

BROADCAST engineering

September 1981/\$15

BUYERS' GUIDE

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The broadcast industry's comprehensive product directory

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The Audio Company

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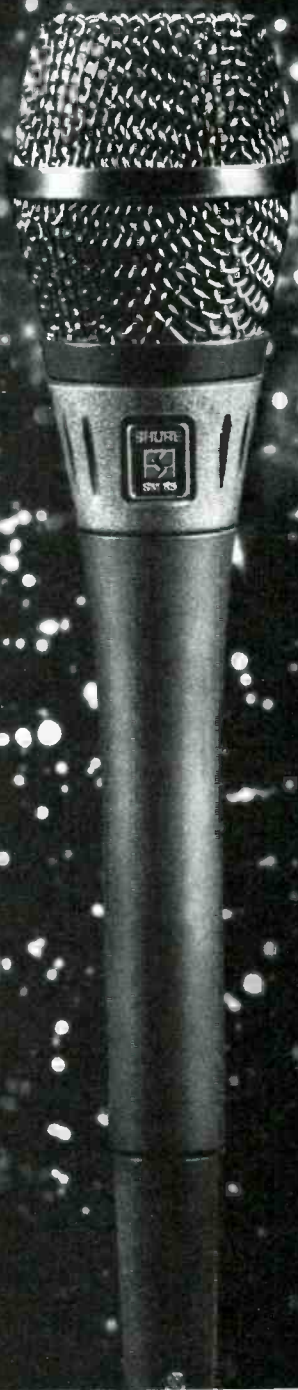
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SM85

a studio quality
condenser
microphone
that's not
"studio bound"

This new high technology Shure microphone will change the way people think of condenser microphones. The SM85 is designed especially for on-stage, hand-held use. Its sound is unique—far more tailored to the special needs of the vocalist: sizzling highs and a shaped mid-range for superb vocal reproduction, and a gentle bass rolloff that minimizes handling noise and "boominess" associated with close-up use. Ultra-low distortion electronics make the SM85 highly immune to stray hum fields. An integral, dual-density foam windscreen provides built-in pop protection.

What's more, the SM85 Condenser Microphone must pass the same ruggedness and dependability tests required of Shure dynamic microphones. As a result, the SM85 sets a new standard of reliability for hand-held condenser microphones.

The SM85 is *extremely* lightweight, beautifully balanced—it feels good, looks good on-stage, on-camera, on-tour. Ask your dealer for a demonstration of the new SM85, or write us (ask for AL664) for full details.

SM85

Cardioid Condenser
Hand-Held
Professional Microphone

Circle (2) on Reply Card

The Sound of the Professionals®



Shure Brothers Inc., 222 Hartrey Ave., Evanston, IL 60204
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BROADCAST engineering

The journal of broadcast technology

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THE COVER

Graphic design by Joy Viscek.

NEXT MONTH

The October issue of **Broadcast Engineering** will focus on technology management for radio and television and the rewards for broadcasters in their profession.

Dennis Ciapura, general manager of telecommunications, Greater Media, will address the subject of how engineers and station managers keep up with the rapid technological advances in broadcasting and how they integrate new techniques into their operations.

BE's second annual engineering management salary survey will reflect salary trends in radio and TV broadcasting. The results will include changes in the fringe benefit packages for top broadcast personnel, plus selected comments on compensation trends from the industry.

The equipment roundup for October will feature ENG microwave systems.

We could have just added bigger reels to make a great three-hour VTR. But we didn't.



We built the HR-300 from the ground up with a new heavy-duty tape transport system designed to handle the stress of larger, heavier 14" three-hour reels. The result is a one-inch production VTR with a three-hour capability — and the technology required to meet those extended production demands.

The HR-300 includes all the exclusive Hitachi features found in our popular HR-200: retracting tape guide for ease of threading; "Pro" tape path for longer tape life; instant head replacement that lets you change all six heads in less than three minutes; slow-motion 1/4 REV-2X Fwd and full audio and video confidence.

This full-production machine can handle all VTR editing functions,

allowing for insert, assemble and split edits. And the HR-300 can accommodate all reel sizes from spot to three-hour, making it as versatile as it is hard working.

For video cassette duplication, for delayed network feeds, for film to tape transfer, the HR-300's three hour continuous record and playback capability is ideal.

Every advanced component has been planned as an integral part of the HR-300's design, making it a one-inch VTR with a lot more than just three hours of capability.

Or, to put it another way, it's not just our big reels that make the HR-300 such a big deal. It's Hitachi know-how. And trying to duplicate that expertise adds up to spinning reel.

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All Wireless Microphones Are Not Created Equal

This One is a
Telex

Wireless mics aren't new, and sometimes it seems as if all systems are basically the same. However, Telex and its Turner and Hy-Gain divisions have combined their 100 years of cumulative experience in microphone, antenna and rf development to produce a DUAL DIVERSITY WIRELESS SYSTEM THAT COSTS AS LITTLE AS SINGLE ANTENNA INSTALLATIONS. The FM receiver can be operated with one or two antennas. When two antennas are used, a unique automatic phase summation network (patent applied for) provides superb dual diversity reception.

The Telex wireless sounds as good as a hard wired mic, offers plenty of options and is economically priced. If you're interested in a wireless system that is *more* than equal—write us today for full specifications.

Quality products for the audio professional



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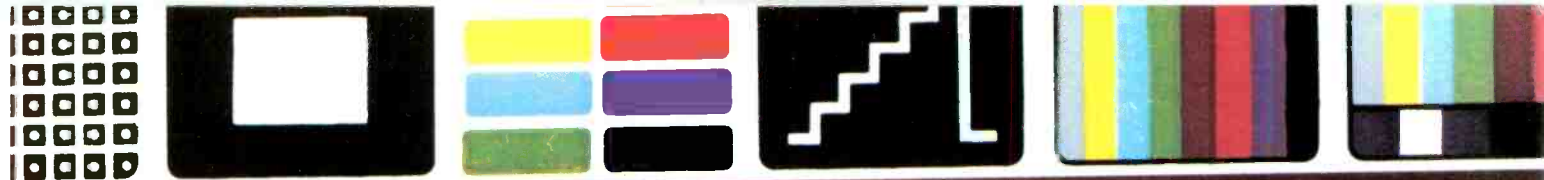
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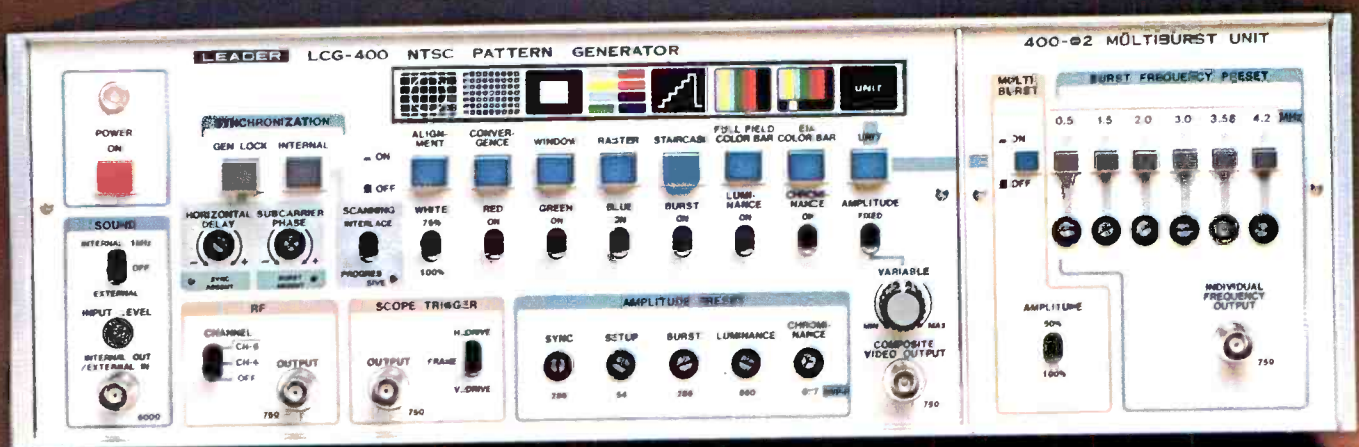
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The Leader Sync/Test Generators.

Every important feature for under \$2,000.



Precise NTSC sync/test pattern generators.

Leader's LCG-400 series sync/test generators provide accurate reference signals for any off-the-air broadcast or non-broadcast operation. Available in either multi-burst or sweep marker configurations, the LCG-400 provides EIA and full-field color bars as well as staircase, raster (in eight colors), window, convergence and cross-hatch test signals... plus gen-lock capabilities and a host of auxiliary outputs. As a matter of fact, Leader's sync/test generators do virtually everything the \$4,000 generators do... except cost as much.

A network-proven 50 MHz oscilloscope.

The Leader LBO-517 oscilloscope makes accurate and detailed measurements. It offers sensitivities of 1 mV to 10 MHz and 5 mV to 50 MHz. Two main and two auxiliary channels can be displayed on main and delayed time bases (8 traces) simultaneously while intensifying



LBO-517 50 MHz Oscilloscope.
Circle (242) on Reply Card

the delayed portion. Composite triggering provides *stable* viewing of two asynchronous inputs. Positive, stable triggering on composite video signals, at either H or V rates, is automatic. Leader's new dome-mesh 20 kV CRT assures bright, clearly defined displays, even at the highest or lowest sweep rates. All for under \$2,000.

The Leader Vectorscope is unique.

Only the Leader LVS-5850 NTSC Vectorscope offers CRT-generated phase/amplitude targets that are as bright and clear as the vectors themselves. Now you can easily verify NTSC Vectors in darkened control rooms. And, electronically generating the targets eliminates non-linearity errors caused by CRT aging. You can mount it in your existing console, view it from any angle



LVS-5850 NTSC Vectorscope.

or distance, and be confident that what you see is what you've got.

Two-year warranty. Evaluation units.

A history of high reliability permits Leader to provide a generous two-year warranty (even on the CRT)... backed by factory service depots on the East and West Coasts. Evaluation units are

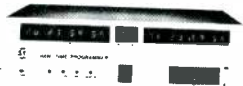
available to all qualified customers. **Call toll-free (800) 645-5104 to request** an evaluation unit, our 1981/82 catalog, the name of your nearest "Select" distributor and additional information.

