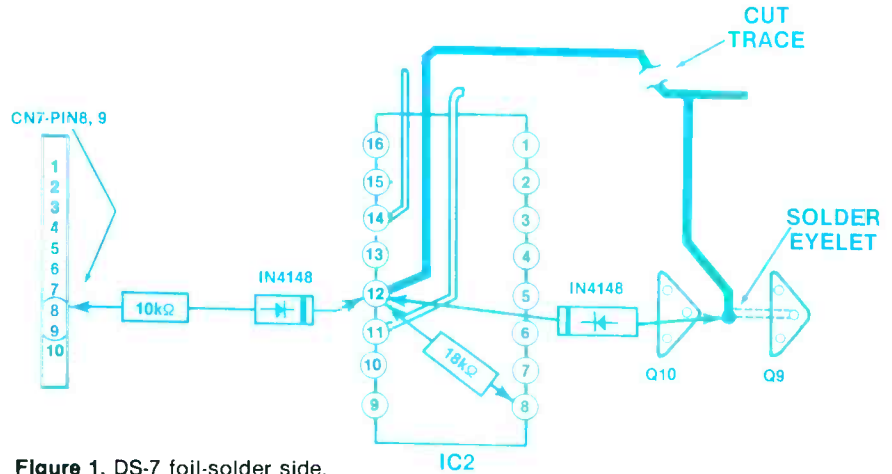


Figure 1. DS-7 foil-solder side.

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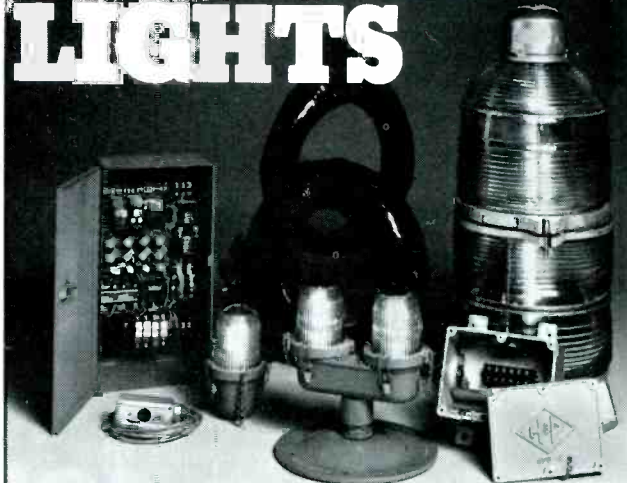
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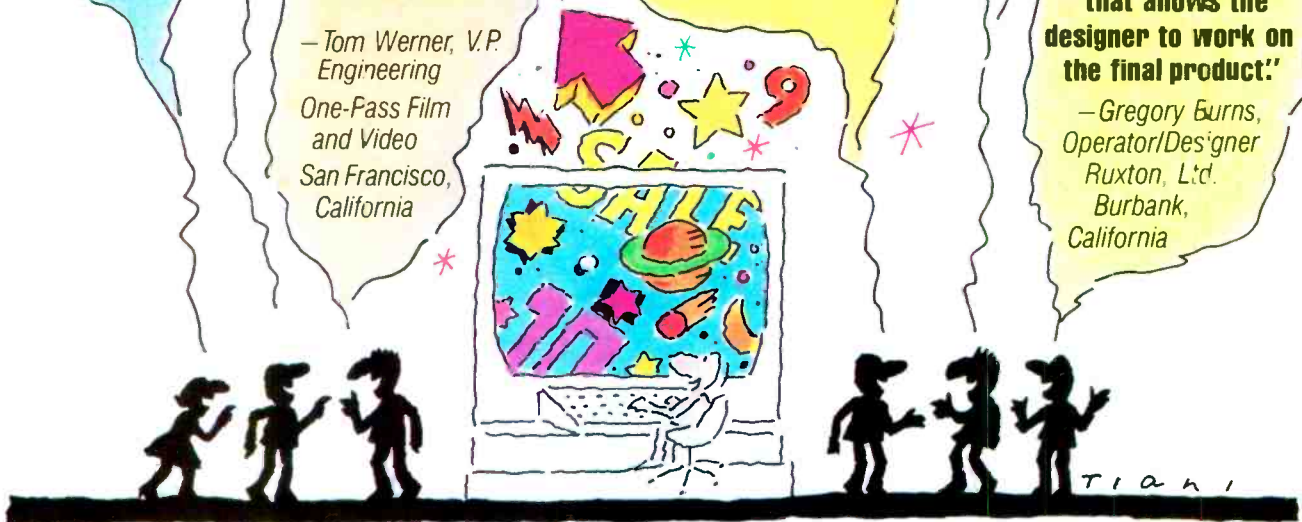
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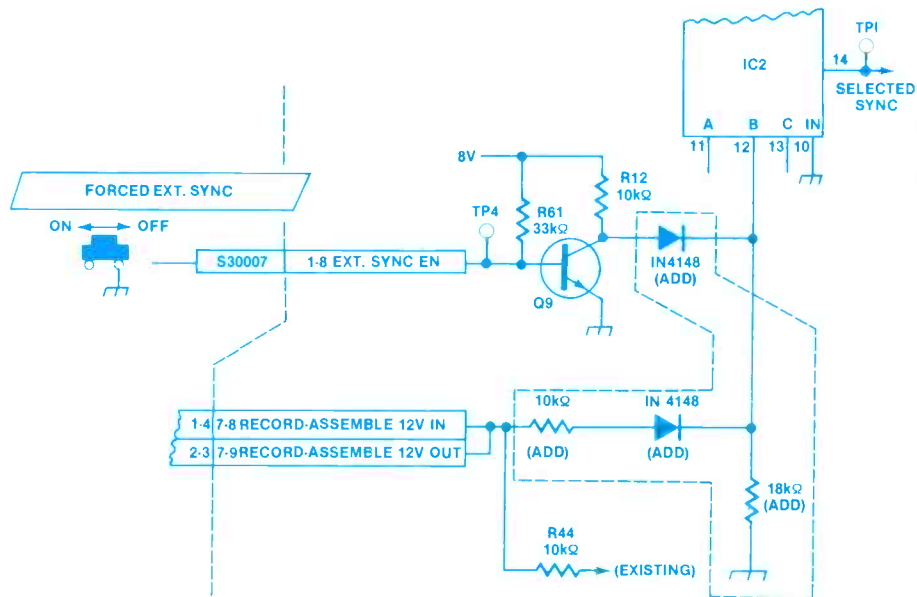