For video engineers who know the difference.



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PERFECT TIMING



780 SERIES

RAM TIME PROGRAMMERS \$1200 to \$1500

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.

The front panel consists of:

- An eight digit real time display when day selection is required as on the ES 781, 784, 785, seven digits for ES 780, and six digits for the others.
- A two digit display of "Next Event" number.
- An eight digit display of "Next Event Time" when ES 780, 781, or 782 is specified, and a six digit display when ES 783, 784, 785, 786 or 787 is specified, and a four digit display when ES 788 or 789 is specified.
- All displays are .3 inch red light emitting diodes.
- Controls, mounted below the displays, consisting of:

An "Active-Disable" Switch used when it is necessary to preempt the program temporarily.

Time Setting Controls—All recessed to avoid accidental bumping.

"Display"—The displays can be observed by actuating this control during a power outage. The unit will continue to operate, but the displays will be blanked to conserve battery energy.

"Event Select"—A two decade thumbwheel, used to set the event number when entering or reading data in the memory.

"Event Time Select"—An eight or six or four decade thumbwheel, used to enter the event time in the memory. The number of thumbwheels will be determined by the part number of the unit specified.

"Enter"—This pushbutton is actuated to enter data into the memory.

"Run-Read/Enter"—A two position switch, placed in the "Run" position for normal operation, and in the "Read/Enter" position whenever entering data or reading data.

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 782, 788 and 787 have 16 isolated outputs. Any of the 32 events can be programmed to activate any of the 16 outputs. **ES 780** has 10 outputs. The other units have a single output.

ES 784, 786 and 788 have a one minute contact closure. The others have a one second contact closure. Contacts are single pole, form A, reed type, and have a one amp rating.

THE 780 SERIES AS A MASTER CLOCK

By adding the **ES 187** Serial Time Code Generator and using a more accurate crystal, the 780 Series Ram Time Programmers can serve the dual functions of Master Clock and 96 event programmable timer.



750 SERIES

THUMBWHEEL PROGRAMMER/COMPARATORS \$310 to \$390

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 1/2 inch high relay rack panel and chassis.

STANDARD UNITS

ES 750—ES 112 and one 6 Digit Program

ES 751—ES 124 and one 6 Digit Program

ES 753—ES 112 and two 4 Digit Programs (Hrs & Min)

ES 754—ES 124 and two 4 Digit Programs (Hrs & Min)

ES 756—ES 510 and one 4 Digit Program (Min & Sec)

ES 758—ES 510 and two 4 Digit Programs (Min & Sec)

ES 760 \$620

ATS CLOCK

The **ES 760** is a six digit, 24 hour, programmable clock.

On the front panel are a six digit display of time, in hours, minutes and seconds, and two sets of four thumbwheels.

An internal comparator is fed "Clock Time" and "Thumbwheel Time," and when these two agree, a reed relay contact closure occurs, which is brought to a rear-mounted connector. The connector also provides four line parallel BCD time information.

If normal power is interrupted, **ES 760** will automatically switch to its internal battery and crystal time base.

Mechanical: 3 1/2" High x 19" Wide x 8" Deep.

PRESETTABLE TAPE TIMERS

ES 1296 \$182

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.

There are four push-button controls (Fast, Slow, Set and Reset) and a four position selector switch. The Fast and Slow controls are used to set time of day and recorder start time.

When setting the recorder start time, the Set control is used in addition to the Fast and Slow controls, to set the time to the nearest minute. 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**.



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, 160/1 and 190**.

MASTER CLOCKS

ES 160 Mounted in a 5 1/4" relay rack panel and chassis, displays six digits of time information on .3" 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 **ES 161, 166, 171, 991 or 993** Remote Displays without buffering. All inputs and outputs are through rear-mounted connectors.

Dimensions: 5 1/4" High x 19" Wide x 15" Deep. \$1005

ES 160/1 One second per month version of **ES 160**. \$1179

ES 190 The ultimate in accuracy! Similar to **ES 160**, with special circuits for receiving and decoding a 1000 Hz tone at the start of each minute. The decoder output resets the seconds' counters in the clock each minute except the first minute of every hour. These tones are transmitted by radio Station WWV, with an oscillator accuracy of ±1 part in 10¹¹. **ES 190** has an antenna and internal WWV receiver with audio-output. Displays are .3" red LED's. Serial output drives **ES 161, 166, 171, 991 and 993** Remote Displays.

Dimensions: 5 1/4" High x 19" Wide x 15" Deep. \$1179

ES 192/194 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 .6" incandescent type.

Dimensions: 3 1/2" High x 8" Wide x 6" Deep. \$312

ES 196 TIME AND TEMPERATURE MASTER Basically the same as **ES 192**, but with gas discharge displays, panel mounting and separate serial BCD outputs for time and temperature. Displays 12 hour and °F format.

Dimensions: 3 1/2" High x 19" Wide x 8" Deep. \$737

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 6" Deep. \$158

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. \$193

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.

Dimensions: 8" Wide x 2 1/2" High x 6" Deep. \$235

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. \$244

ES 167 SERIAL TIME CODE GENERATOR An integral part of **ES 160, 190, 192/194 and 196** 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 Displays. \$141

ES 169 TEMPERATURE SLAVE Receives serial code from **ES 196**, displays it on .55" Gas Discharge Displays.

Dimensions: 8" Wide x 2 1/2" High x 6" Deep. \$141

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 .3" LED's.

Dimensions: 2 1/4" High x 4 1/2" Wide x 4" Deep. \$152

ES 1548 CONSOLE MOUNT TEMPERATURE DISPLAY In the same case as **ES 171**, receives the serial code from **ES 196** and displays it on bright red .3" LED's.

Dimensions: 2 1/4" High x 4 1/2" Wide x 4" Deep. \$152

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. \$170

ES 991 4 DIGIT SERIAL INPUT SLAVE Decodes serial time data and displays four digits of time on large 2" gas discharge displays.

Dimensions: 10 1/2" Wide x 4 1/2" High x 6 1/2" Deep, Desk Top Case. \$312

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 167**.

Dimensions: 5" High x 12" Wide x 3" Deep (Wall Mount). \$432



ES 1372 \$260

The **ES 1372** is similar to the **ES 1296**, except that **ES 1372** has two timed AC outlets. AC power is applied to outlet "1" at the alarm time and day selected and remains on for 138 minutes and 53 seconds. AC power is applied to outlet "2" 60 minutes after power has been applied to outlet "1" and remains on for 78 minutes and 53 seconds. All other specifications of the **ES 1296** apply.



ES 251 \$284

ES 251 SMPTE TIME CODE READER: **ES 251** is a six digit SMPTE Time Code Reader displaying Hours, Minutes and Seconds. Receives the standard SMPTE Time Code through rear mounted BNC connector, converts it into six digits of clock time.

Dimensions: Aluminum Case 2 1/4" High x 8" Wide x 5 1/4" Deep.

ES 252 SMPTE TIME CODE READER: Exactly like **ES 251**, but displays Minutes, Seconds and Frames.

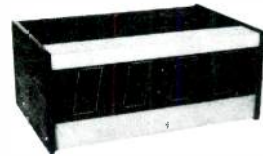
ES 253 SMPTE TIME CODE READER: Similar to **ES 251 and 252**, but displaying EIGHT DIGITS of information—HOURS, MINUTES, SECONDS and FRAMES, using .3" red LED's.

ES 254 SMPTE TIME CODE READER: is a bi-directional, multi-speed eight digit reader, displaying Hours, Minutes, Seconds and Frames on .3" red LED displays. \$650

ES 112/124

DIGITAL CLOCK \$158

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 incandescent filament. .6" high.
Dimensions: 2 1/2" High x 8" Wide x 6" Deep.



70 SERIES

CONSOLE MOUNT CLOCKS AND TIMERS

ES 174 SIX DIGIT, 24 HOUR CLOCK: Three setting controls—Fast Advance, Slow Advance and Hold. \$152

ES 370 FOUR DIGIT, ONE HUNDRED MINUTE UP/DOWN TIMER: Six controls—Count Up, Count Down, Stop, Minutes Advance, Seconds Advance, Reset. \$194

ES 371 UP/DOWN TIMER: Similar to the ES 370 except with Leverwheel Preset capability for faster setting of the desired time. \$304

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 when running or will stay at zero if reset when stopped. \$152

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. \$185

ES 574: A 24 hour version of ES 572. \$185

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. \$185

ES 576: A 24 hour version of ES 572. \$185

ES 577: 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. \$185

ES 578: A 24 hour version of ES 572. \$185

ES 579: A 24 hour version of ES 572. \$185

ES 580: A 24 hour version of ES 572. \$185

ES 142/144

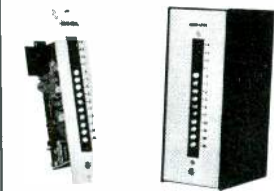
DIGITAL CLOCK THERMOMETER \$283

ES 142 (12 hr.) and ES 144 (24 hr.) are solid state digital clock/thermometers. Six digits of time (hours, minutes, seconds) and 3 digits of temperature (-50°F to +150°F or -45°C to +66°C) in gas discharge displays. .55" high. Temperature sensor on 25 ft. cable included.
Dimensions: 2 1/2" High x 10" Wide x 6" Deep.

ES 240/241

ES 240 DIGITAL THERMOMETER is calibrated for °F and °C. Displays are planar gas discharge. .55" high \$185

ES 241 DIGITAL THERMOMETER is calibrated for °F and °C, alternating between the two every four seconds. Displays are planar gas discharge. .55" high. \$225



ES 211/214

DYNAMIC AUDIO LEVEL INDICATOR

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". \$130 \$109

SPECIFICATIONS

Number of Indicators: 14 LED Lamps in 3 colors.

Scale: +4, +3, +2, +1 dB—Red

0 dB—Yellow

-1, -2, -3, -5, -7, -10,

-15, -20, -25 dB—Green

Input Impedance: 2200 ohms at maximum sensitivity, 6800 ohms at +8dBm "House Level", 10,000 ohms at minimum sensitivity

Input Circuit: Transformer isolated, balanced bridging.

Frequency Response: 20-20 KHz ± 1 dB (all modes).

Rise Time: Less than 250 MicroSec (Peak Mode), less than 25 MilliSec (Fast Averaging Mode). Approximately 300 MilliSec (Optional VU Standard).

Fall Time: (All Modes) About 300 MicroSec from full scale.

Modes of Operation: Peak Reading, Fast Averaging (Apparent Loudness), Slow Averaging (USA VU-Standard).



ES 562/564

SIX DIGIT CLOCK/TIMER WITH MEMORY \$301

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. Five 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 removed, through two rear-mounted five pin connectors (Option R or Option D). These controls are Clock, Fast/Start, Slow/Stop, Timer and Hold.

Display: Six digits of .55" Planar Gas Discharge Display.



ES 280 \$500
AUDIO TIME CODE GENERATOR/READER

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.

80 SERIES

JUMBO CLOCKS AND TIMERS

Large, bright 1 1/2" 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. \$262

ES 184 SIX DIGIT, 24 HOUR CLOCK: Otherwise identical to the ES 182 \$262

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. \$304

ES 381 UP/DOWN TIMER: Similar to ES 380, except that leverwheel preset is used. \$400

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.

80 Series slaves are also compatible with other ESE clocks and timers ES 112/124, 301, 302 and 510. \$219

Dimensions: 4 4/5" High x 10 3/8" Wide x 6 5/8" Deep.

ES 510L 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.

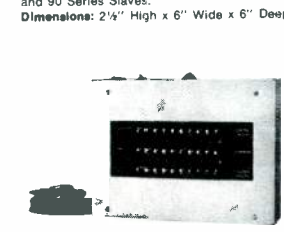


ES 510L

FOUR DIGIT 60 MINUTE TIMER \$155

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.



ES 203/205

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 either an ES 400 or ES 510 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 8" x 2".

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. \$468

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. \$338

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. \$432

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. \$432

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

ES 301/302 100 MINUTE UP/DOWN TIMERS \$225 \$288

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.

ES 302 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 302 can drive 80 Series and 90 Series Slaves. Displays are gas discharge. .55" high.

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.

ES 302 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 302 can drive 80 Series and 90 Series Slaves. Displays are gas discharge. .55" high.



ES 301/302

100 MINUTE UP/DOWN TIMERS \$225 \$288

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 1/4" High x 8" Wide x 6" Deep

ES 302: 2 1/4" High x 10" Wide x 6" Deep.

ES 206 VIDEO TIME AND DATE GENERATOR \$550

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 270 IRIG B TIME CODE READER \$350

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. .3" character height. ES 270 comes in a rack mounting enclosure, 1 3/4" High, 19" Wide and 10" Deep.

The power requirement is 117V AC, 50/60 Hz, 230V AC, 50 Hz is available as an option.



142 Sierra Street El Segundo, CA 90245
(213) 322-2136

FCC update

September 1981



First Class License eliminated

The FCC has eliminated the First Class Radiotelephone Operator's License. The license was required for people who installed, repaired, maintained and supervised radio and TV broadcast transmission equipment. The license was obtained by passing an FCC examination covering broadcast rules and regulations and broadcast technology.

The examination issued for the first class was thought to be obsolete as well as costly. The applicant's understanding of the portion of the exam that relates to practical operator abilities was believed to be best determined by a hands-on approach, using actual broadcast equipment.

By eliminating the license, present holders of all classes of commercial

operator licenses or permits (with the exception of the Marine Radio Operator's Permit) are allowed to perform all operating and maintenance duties at broadcast stations. This includes persons with limited technical training who had previously performed the basic operating procedures. Station licensees bear the responsibility for evaluating the competence of technical personnel.

What was once the Second Class Radiotelephone Operator's License will in the future be called the General Radiotelephone Operator's License. In order to qualify for the general license, applicants will be required to successfully complete the requirements embodied in the current second class license. Once this procedure goes into effect there will not be any further issuance of the First or

Second Class Radiotelephone Operator Licenses—only the General Radiotelephone Operator Licenses. Upon renewal, persons holding either the first or second class licenses will receive the General Radiotelephone Operator License. The commission will release a public notice when the General Radiotelephone Operator Licenses are ready to be issued. (General Docket 20817)

The relaxed licensing requirements for radio operators of AM, FM and TV broadcast stations adopted by the commission in the Fourth Report and Order in Docket 20817 became effective on August 7, 1981.

Chairman Fowler testifies at House Oversight Hearings

In his first appearance before the House Oversight Hearings, FCC Chairman Mark Fowler recently established five specific objectives toward which the commission would devote its energies. They are:

- To create, to the maximum extent possible, an unregulated, competitive marketplace environment for the development of telecommunications;
- To eliminate unnecessary regulations and policies;
- To provide service to the public in the most efficient, expeditious man-

CAMRAPROMPTER

Cinema Products' unique film/video camera prompting system: low-cost, compact, light-weight, easy to set up and simple to operate!

- Bright, easy-to-read script. Ultra-silent operation.
- The *Camraprompter** utilizes a clear acrylic optical flat (set at a 45° angle in front of the camera lens) which acts as a mirror reflecting the back-lit script "scrolls." The system functions with virtually no light loss to the lens.

- A small remote control unit provides continuously variable speed control (forward or reverse). Permits convenient self-pacing by "on camera" subject. Script can also be easily read and controlled from the side of the *Camraprompter* unit.

- Entire system is powered by standard 12V battery pack or belt.

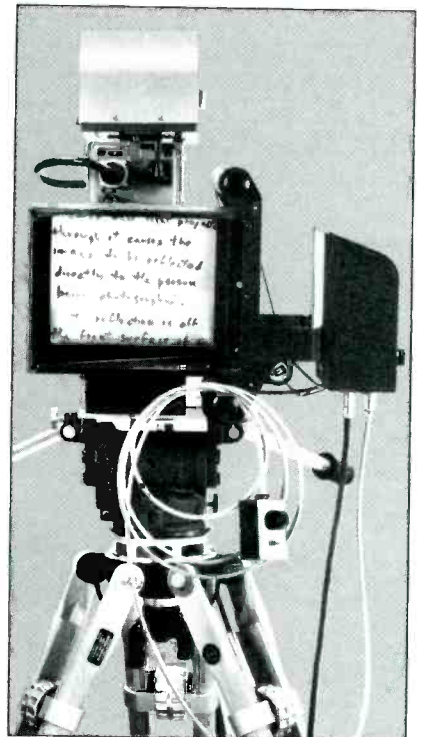
For further information, please contact:

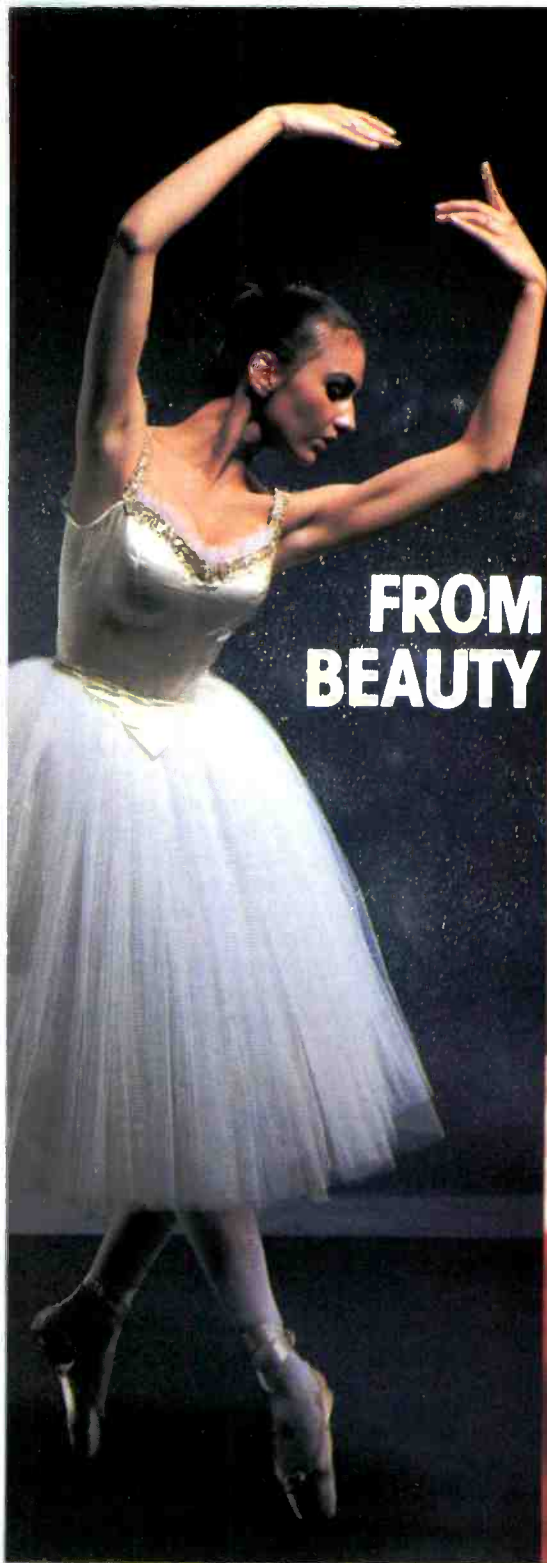
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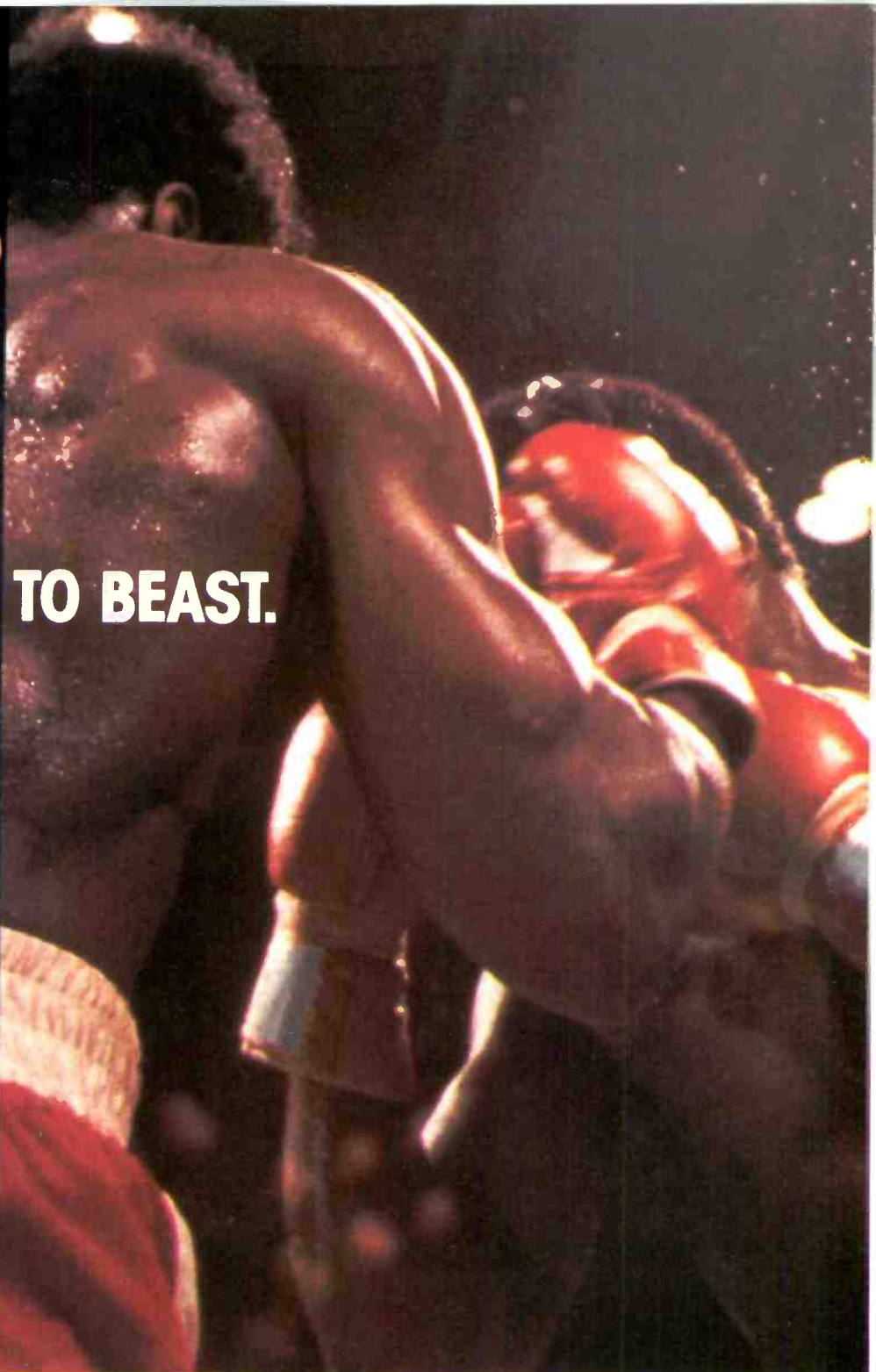
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Circle (8) on Reply Card