Figure 2. DS-7 drum servo BVU-200B modification.

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signals. Most of these playback systems incorporating advanced vertical sync feedback require that the VTR servo be locked to the TBC through the external sync reference. In turn, when recording, the sync reference must be switched to incoming video to properly phase the drum servo with respect to non-synchronous video.

The Sony BVU-200B has a rear panel switch called *forced external sync*. This switch must be placed in the *off* position to record incoming non-synchronous video (especially if the VTR is locked to house reference or TBC advanced sync). Failure to change this reference switch to *off* will produce a drum phasing error that appears as a video sync-bar somewhere in the picture. The position of the sync-bar is random, but will remain in the picture area throughout the recording.

This *mis-phasing* cannot be detected

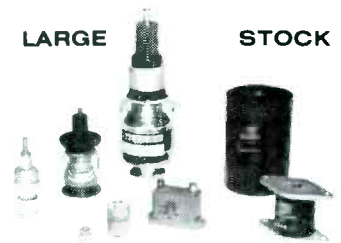
in the recording process, but is evident upon normal playback. Time base correcting can cause complete mis-framing with respect to vertical because, in essence, the TBC sees a second vertical interval start position. The result is a black sync-bar and picture displacement in a random position.

This condition can be corrected by modifying the Sony BVU-200B drum servo board (DS-7) as shown in Figures 1 and 2. The modification will positively assure that when the VTR is placed in the assemble record mode, the drum servo will lock to incoming video instead of the forced external sync. For ENG operations, the VTR's *sync reference* switch is left in the external mode at all times, and proper video phasing in assemble record is assured. This condition and modification is also applicable to edit stations where the VTRs are force-locked to external sync.



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## Satellite update

Continued from page 14

specifically prohibits American pay TV programmers, such as Home Box Office, from being imported by Canadian cable systems at this time. This policy protects the six new Canadian pay TV channels that went into operation on Feb. 1. Oddly, one of the new pay TV channels, First Choice, has incorporated *The Playboy Channel* into its programming package, and thus has leaped into the lead in the competition for Toronto, a city with almost half of the total cable TV audience in Canada. *The Playboy Channel*, considered by many viewers and reviewers to be at least semipornographic, has caused concern in Canada. The government tried to convince First Choice to reverse its decision, but was eventually forced to give in to reality again. The majority of First Choice subscribers wanted *The Playboy Channel* and the marketplace's demands prevailed.

This latest embarrassment to the Canadian government may have triggered the type of action necessary to stimulate the development of new, high quality programming in Canada. Also, new standards are being imposed on programming developed in

the United States for Canadian pay TV, which will require much higher "real" Canadian content than in the past. The new content rules are to be phased in over the next five years, and include requirements for Canadian performers and producers to be involved in meaningful roles.

Thus, the longest satellite border has reached a point where relative peace prevails, with policies on either side giving way to the realities of technology and the marketplace. The United States dominates the programming marketplace now shared between the two countries, and will be increasingly more dominant in the future. The Canadian role most likely will be to enhance the general quality of programming by insisting on high standards for the Canadian pay TV market and by creating new standards of excellence to sell to the US market.

The new Direct Broadcast Satellite (DBS) technology will provide new opportunities for transborder services on a scale never before imagined. DBS systems will compete with cable and will make the US-Canadian border irrelevant with respect to satellite broadcasting, particularly along the eastern half of the border. A strange twist to the story is that a Canadian ANIK C-2 satellite will provide chan-

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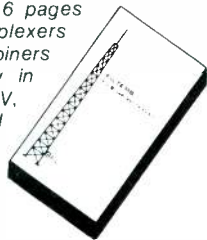
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nels on an interim basis to the first DBS-type service (USCI) planned to commence operation before the end of this year in the northeastern United States. This will accelerate DBS' pace of development in advance of a previously anticipated 1986 startup date for most DBS services. Some day, Canadian programming may have as significant an impact on satellite broadcasting along the border as have Canadian contributions to the development of the technology.

### Other borders

When the FCC authorized US satellite carriers to transmit signals into Canada, it also authorized transmissions into the Caribbean region. A similar action may be undertaken by Canada because its economic influence in the Caribbean is important. Other agreements are pending between Canada and Mexico concerning the sharing of orbital resources and possible programming exchange. For several years, Spanish language programming has been distributed via satellite to the US cable industry. Some of that programming originates in Mexico.