FCC update

- ner possible;
- To promote the coordination and planning of international communications, which assures the vital interests of the American public in commerce, defense and foreign policy;
 - To eliminate government action that infringes upon freedom of speech and the press.

Fowler stated that the FCC could not accomplish regulatory objectives under the current statutory framework. His staff is reviewing its functions in light of this framework

and has been requested to recommend to the commission any legislative amendments that would make the FCC more efficient and responsive to the public interest.

Fowler said, "The commission will present...this fall a comprehensive legislative package and work in close cooperation with the Congress to secure the passage of legislation necessary to achieve regulatory objectives we have established."

Courtesy of NRBA

Use of TV aural subcarriers authorized

The FCC has amended Part 73 of the rules and regulations to authorize the

use of subcarrier frequencies in the aural baseband of TV broadcast transmitters. The commission revised the rules to meet the expanding use of electronic newsgathering (ENG) techniques in TV news programming. This was done to facilitate coordination and cueing between stations and the field crews operating ENG equipment.

A station using this technique would mix transmissions from the station to the field crew with the audio portion of its broadcast signal, which is the frequency baseband used for sound transmissions within the station's assigned channel.

The commission will not require licensees to submit any specific filing or request authorization to begin using the subcarriers. The rules will, however, require that sufficient aural transmitter performance measurements be taken while the subcarrier is in operation to show compliance with the noise and sub-channel to main channel crosstalk specifications. Records of the transmitter changes and measurement procedures and results are to be retained in station files. If a station's aural transmitter is not readily adaptable to subcarrier operation, the licensee should consult with the manufacturer. Amendment of Part 73 of the rules was effective August 28, 1981.

Emergency shutdown rule proposed

On April 13, the National Aeronautics and Space Administration (NASA) told the FCC it was receiving severe interference to its space shuttle's landing site. The interference was caused by TV electronic news gathering (ENG) equipment which, although meeting FCC standards, was nonetheless causing harmful interference due to the extremely sensitive equipment NASA was using. (Operators of the equipment stopped using it voluntarily and the interference was eliminated before the shuttle landed.)

The FCC is concerned about situations in which it might be necessary to act on a moment's notice, which would not allow time to seek voluntary cooperation, to eliminate interference to vital communications. A rule was proposed giving the commission power to temporarily suspend the operation of interfering equipment until the emergency has passed. The chief of the commission's Field Operations Bureau would have the authority to administer the rule. The proposed rule would only be used when an immediate threat to life or property exists and when offending users do not cooperate promptly to eliminate the interference themselves. □

Case History #437

Electronic News Gathering is one of the toughest environments a microphone will ever encounter. Every mike we've seen has compromised the demand for low handling noise, fine audio quality and virtual indestructibility.

Credit the NBC Electronic Journalism Department/Operations and Engineering in New York for putting the Electro-Voice DO56 shock-mounted omni in the field. Although originally designed as an on-camera entertainment and MC's microphone, NBC found the DO56 to be the microphone that provides an audio signal commensurate with video in real-life crisis situations. In these situations audio often takes a back seat to video,

Electro-Voice DO56 Shock-Mounted Omnidirectional Microphone

pushes, the shoves, the rubs and finger taps in stride. And when handling *really* gets rough, the DO56's unique internal shock mount virtually eliminates the bell-like clang transmitted by other shock-mounted mikes.

Congratulations to the NBC Electronic Journalism Department in New York. You found the solution—the DO56.

For an in-depth description of this and other case histories, get on the Electro-Voice "Mike Facts" mailing list. Write on your letterhead to Mike Facts, c/o Electro-Voice, 600 Cecil Street, Buchanan, MI 49107.

resulting in a final product that doesn't accurately reflect the broadcaster's professional standards. NBC discovered that the DO56 takes the

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"ONE INCH" AUDIO FROM NEVE.

There is one audio mixer that complements the new 1" VTRs. Designed for both production and post production needs, the Neve 542 Series is available in 8 models with 6 to 16 inputs, including a truly portable Ni-Cad powered 8 input suitcase mixer. With Neve's superior quality and support at an affordable price, you can be assured that your audio productions will do justice to your new (or existing) TV and video facilities. Please call or write today for Neve's comprehensive TV audio console information package.

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Suitcase Mixer
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Other 542 Range Mixers:
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Table Drop Through
Model 5452
12 or 16 Inputs

Model 5442
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Partial Listing of Recent 542 Range Customers:

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WNEW-TV • WTAE • WXXI

**Neve**

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Circle (5) on Reply Card

Xinhua news agency joins NEXIS news research service

News of China and the world, as reported by Xinhua, will soon be available in NEXIS, the international electronic news library.

Xinhua is the official news agency of the People's Republic of China. Founded in 1931 and China's official news agency since 1949, it is one of the world's largest wire services. The Xinhua file in NEXIS will include stories from the agency's world report. The bulk of the reporting will be political and diplomatic. Other subjects covered will include China's economy, industry, agriculture and foreign trade.

NEXIS is a computer-assisted research service that allows users sitting at video display terminals to search rapidly and efficiently through a large data base of stories—all in full text—from general and business news media.

French government supports videotext marketing programs

The new French government recently announced that it would pursue re-

cent videotext and teletext successes in the United States.

Louis Mexandeau, French minister of Post Office, Telecommunications and Telediffusion, cited the adoption of the Antiope standard for broadcast teletext tests being conducted on the West Coast by CBS, NBC, Group W (Westinghouse Broadcasting Co.) and KCET-TV, the positive results achieved recently in May with regard to a compatible standard between Antiope, Telidon and AT&T, and the orders obtained in the United States and Europe by French interactive videotext terminal manufacturers as the reasons for success.

Broadcast museum opens

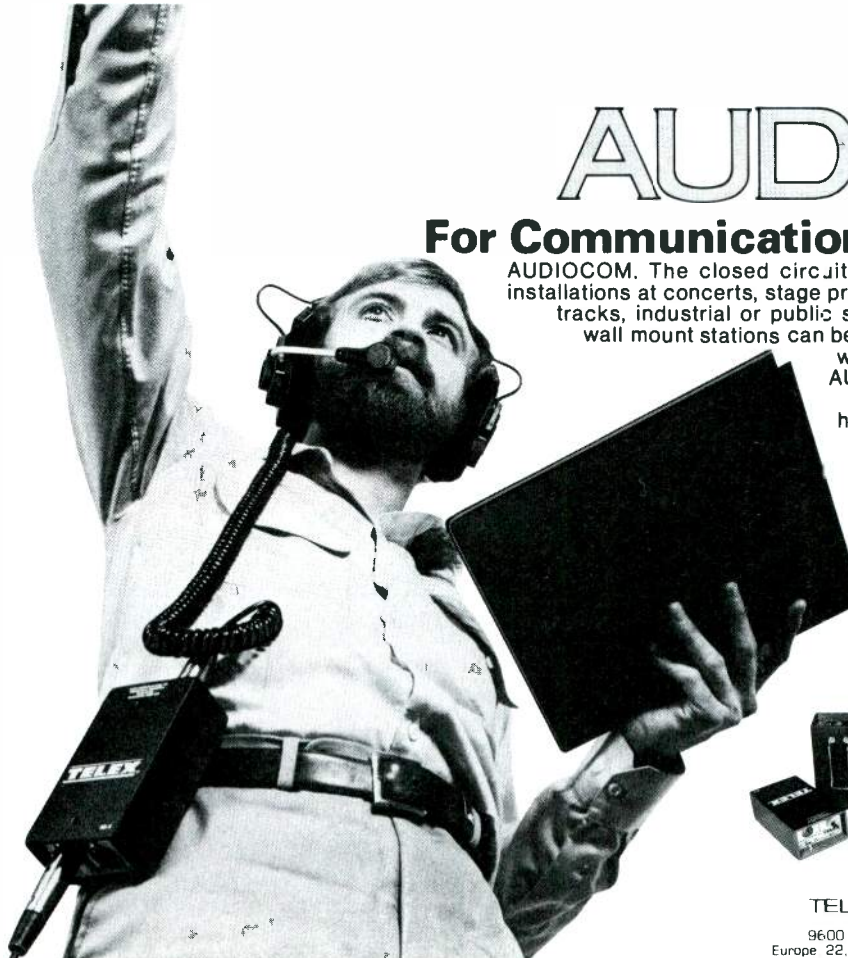
The Texas Broadcast Museum opened May 16, 1981, in Dallas. The museum covers 100 years of broadcast-related history, including antique cylinder phonographs and victrolas, radios from the '20s, early TV sets and 30 different kinds of phonograph records. Also, there is a detailed recreation of a '40s radio station, which works; and a replica of a 1957 TV station that includes four

black and white cameras and one of the first videotape recorders.

British Telecom launches first world videotext service

British Telecom launched Prestel as a world videotext service recently in the Netherlands, Sweden, West Germany, Switzerland, Australia and Hong Kong, marking the end of the market trial. Prestel will be launched in the United States later this year. It has been a commercially operating service in the United Kingdom since 1979, providing easy access through TV sets and telephone lines to a worldwide computerized database.

Prestel users worldwide, including Shell, Unilever and IBM now have access to closed user group facilities for intracompany transfer of information; to business-oriented information on shipping from Lloyd's of London and commodities prices in London, New York and Chicago, from Intercom Videotex. Also for the first time, users will be able to access the 185,000-page business and consumer database, available until now only in the United Kingdom. □



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AUDIOCOM. The closed circuit intercom for small, large, portable or fixed installations at concerts, stage productions, film or TV studios, stadiums or race tracks, industrial or public safety applications. AUDIOCOM belt packs or wall mount stations can be "daisy-chained" by the dozens over five miles without degradation in signal quality or strength. AUDIOCOM interfaces with other sound systems and telephone circuits. AUDIOCOM includes headsets, mics, cables, switchboards, signalling kits, even battery packs for remote locations; the complete intercom system for communications behind the scene.

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NRBA

**National Radio
Broadcasters' Association**

1705 De Sales Street, NW
Washington, DC 20036

Conferees reach compromise on radio regulation

At noon on July 27, after five days of debate and negotiation, Senate and House budget reconciliation conferees concluded an agreement on radio regulation for inclusion in the budget bill.

Senate Republicans fought for definite license terms and deregulation for radio. House Democrats refused to accept deregulation as part of the budget bill. Finally, faced with the deadline for completing the budget, a compromise was formed.

The following items were agreed upon:

- 7-year license terms for radio
- No license fees

- Lottery for new competing license applications
- Language to prohibit or discourage malicious or frivolous petitions to deny
- 5-year license term for television.

Bocock elected NRBA regional director

Because of a tie-vote in Region VII, NRBA has held a special run-off election for that region. The winner of the 2-year term is Jim Bocock, manager/radio of WSIX in Nashville, TN. Bocock is the former owner of WARV in Warwick, RI and was general manager of WRXL/WRNL in Richmond, VA.



**National Association
of Broadcasters**

1771 N Street, NW
Washington, DC 20036

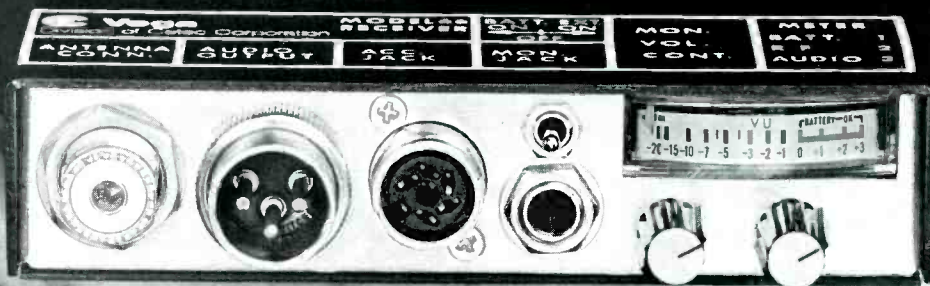
NAB requests hearing on DBS

The NAB recently petitioned the FCC to hold a hearing on the application of the Satellite Television Corporation (STC) of the Communications Satellite Corporation (COMSAT). "Many of the momentous issues raised by STC's proposal for DBS service have never been faced by the commission," NAB said. "They deserve the fullest possible airing before the commission sets a new course in national telecommunications policy."

The NAB detailed the broad-based legal and economic barriers that prevent the FCC from granting STC's application. Not only does Section 307(b) of the Communications Act bar the authorization of a non-local broadcast service such as STC plans to provide, but, NAB said, COMSAT's statutory charter, contained in Section 305 of the Communications Satellite Act of 1962, limits COMSAT to operating as a common carrier.

STC's proposed system, NAB said, would adversely affect the public by jeopardizing local TV stations, particularly subscription TV stations, and

The Ultimate PORTABLE RECEIVER for wireless microphones



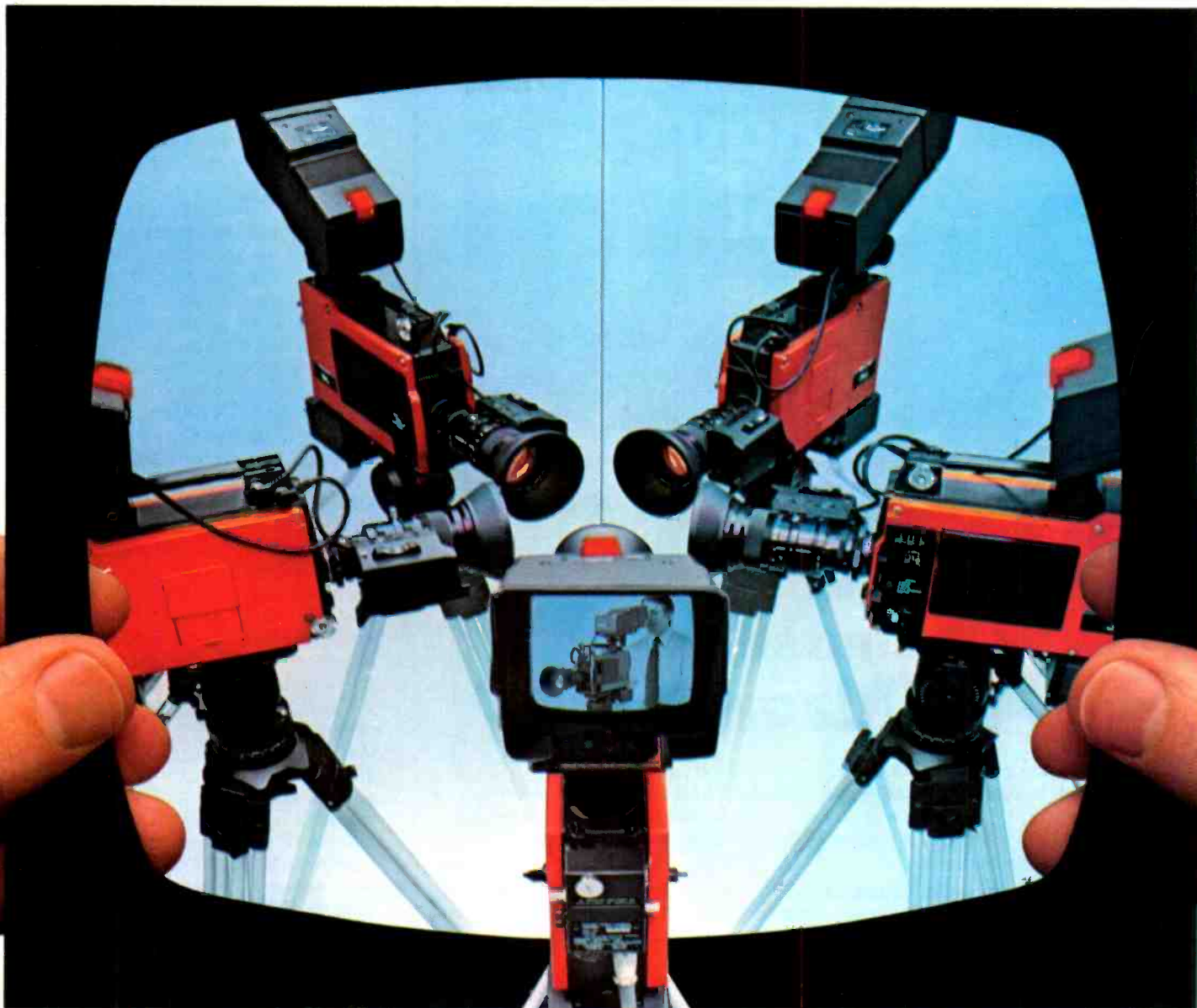
Vega offers the most advanced portable receiver in the industry. The Model 66 provides operation superior to the highly successful Vega Model 58 or 67, but in a rugged single unit that is much smaller. (Dimensions: W 5.4" x H 1.3" x D 6.25") Designed for the professional sound user, the 66's compact size makes it suitable for mounting to leading portable recorders, both audio and VTR's. The unit operates from either internal 9V batteries or an existing D.C. voltage source. Contact Vega for complete specifications on this exciting unit.

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COMPARE PERFORMANCE:

The KY-2700 holds registration specs to a tight 0.1, 0.2, and 0.4%, for crisp clean pictures. That's stability!