Actions also are under way to extend the sphere of activity for US program suppliers to Europe. Positive

reaction on the other side of the ocean has been noted as program suppliers there see the potential reciprocal market in the United States. Satellite technology will play a key role in this developing international marketplace, and a proposal has already been made to establish a transoceanic satellite system to provide TV transmission capacity, in addition to the current capacity on Intelsat satellites. The new system, Orion, would provide privately owned satellite links to serve the anticipated future market demand. It will be some time before this type of service is approved, because of current commitments to the Intelsat system, but if any projections can be made into the future based on experience in North America, artificial communications borders resulting from previous international agreements must eventually dissolve because of the force of the commercial marketplace. **||=:(=)]]]]**

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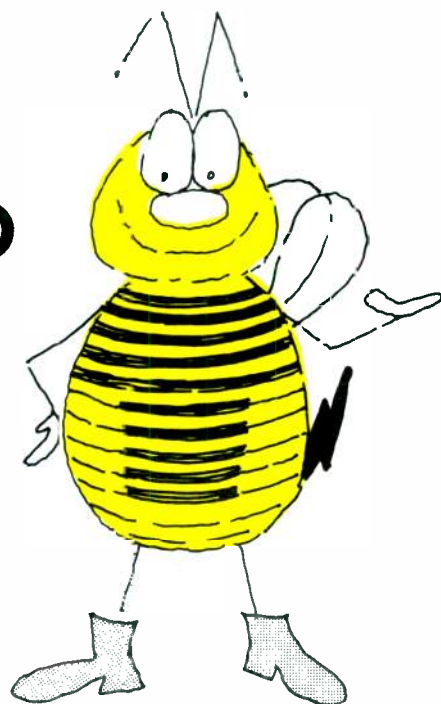
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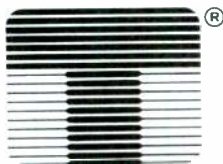
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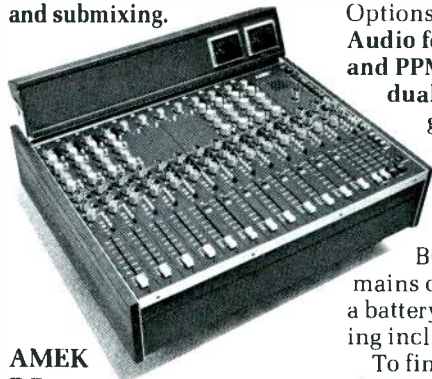
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## new products

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### Color corrector

The CCS-4200 from *For-A Corporation of America* consists of a main unit, which provides RGB gain and setup corrections and full video proc amp functions, and a remote control unit.

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### Mic mixer

*Comprehensive Video Supply Corporation's* MX-1002 3-channel mixer provides three balanced, low impedance inputs with phantom powering provisions and individual and master gain controls.

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### Satellite receiver system

The *Amplica* RC-20 LNC system features infrared remote control, LED readout and detent tuning.

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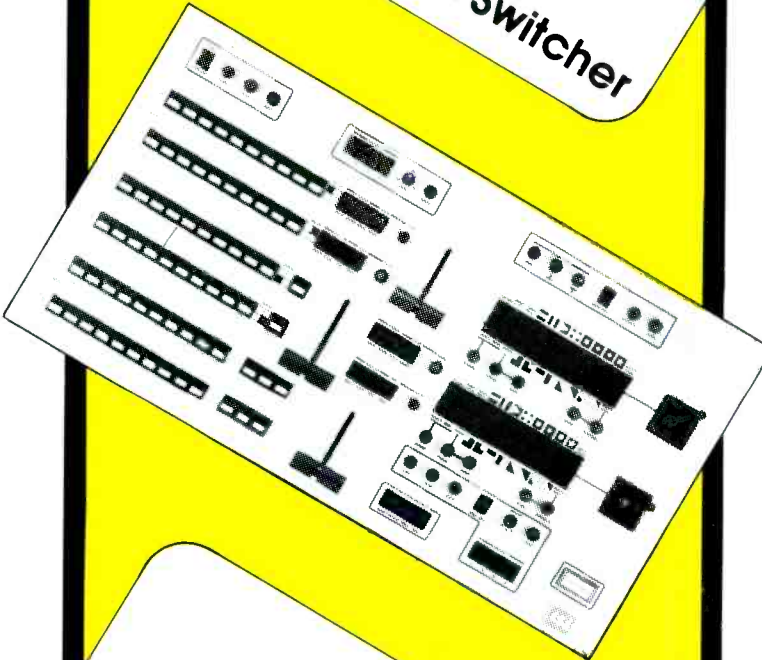
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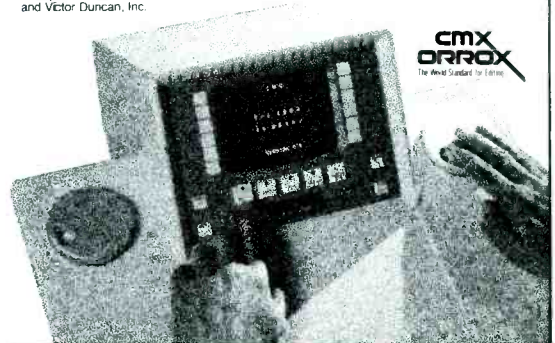
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The model 761 from American Laser Systems uses an infrared optical carrier to transmit any 1Vp-p composite video signal from sources such as TV cameras, VTRs and demodulated microwave basebands.