The KY-2700 has dual-edged vertical and horizontal contour correction for the detail and sharpness you require, 500 lines resolution, and for virtually noise-free video, 54db signal to noise. That's performance!

COMPARE FEATURES:

A fast, 14:1 Servo zoom lens, Automatic Beam Control (ABC), Automatic White Balance with memory, Automatic Black Stabilizer circuit (ABS), a low 18 watt power consumption for extended battery operation, "Instant On"

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The new KY-2700



performance. And much more. That's a lot.

COMPARE VALUE:

No other professional 3-tube color camera can match these specifications at a price even near the KY-2700.

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Or write US JVC Corp., Dept. BE 9/81, 41 Slater Drive, Elmwood Park, NJ 07407.

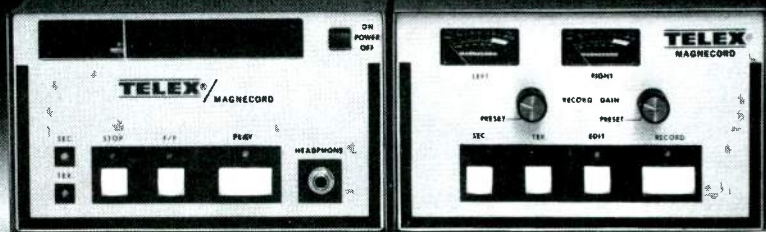
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CANADA: Telak Electronics, Ltd., 100 Midwest Road, Scarborough, Ontario M1P3B1, Telephone: 416-752-8575

Circle (13) on Reply Card

Associations

cause the loss of significant locally oriented programming such as news, public affairs and community information. NAB pointed to STC's prediction that subscription TV stations would lose from 40 to 80% of their subscribers through the implementation of its system.

Not only does STC's application fail to demonstrate a need for its 3-channel service, but NAB said it will deprive the public of other uses of the spectrum space in the 11.7 to 12.7GHz band, such as governmental, educational, medical and other public service uses, as well as the development of high-definition television.

STC's application also poses serious questions under the commission's multiple ownership rules, NAB said, by asking the FCC to give it something no other broadcaster is permitted to have—multiple broadcast channels in every market of the country. Although NAB supports the lifting of all multiple ownership regulations from broadcast television, cable and STV, as long as the commission applies the rules to terrestrial broadcasters, it should apply them to DBS operators, as well.

The FCC has always required broadcast applicants to demonstrate that they are financially qualified to build and operate the facilities they are proposing. Yet, NAB noted, STC has not shown it is qualified to construct and operate its proposed system. NAB said that STC's bank financing had not been secured, its proposed capitalization by COMSAT was unsupported, and its reliance on anticipated revenues was not permissible.

If any DBS application is to be granted, NAB said, the commission should establish a pool of qualified applicants to choose from, because haste would not benefit the public.

NAB supports congressional decision

Vincent T. Wasilewski, NAB president, applauded a recent Congressional budget reconciliation conference vote on communications matters. The unanimous vote by House and Senate conferees includes an extension of a radio station's license term from the present three years to seven years, and the extension of a TV station's license from three to five years.

"The National Association of Broadcasters is extremely heartened by this action," Wasilewski said. "This is an important step toward our overall goal of full First Amendment freedom for broadcasting." □

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is a microprocessor based editing system designed to operate with most 3/4-inch and 1/2-inch VCRs without any modifications. Simple, rugged, and reliable, it provides you with outstanding performance and features, in a variety of configurations at an attractive price. A 2-year unconditional guarantee assures your uninterrupted use of the product. Furthermore, you may satisfy your future production growth with our 100% trade-in provision towards the purchase of any of our "Executive" line of advanced editing systems.

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"The Originators"

Centro orders 15 Ampex VPR-2Bs

Ampex Corporation has announced that it has received an order to deliver 15 VPR-2B helical scan VTRs valued at more than \$1 million to Centro Corporation, San Diego, CA.

Centro, a wholly owned subsidiary of Skaggs Telecommunications Service, specializes in the design engineering and construction of mobile and studio production systems. The Ampex VPR-2Bs will be built into the studios and mobile vehicles to be located throughout the United States.

The Ampex VPR-2B is an advanced version of the VPR-2 that offers a reverse slow motion capability together with other new features and improvements. The newest option of the VPR-2B allows true-frame playback in stop motion. The true-frame playback option doubles the resolution in still frame and can achieve dramatic picture improvements in many instances.

RCA Corporation, Columbia Pictures to market home video

RCA Corporation and Columbia Pictures Industries Inc. recently announced the formation of a joint venture for the marketing of home video entertainment programs throughout the world, excluding the United States and Canada.

Under the new arrangement, the joint venture will develop a worldwide organization, with offices in principal countries, to market existing and future theatrical and TV programs produced by the participating organizations and other producers, as well as original productions created specifically for the home video market.

RCA Records' video music programs and RCA "Select-aVision" programs will also flow through the venture. The venture will handle all formats for home video, including various cassette and disc systems. RCA Records' international subsidiaries will provide sales and support services to the joint venture's branch operations in major markets around the world.

Intelsat establishes full-time TV relays

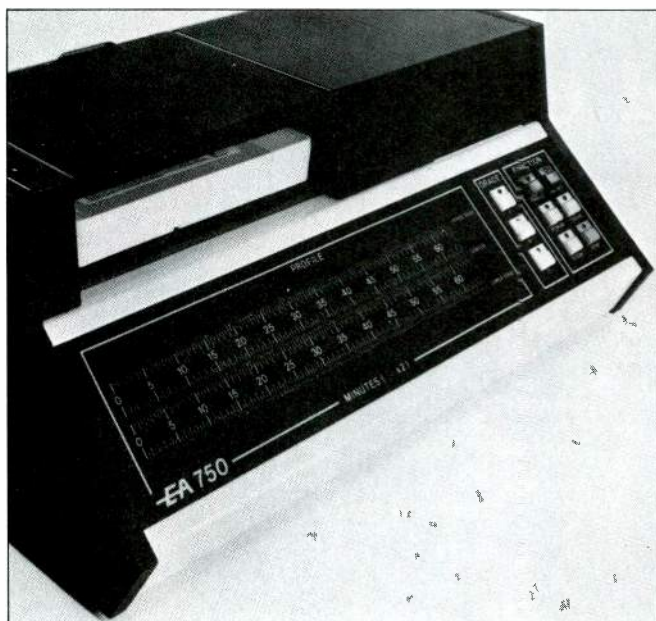
INTELSAT has established a new service for full-time international TV relays.

INTELSAT is the 106 member-country organization that owns and operates the global satellite system that provides about two-thirds of the world's international transoceanic telecommunications and virtually all overseas television relays. The INTELSAT system today provides virtually 100% of the world's overseas television relays.

The new service will cover channels of between 18 and 36MHz and will be available on either global, hemispheric or spot beam transponders.

Rank Cintel Mark III to receive Emmy

The Rank Cintel Mark III Flying Spot Telecine—a machine process that simplifies the conversion of motion picture film to video—has been selected to receive an Emmy for outstanding achievement in engineering development. The award will be presented Sept. 12 at the Emmy Awards Banquet at the Los Angeles Bonaventure Hotel. The Mark III has the capability of producing a positive picture from negative film, which yields much improved resolution and picture contrast. □



Elcon Video Cassette Cleaner and Evaluator

Are your new, 3/4 inch cassettes sometimes below "Master Stock" quality? Are you throwing away serviceable cassettes? If you're finding out too late about your stock, or want to be sure about the quality of your cassette inventory, you should take a new look at your 3/4 inch cassettes with the Elcon EA 750 Cleaner/Evaluator.

Features

1. Three front panel illuminating LED displays identifies the location of video dropout, upper edge and lower edge damage.
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Facts from Fluke on low-cost DMM's

Our new 4½-digit bench/portable: You've never seen anything like it.

Take a close look at the face of this instrument. Notice anything new? If you just realized you've never seen *words* on a low-cost DMM display before, you're on the right track.

This is the new 8050A from Fluke, the *lowest* priced 4½-digit multimeter available that uses microprocessor technology.

The legends on the LCD are clues to what makes the 8050A unique.

dB: You're right. The 8050A delivers direct readouts in dBm, referenced to any of 16 impedances. Use the "REF Z" button to scroll through the memory and locate the zero dBm reference you need,

then set it and forget it. No more tedious calculations or conversions.

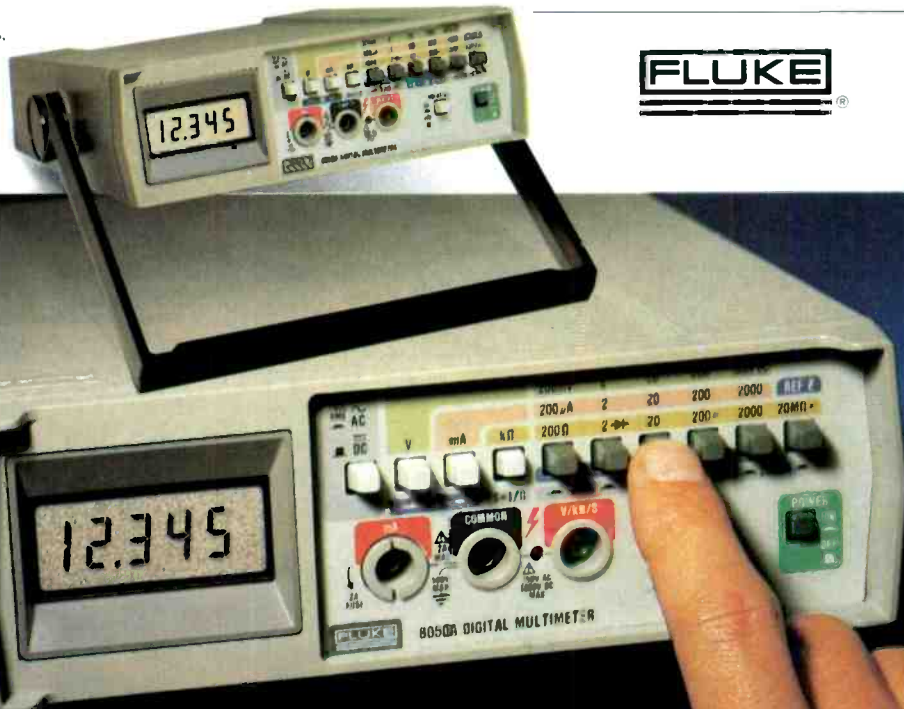
REL: For relative references in the dB mode or offset measurements in all other functions. Lets you store any input as a zero value against which all others are automatically displayed as the difference. Another timesaving convenience.

HV: Just a reminder when your input is over 40V, so you won't forget about safety while in the dB or relative modes. Of course there's much more to the

8050A. True RMS measurements to 50 kHz. Conductance for measuring resistance to 100,000 Megohms and leakage in capacitors, pcb's, cables and insulators. Diode test, 0.03% basic dc accuracy and full input protection. Plus a large family of accessories. Just \$369 U.S.

For all the facts on the versatility and value of the new 8050A, call toll free **800-426-0361**; use the coupon below; or contact your Fluke stocking distributor, sales office or representative.

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BE 9/81

- Please send 8050A specifications.
- Please send all the facts on Fluke low-cost DMM's.
- Please have a salesman call.

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For technical data Circle (16) on Reply Card



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This flawless performance comes from our AST™ tracking system option. After all, we invented the AST using a flexible bi-morph strip to optimize head-to-tape contact over the entire deflection range.

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Two accessories from Ampex can really make a difference in your total production capabilities. And each are top performers in the Ampex tradition.

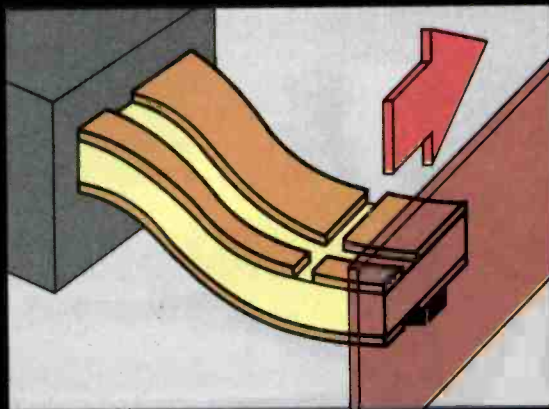
Take our STC-100 Multipoint Search To Cue. Its memory can store up to 99 auto cue points or 99 still recordings for quick recall. In addition, the STC-100 can store its memory on tape for recall by another STC-100 in another location.

Now add our SMC-100 Slow Motion Controller and you've got remote speed control for operations like normal speed playback, variable slow motion in forward and reverse, freeze frame, variable speed shuttling, and automatic cue point.

The Ampex Edge. It's experience. It's design excellence. It's performance when and where you need it.

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SMC-100 SLOW MOTION CONTROLLER



STC-100 MULTIPOINT SEARCH TO CUE

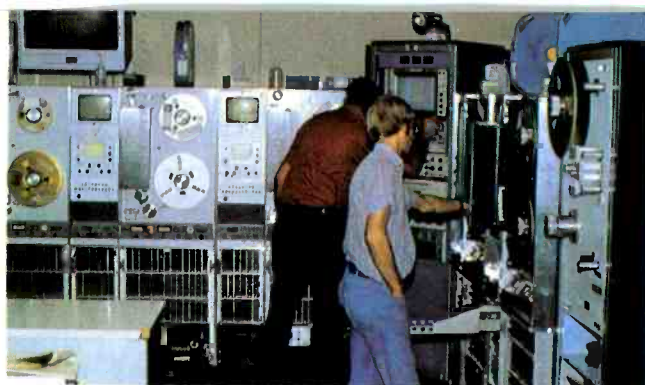
AMPEX

Ampex Corporation, Audio-Video Systems Division
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415/367-2011

Circle (17) on Reply Card



The Master Control Room line monitor racks with switcher control.



Tom Feters and Paul Rediger check out the setup of an RCA TR60 VTR.



Automation CRT with display and keyboard.



Mobile earth station at Network Operation Center for the network interconnection with PBS.

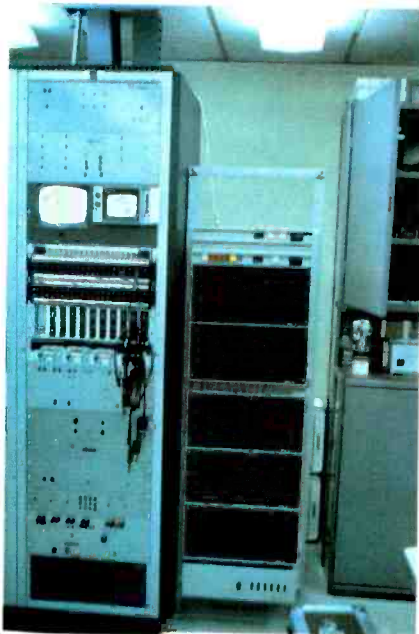
Case study:

The Ohio Educational TV Network

By Willis I. McCord, director of engineering, Ohio Educational Television Network, Columbus, OH; and Carl Bentz, technical editor

The Ohio Educational Television Network Commission is a state agency with the responsibility for ensuring the orderly, efficient growth of educational television throughout the state

Portions of this article were presented at the National Association of Educational Broadcasters Convention.



Alarm Rack by Dantel.

of Ohio, and of providing a high quality ETV off-air signal to all Ohio residents. The project involves working with the multiple licenses of 12 ETV broadcast TV stations for program dissemination via a microwave interconnect system; a single massive tape duplication center and statewide program library; a program development system for statewide use; and a subsidy that enables an adequate broadcast schedule for all citizens, regardless of the relative size and/or financial well-being of the station serving a particular area of the state.

Development and scope

The project was funded by the Ohio General Assembly in 1969. Work on the facilities began in 1970 with the construction of six new transmitting plants. That same year, the Network Operations Center (NOC) in Columbus was established and equipped and a system of duplex microwave communications was created with the 12 transmitter/remote origination studio facilities that comprise the network. Translators fill areas not adequately covered by the principal stations, so that signal is available over 41,000 square miles to a population of 10,700,000—75% of which is urban. Computerization handles the bulk of

programming traffic control with an extensive automated machine control system. Finally, the network provides program services 17 hours a day, 365 days per year and is available to all areas of the state. The programming from the Ohio Educational Television Network exceeds 22,000 hours fed by microwave per year.

The state of Ohio is served by 12 UHF educational broadcast TV stations:

Akron	WEAO/49	210kW ERP
Alliance/ Salem	WNEO/45	1820kW ERP
Athens	WOUB/20	479kW ERP
Cambridge	WOUC/25	550kW ERP
Cincinnati	WCET/48	2000kW ERP
Cleveland	WVIZ/25	1000kW ERP
Columbus	WOSU/34	1170kW ERP
Dayton	WPTD/16	2000kW ERP
Lima/ Bowling Green	WBGU/57	740kW ERP
Oxford	WPTO/14	740kW ERP
Portsmouth	WPBO/42	525kW ERP
Toledo	WGTE/30	1000kW ERP

Several factors determined the size of the transmitting plants: the size of the area to be served, city populations, coverage comparability desired with other stations and cost considera-

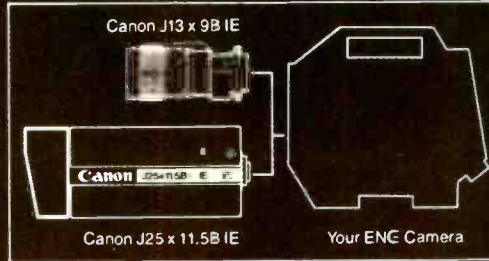
Two Assignments

Canon J13x9B IE plus Canon J25x11.5B IE and your camera

Two assignments, one location. For example, get great action shots of a football game and also get player interviews at half-time. You can do it with one cameraman and one camera—like the one shown here—with Canon's amazing E.F.P. lenses. Here's how:

Mount our J25x11.5B IE on a tripod at your principal location. It's 2/3" system was designed specifically to work with ENG cameras, yet this lens provides a 25-to-1 zoom ratio, power zoom and focus, automatic iris and the image quality you'd expect from a Canon broadcast lens. Another choice is the Canon J20x8.5B IE, with a 20-to-1 zoom ratio. (Both these lenses have built-in extenders, too!) With your ENG camera attached, you've got full capability.

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Canon J13x9B IE and head for the locker room!

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Electronic Field Production is a reality. A practical reality because you don't have to send two crews or even two cameras to a single location if all you really need is one ENG camera and two Canon lenses. And, costs notwithstanding, sometimes you just don't have enough cameras to go around. Selecting the right combination of Canon lenses could actually double the utility of the ENG cameras you already own. And that's something even your accountant can appreciate!

Find out more. Use the coupon or write on your letterhead for the facts on the Canon J25x11.5B IE and J20x8.5B IE lenses, as well as our popular J13x9B IE. We'll also be happy to arrange a practical demonstration for you. A very practical demonstrator!



Canon

Optics Division

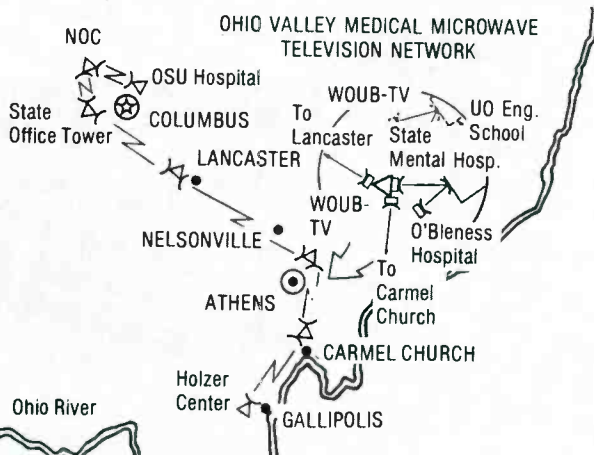
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LOCATION	MILES	GHz
OSU Hospital To NOC	1.8	12
NOC To State Office Tower	3.9	12
State Office Twr. To Lancaster	29.5	6
Lancaster To Athens	34.4	6
WOUB-TV To State Mental Hosp.	3.16	12
WOUB-TV To O'Bleness Hosp.	3.16	12
WOUB-TV To Carmel Church	19.95	8
Carmel Church To Holzer Center	16.6	12



Ohio Valley Medical Microwave Television Network.