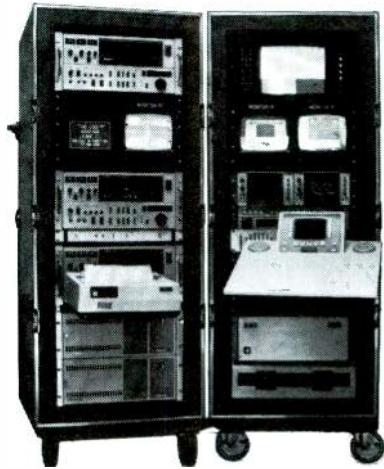
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The Broadcast Electronics FM-1.5A, FM-3.5A and FM-5A transmitters feature folded half-wave output cavities, broadband input matching networks, automatic power control with proportional VSWR foldback, and digital control systems with optional microprocessor diagnostics.

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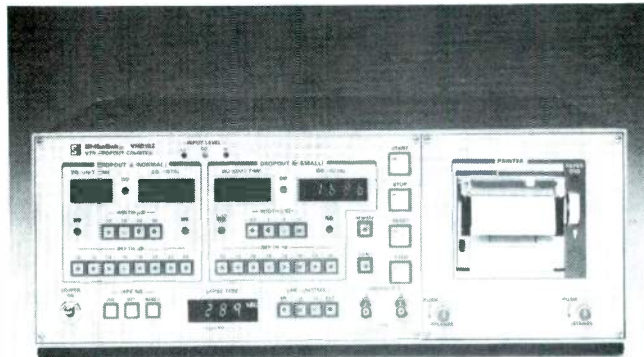
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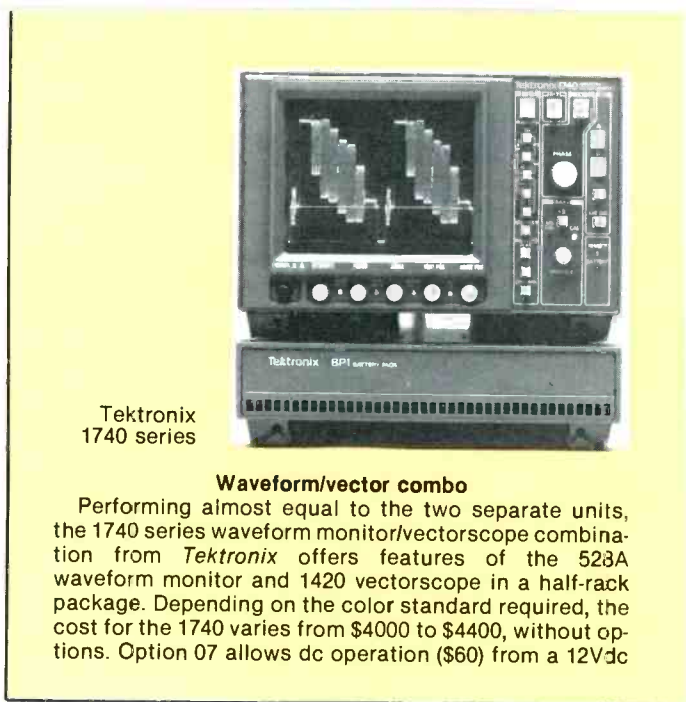


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Tektronix 1740 series

### Waveform/vector combo

Performing almost equal to the two separate units, the 1740 series waveform monitor/vectorscope combination from Tektronix offers features of the 528A waveform monitor and 1420 vectorscope in a half-rack package. Depending on the color standard required, the cost for the 1740 varies from \$4000 to \$4400, without options. Option 07 allows dc operation (\$60) from a 12Vdc

### Alignment generator

The Signal Source 14 TV title alignment generator from Visual Information Institute features horizontal and vertical grid references, safe title area and automatic signal mixing for preview monitor video.

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### Videocassette changer

The Broadcaster I from Channelmatic can automatically access up to 15 standard 3/4-inch videocassettes. A com-



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source. Option 11 adds an easily attached battery pack (\$650) for 2-hour portable use of the equipment, with a total weight of 24 pounds.

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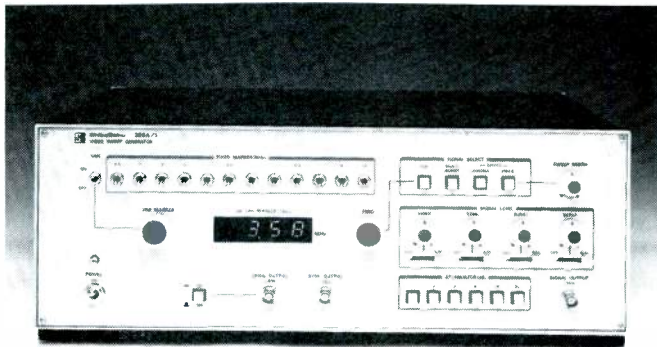


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## Editorial

Continued from page 8

If the electronic press is to truly serve the public interest, we must challenge the Congress to act by a concerted industry-wide effort. Case by case relief from the courts is not broad enough and administrative relief from the FCC under Chairman Fowler may not be permanent enough. Our freedom of speech cannot be traded for spectrum fees or alternative forms of content regulation. Changing the name to "quantification" does not change the facts. The content of our media will still be regulated by the government, a situation that is intolerable!

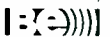
We cannot live with content regulations under any guise or circumstance. We must seek out the right of free, unfettered speech—not the appearance of deregulation behind a facade of percentage signs. And our call for relief must also apply to radio and television. As an industry we can ill afford to trade the rights of one medium for those of another.

To gain our freedom of speech, we will have to lobby aggressively and bring the weight of opinion to bear in each district, each state and each House of Congress.

We will show Senator Packwood and others, once again, that, as an industry, we can lobby ourselves out of a paper bag. Indeed, we can and will lobby ourselves into full First Amendment rights, but we must act now!

### Editor's note:

Your opinions on our editorial, on other critical issues facing broadcasters, or on the views of our authors, are welcome. Address comments to The Editor, **Broadcast Engineering**, P.O. Box 12901, Overland Park, KS 66212.



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# ad index

ADM Technology, Inc.	IFC	Evertz Microsystems	108	Pacific Recorders and Engineering Corp.	111
AFA Systems division	126	Feldmar Watch and Clock Center	234	Panasonic Co.	5C-51
AFA Products division	153	Fidelipac Corp.	131	PESA	236
Abekas Video Systems	95	Fortel, Inc.	93	Perrott Engineering Labs	94
Agfa-Gevaert, Inc.	33	Fujinon Inc.	235	Penney & Giles	54
Allen Avionics, Inc.	34	Fuji Photo Film USA Inc.	183	Phelps Dodge Communications Co.	247
Alpha Audio	14	Garner Industries	84	Philadelphia Resins Corp.	38
Amber Electro Design Inc.	256	General Electric Video	143	Phillips Television Systems, Inc.	56-57
Amek of America	260	Gentner Engineering Co., Inc.	115	Phillips Test & Measuring Instruments	237
Amperex Electronic Corp.	55	Gerstenlager Co.	189	Pineway Electronics	215
Ampex Corp.	31,77	Graham-Patten Systems, Inc.	110	Polyline Corp.	244
Amtel Systems Inc.	238	Grass Valley Group	7,9,261	Potomac Instruments	246
Andrew Corp.	75	Gray Engineering Laboratories	54	Q.E.I.	265
Angenieux	206	Great American Market	32	Quad Eight Electronics	107
Antenna Technology Corp.	52	HEDCO	16	Quanta Corp.	40,211
Anton Bauer, Inc.	171	HM Electronics, Inc.	58	Quantum Audio Labs, Inc.	240
Aristocart Div.	92	Hannay Reels	90	RCA Camera Tube Marketing	249
Asaca Shibasoku Corp. of America	263,266	Harris Corp.	49,136	RCI Engineered Audio Systems	211
Audio and Design Recording, Inc.	165	Harris Video Systems	82-83	RSC Electronics Inc.	210,211
Audio Kinetics	42	High Tech Marketing Co.	234	RTS Systems, Inc.	147
Audiomedia Associates	211	Hill Radio Equipment	214	Racal-Decca	116
Audio Technologies Inc.	206	Hitachi Denshi America Ltd.	3	Radcom, Inc.	208
Auditronics, Inc.	68,238	H.M. Holzberg Associates, Inc.	212	Ramko Research	81
Audio Video Engineering	234	Howe Audio Productions Inc.	135	Research Technology Inc.	70
Avtec Industries, Inc.	251	Ben Hughes Communication Products Co.	256	Restoration	244
BSM Broadcast Systems, Inc.	187	Hughey & Phillips	252	Richardson Electronics, Ltd.	210
Beattie & Associates, Inc.	209	ITC/3M	100-101	Rohde & Schwarz	248
Belar Labs	120	Ikegami Electronics Inc.	35,85	Ross Video	119
Belden Corp.	63	Image Video Ltd.	121	Russco Electronics Inc.	264
Beyer Dynamics	141	Industrial Sciences Inc.	262	SSAC, Inc.	255
Bosch-Fernseh (Fernseh, Inc.)	103	Inovonics Inc.	224	Sachtler Corp. of America	203
Broadcast Aids	254	Interactive Systems Co.	220	Satellite TV Week	254
Broadcast Services Co.	213	JVC Corp.	79	L.J. Scully Mfg. Corp.	266
Broadcast Systems, Inc.	23,219	Jensen Transformers	167	Sencore	15
Broadcast Video Systems Ltd.	115	Kaitronics Corp.	53	Sennheiser Electronics Corp.	86
COARC	240	King Instruments Corp.	231	Shalco Inc.	120
Calvert Electronics, Inc.	20	Kliegl Lighting	78	Shintron Electronics	177
Camera Mart, Inc.	4	LPB, Inc.	230	Shiveley Laboratories	118
Canare Cable, Inc.	64	Laird Telemedia	22	Shure Bros.	43
Canon USA, Inc.	97	Lake Systems	122	Singer Broadcast Products	224
Capitol Magnetic Products	30	Landy Associates, Inc.	212	Sitler's Supplies	240
Cara International Ltd., Inc.	208	Larcan Communications Ltd.	258	Sony Corp.	88-89,94
CeCo Communications, Inc.	102,252	Laumic Co., Inc.	263	Soundcraft Electronics	233
Central Dynamics Corp.	29,59,245	Leader Instruments Corp.	5	Sound Technology	129
Cetec Antennas	90	Leitch Video Ltd.	243	Stainless, Inc.	242
Cetec Vega	74	Lerro Electrical Corp.	21	Standard Tape Laboratory, Inc.	265
Chester Cable Corp.	105	Listec Television Equipment Corp.	28	Stanton Magnetics	195
Christie Electric Corp.	246	Logitek Electronic System Inc.	222	Stantron div Wyco Metal Products	252
Circuit Research Labs, Inc.	71,239	3M Mag Tape	72-73	Studer ReVox America, Inc.	25
Comark	69	M/A-Com Microwave Power Devices, Inc.	91	Surcom Associates, Inc.	255
Comex Systems	250	MCI/Quantel	149	Swiderski Electronics Inc.	230
Comrex Corp.	220	MCI/Sony	228-229	Swintek Enterprises, Inc.	112
Comtech Data Corp.	24	MCL, Inc.	232	TFT, Inc.	76,104,118
Continental Electronics Mfg. Co.	10	Magna-Tech	185	Tandberg of America	78
Crosspoint Latch Corp.	272	Maric Industries Ltd.	250	Tascam div TEAC Corp. of America	27
Peter W. Dahl Co., Inc.	116	Marti Electronics	20	Tech Laboratories, Inc.	254
Bill Daniels Co.	234	Maxell Corp. of America	124-125	Tektronics, Inc.	18-19
Datatek Corp.	217	McCurdy Radio Industries	IBC	Tele-Cine Corp.	106
Datatron, Inc.	48	Microdyne Corp.	99	Telemet	258
Dictaphone Corp.	179	Microtime Inc.	221,223	Telesource Communications Services Inc.	259
Digital Entertainment Corp.	17	Microwave Filter Co., Inc.	258	Television Technology Corp./Wilkinson	155
Dolby Labs	161	Midwest Corp.	1	Tennaplex Systems Ltd.	44
Dubner Computer Systems	253	Modular Audio Products	219	Tiffen Professional Products	106
Victor Duncan, Inc.	262	Modulation Sciences, Inc.	199	Townsend Associates, Inc.	65
Dynair Electronics, Inc.	39	R.K. Morrison	250	Truetime	264
Dynatech Data Systems	62	Moseley Associates, Inc.	226,227	Turner Engineering	213
EEV, Inc.	66-67,117	NEC America Inc.	36	UREI	123
EMCEE Broadcast Products	218	Nagra Magnetic Recorders, Inc.	80	United Media	191
ESF	12-13	Rupert Neve Inc.	11	Utah Scientific	225
Eagle Hill Electronics, Inc.	250	North Hills Electronics Inc.	230	Varian EIMAC	109,241
ECHOlab, Inc.	98	Northwest Broadcast Systems	215	Videotek, Inc.	45
EIP Microwave	206	Omicron Video	206	Ward-Beck Ltd.	BC
Elector USA, Inc.	257	Opamp Labs Inc.	250	Winsted Corp.	244
Electrex Co.	120	Orban Associates	87,173	Yamaha International Corp.	113,114
Electro Impulse, Inc.	239	J. Osawa & Co., Ltd.	260		
Equipto Electronics Corp.	260	Allen Osborne Assoc.	104		
Eventide Clockworks	60-61	Otari Corp.	47		

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**TELEVISION MAINTENANCE ENGINEER:** For the experienced-qualified maintenance engineer that would prefer a sunny Virginia Beach location, we would like to talk to you about excellent employee benefits. The third fastest growing area in the USA is rich in cultural and recreational opportunities. Additionally, we pay for experience. Send resume to the Personnel Department, WHRO-TV, 5200 Hampton Boulevard, Norfolk, VA 23508. Call Jack Beck or Keith Massie for details, if interested at (804) 489-9476. 9-83-11

**SENIOR VIDEOTAPE MAINTENANCE ENGINEER** needed by expanding public TV station. Strong technical background plus 5 years experience with 2" and 1" equipment required. Excellent opportunity for advancement. Resume and salary requirements to: Personnel, KERA TV/FM, 3000 Harry Hines, Dallas, TX 75201. 9-83-11

**POST-PRODUCTION MAINTENANCE ENGINEER:** Established NYC facility seeks responsible individual preferably familiar with Sony 1" VTR's, CDL Switchers, CMX, Chyron, and Quantel for early evening shift. Excellent salary and benefits. Reply to Dept. 595, P.O. Box 12901. Overland Park, KS 66212, Broadcast Engineering. 9-83-11

## RADIO SYSTEMS ENGINEER

We are seeking an experienced Radio Systems Engineer to coordinate, analyze and evaluate radio and microwave communications systems.

This key position will encompass direction for new communication system design as well as modification of existing technologies.

Your experience must include a minimum of six years of experience in the planning and design of electronic communications systems. Certification as a registered professional electric or electronic engineer with the State of California or a degree with a major in electric, electronic, or communications engineering may be substituted for up to two years of the required experience. Possession of a valid First Class Radiotelephone Operator's License or General Class Radiotelephone Operator's License issued by the FCC.

We offer a fine salary with regular reviews and an exceptional fringe benefits package. For additional information, call **(213) 742-7761**

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## HELP WANTED (CONT.)

**SERVICE MANAGER:** Growing video systems house in South Florida seeks experienced technician to manage service department. Qualified candidate must have experience w/3-tube cameras, 3/4" and 1" VTR's. Good starting salary, incentive plan and standard fringe benefits. Employer will pay for current technology training schools. Send resume to: Broadcast Engineering, P.O. Box 12901, Dept. 595, Overland Park, KS 66212. 9-83-11

**ASSISTANT CHIEF ENGINEER—Strong background** in broadcasting a must! Some administrative responsibilities mixed with future planning and growth of station. Engineering department is young and growing. Excellent opportunity for the right person to get on board, as the station will be remodeled very soon. Salary commensurate with abilities. Send resume to Rod Hughes, KFVS-TV, P.O. Box 100, Cape Girardeau, Missouri 63701. Equal Opportunity Employer. **MAINTENANCE ENGINEER—Minimum of 3 years** in broadcasting and FCC license required. Responsibilities include repair and maintenance of ENG equipment and reconfiguring of Master Control and Production Control. Send resume to: Rod Hughes, KFVS-TV, P.O. Box 100, Cape Girardeau, Missouri 63701. Equal Opportunity Employer. 9-83-11

**CHIEF BROADCAST ENGINEER:** Needed to oversee and maintain the performance of high-power FM public radio station KUMR. An associate's degree with emphasis in electronics or an equivalent combination of education and experience from which comparable knowledge and abilities can be acquired is necessary. Two to three years of broadcast equipment repair and maintenance and possession of a valid first class or general class FCC radiotelephone license are required. Salary range: \$18,288 - \$28,445. UMR is an engineering-scientific campus located 100 miles SW of St. Louis, on the fringe of the Ozark recreational areas. Excellent fringe benefits, including educational assistance. Deadline for receipt of completed applications: September 23, 1983. For application forms, contact: Personnel Services, G-1 Parker Hall, University of Missouri-Rolla, Rolla, MO 65401, or call 314-341-4241. **UMR is an Affirmative Action/Equal Opportunity Employer.**

**VIDEO MAINTENANCE ENGINEER** familiar with Ampex VPR's, Sony 1100, CMX 340X, Datatron Editors, CDL Switchers. Send resume to Tulchin Studios, 240 East 45th St., N.Y., N.Y. 10017, Attn. Chief Engineer, Shelly Rattner. 9-83-11

**NEED IMMEDIATELY!** Top quality video/audio production company requires top notch maintenance engineer. This person must have experience on CMX, Ampex VPR-2-VPR-20, Ampex Cameras, ADO & Ampex Switching, Rank-Cintel, etc. Salary & benefits substantial for right person. Contact: Kartes Video Communications, 10 East 106th Street, Indpls., IN 46280, 317-844-7403. 9-83-11

**FM ENGINEER FOR GROWING AOR** Radio Group based in Duluth. Exciting projects, imaginative remotes, maintain best equipment in top notch condition. Top salary and benefits. Resume to KQDS, Box 6167, Duluth, MN 55806. 8-83-21

**CHIEF ENGINEER—WHON-WQLK,** Richmond, IN. Salary plus fringe benefits. High-power FM, Directional AM, and automation experience a must with at least 2-3 years ex. Send resume to: Richard Huckaba, GM, P.O. Box 1647, Richmond, IN 47374 or call: (317) 966-3932. 8-83-21

## POSITION WANTED

**15 YEARS EXPERIENCE** in all aspects of commercial television. Particular engineering expertise in production areas of studios, O.B.'s and ENG. Write or phone for resume to: P. Jauncey, 637 La Chapa, El Paso, TX 79912 or 915-581-5596. 9-83-11

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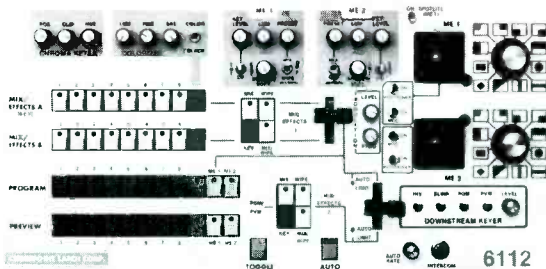
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### **Special Note:**

The number of tour delegates will be strictly limited. Persons interested in participating should inquire early.



# A RANGE OF VIDEO SWITCHERS



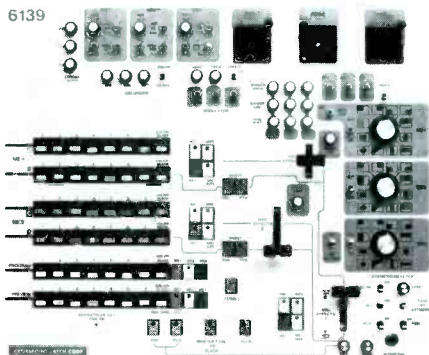
## 6112

The only switcher in its class to offer two fully independent MIX EFFECTS systems, with each M/E having its own pattern generator and positioner. This nine input, four bus unit includes the following standard features: downstream keyer, pattern modulator, spot-lite, colorizer, toggle or "take preview", automatic or manual mix and wipe operations, variable soft wipes, adjustable borders, internal or external keying on each M/E, intercom, loop-thru video inputs, preset of mix or wipes, black burst output, and a blanking processor. There is also a plug-in optional chroma keyer available. All inputs accept synchronous, non-synchronous, composite, non-composite, monochrome or color signals and go thru dual back porch clamping.

**Price \$7,950.00 PAL \$8,950.00**

### Options

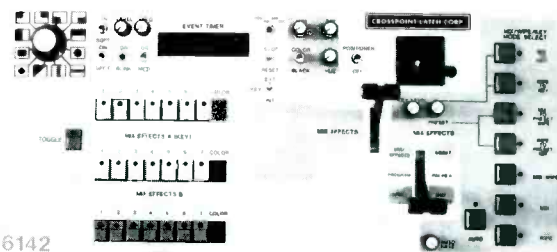
- Encoded chroma keyer (plug-in board) **\$1,050.00**
- RGB chroma keyer (plug in board) **\$1,050.00**
- Slimline control panel (4 inches) **\$250.00**



## 6139

Eight input production switcher with three fully independent Mix Effects Systems. Each ME has its own pattern generator and positioner. Downstream keyer with matte, blink, invert and edge or external border. Downstream keyer may be previewed. Five video signals can be displayed at the same time. Downstream fade to black. Quad split. Field expandable to 16 inputs with additional patterns **Price \$14,500. PAL 15,500.**

- CHROMA KEYERS, each (max two) **\$1,050.**  
(Encoded or RGB) encoded not available in PAL
- Additional dual colorizer (instead of one CK) **\$420.**
- Genlock board **\$350.**
- Expansion Unit (8 additional inputs) **\$5,000.**
- Additional patterns + rotary wipes **\$3,000.**

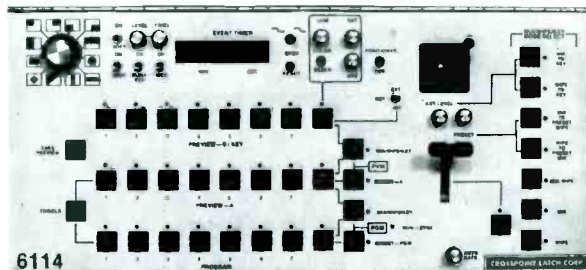


## 6142

## 6142

The 6142 is a three bus, eight input completely self-contained video switcher. This unit features dual fader handles which permits the operator to dissolve to an effect. The mix effects system features double re-entry along with 12 patterns, variable soft, 24 hour event timer, internal or external keying, pattern modulator, blink key, colorizer, toggle, spot lite, positioner, mix or wipe to key, preset of mix and wipes, blanking processor, loop thru video inputs, dual back porch clamps and black burst output.

**Price: \$5,245.00 PAL \$6,245.00**

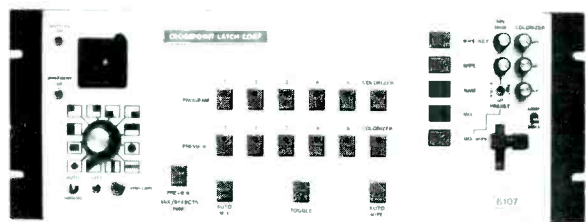


## 6114

## 6114

The 6114 is a broadcast quality, eight input, three bus video switcher. It features 12 patterns, positioner, event timer, pattern modulator, soft wipe, spot lite, blink key, toggle, take preview, automatic or manual mix and wipe blanking processor, non-sync lamp, loop through video inputs and a blackburst output.

**Price: \$4,680 PAL \$5,680**



## 6107

The 6107 is a broadcast quality switcher. Though there are only 2 buses it is possible to preview and/or preset a mix or effect without disturbing the program output. The special mix-wipe function provides a combination mix and wipe (for instance, a dissolve within a circle pattern), which normally requires at least three buses. It also features 12 patterns, soft wipes, built-in intercom amplifiers, and colorizer, toggle and blackburst output.

**Price: \$3,800. PAL \$4,800.**

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# For dependable, quality audio, make sure all the parts get along.

All metalwork is welded, heavy-gauge steel construction with durable textured epoxy paint. Dark blue finish.

McCurdy turntables are engineered for broadcast use incorporating rugged construction, specialized features and weighted, isolating shock mounts.

Convenient housings in matching woodwork are available in a range of sizes for cart machines, auxiliary equipment and jackfields.

This modular stereo audio console (SS8670) is available in 16, 20 and 22 channel standard versions. Custom designs can be produced to meet specific requirements. The control panel is made of mar-resistant, heavy gauge, vinyl-coated steel strips, set in to aluminum excursions.

Sloping, front-hinged mounting panels are available for all popular reel tape machines.

High quality woodwork and trim is custom built to your specifications. Choose from solid oak or walnut.

## Let McCurdy put it all together!

Technical harmony is essential to clear professional audio. All the components have to get along before the system can deliver its full potential.

At McCurdy, we strongly believe in technical harmony. It's the basis on which we've built all our dependable, quality audio systems for over 30 years. And because McCurdy can supply the complete system, we can guarantee that it will work together and work right.

Whatever the audio requirement, a McCurdy system can fill the need with quality components. Take our consoles for example... from standard versions to custom models, we cover the complete range of audio applications. Or our turntables... the only turntable systems designed specifically for broadcast. And all McCurdy audio systems are available with various tape configurations... cassettes and/or jackfields.

Let McCurdy put together a complete audio system for your broadcast application. McCurdy components get along so well, you'll agree they were made for each other. And the result of that is technical harmony... the best audio possible!

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