Ohio ETV

tions. The number of stations has been influenced by the area of the state, geographical distribution of the cities, transmitter plant considerations, the need to reach every citizen, and budgetary constraints.

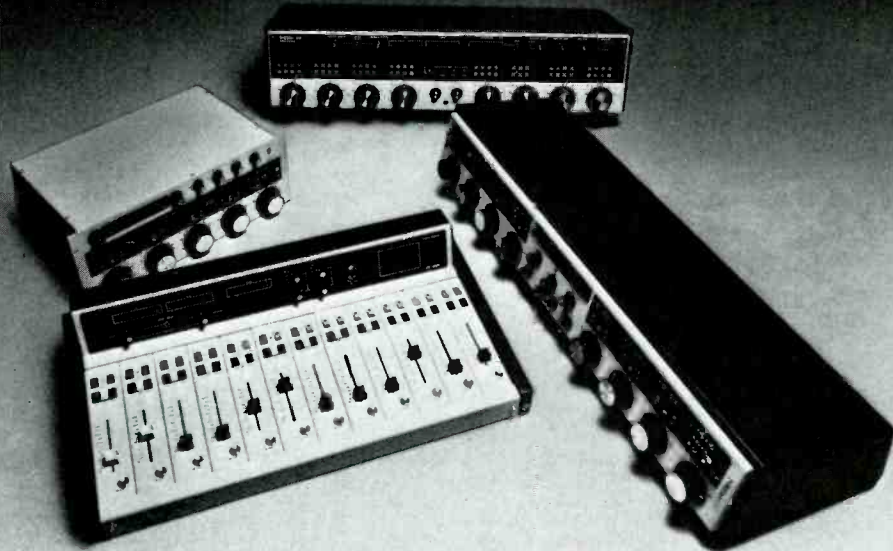
Towers for the stations, ranging from 400 to 1200 feet AGL in height, are designed for minimum twist and sway because high gain, narrow beam antennas are sometimes used. For stations where ERP may seem much lower, the tower height places the average antenna height at a point above average terrain to put "predicted" signals on a par with stations of a much greater ERP, but with lesser antenna heights.

Regulations

Part 73 of the FCC Rules and Regulations states certain maximum ERP (effective radiated power) limitations: 100kW for low VHF channels; 316kW on high VHF frequencies; and 5000kW for UHF broadcasters. Signal ranges for the maximum power levels with a nominal 1000 feet average antenna height tend to show the relative handicap suffered by the UHF operator. Yet, using more nominal (and affordable) power levels will show that while the UHF 2000kW level does not yield a Grade B coverage commensurate with VHF stations having maximum power facilities, city grade and Grade A signal ranges compare favorably with the VHF values. An assumption must be made that the public is willing to use proper receiving antennas with orientation in the direction of the transmitting antenna. An on-going effort is needed to educate the viewers on reception of the signal. (Complaints have been received from viewers attempting to obtain the signal while using loop antennas on receivers in houses with aluminum siding.)

The network transmitters are either 30 or 60kW units. The 60kW transmitters employ two 30kW rated klystrons in the final amplifiers. All klystrons are operable in either aural or visual service. Based on 1977 prices, the cost of a 30kW remote-controlled transmitting plant with a moderate gain antenna on a 1000-foot tower was estimated at \$882,000. The ERP of the plant falls at about 600-700kW. For a 60kW plant with similar equipment, costs would be about \$1,149,000 for 1000-1250kW ERP. The 100-110kW remote-controlled transmitter, with a high gain antenna at 1250 feet would cost \$1,291,000 and provide 2000kW ERP.

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Field measurements

Field strength measurements were

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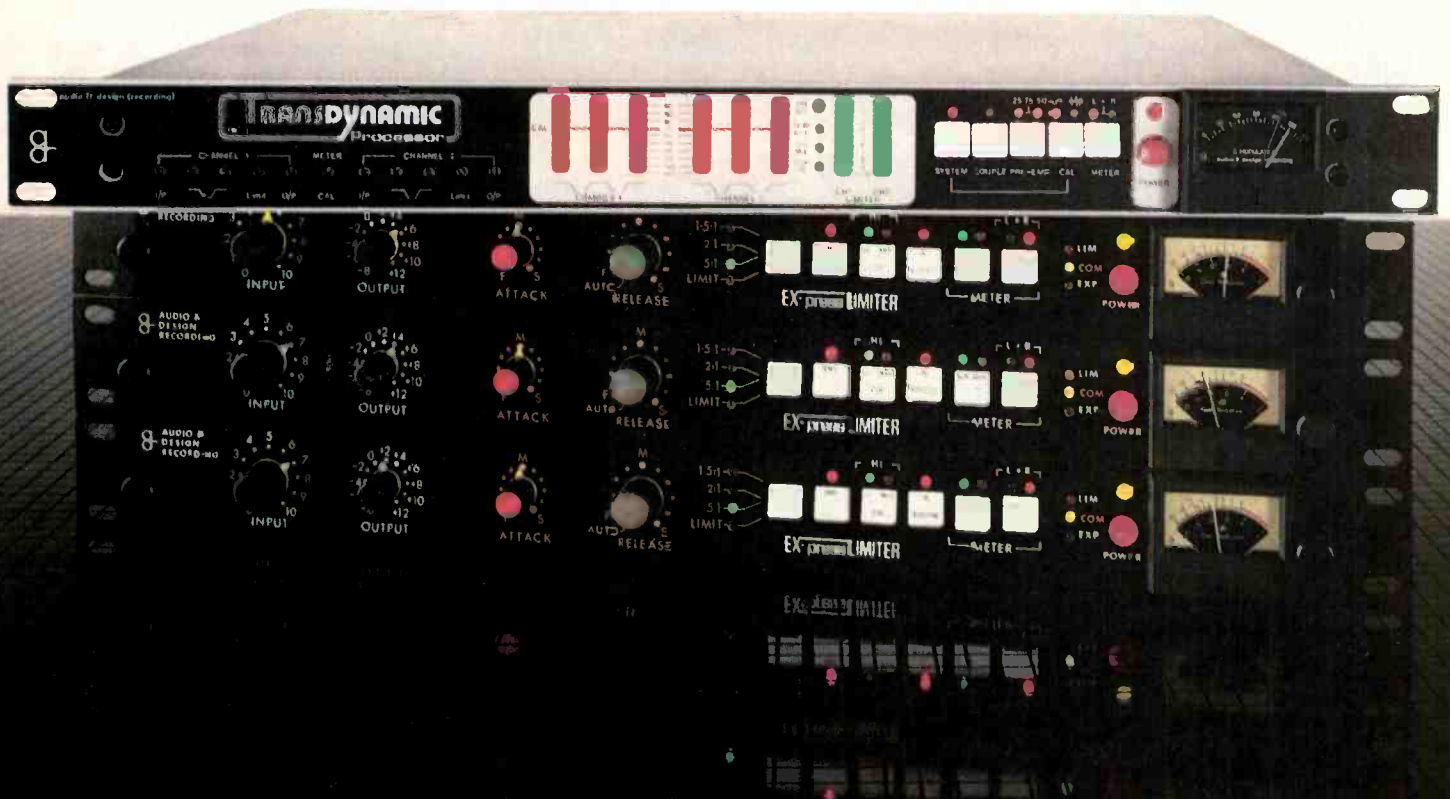
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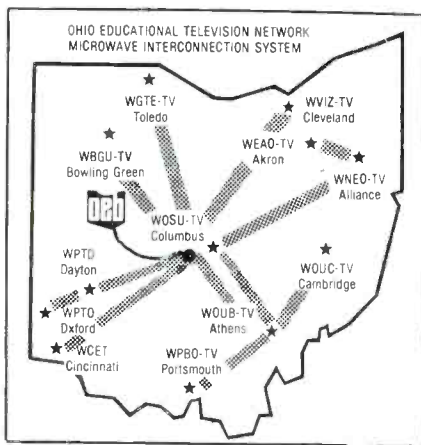
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Paths to network member stations.

Ohio ETV

made from all 12 ETV stations to prove compliance with specified and published coverage information and to determine where translators might be needed to fill nulls due to adverse terrain and low received-signal areas beyond Grade B contours. The surveys followed TASO techniques on eight radials inside and through the predicted Grade B contours (T6602 Standard). Many of the measurements were made under case conditions of dense foliage at predetermined locations in and around certain cities where radical variations in terrain or

man-made obstructions were encountered.

Having established appropriate translator locations, a computer study of channel frequencies was conducted to comply with FCC separation constraints. Required tower heights for specific areas and sites were submitted to the FAA to obtain a determination of "no hazard to air navigation." In addition, a narrative was prepared for the Environmental Protection Agency that considered such effects as tree removal and effect on soil and drainage, impact on wildlife, proximity of state or national recreational areas and game preserves, farmland taken out of productive use, and any adverse esthetic effects. Once all the requirements were fulfilled and applications filed with the FCC resulted in construction permits, ten translators were placed to fill coverage nulls—three at 100W output and seven at 1000W. The sites use Bogner B16U antennas, which offer power gains of 22.6dB over a dipole (15.7dB over Isotropic). Some directional antennas are used to conform to the area coverage needed. In areas of favorable topography, reception of good quality signals has been obtained with battery-operated portable receivers and ordinary whip antennas. The 100W translators provide pictures six feet above ground level at 16 miles distance; 1000W units extend the coverage to 20 miles.

The translators, all products of EMCEE (Electronics, Missiles and Communications Inc.), have operated in remote locations, unattended, with satisfactory service. Reliability has been exceptional and coverage exceeded design expectations. As a result, plans are under consideration for additional sites, one 100W and one 1000W. In addition, at some locations in the state with mountainous topography, where UHF signals cannot serve a large enough area to justify construction (or operation) of the 100 or 1000W systems, 10W units are being considered for future use. Until decisions are made, however, cable TV systems carry the ETV signals into a number of areas where off-air reception is problematic.

A note on translator operation is in order. Perspective ETV translator applicants should be aware of the increasing interest in low power television on UHF channels. When the translator is operated on an assigned commercial channel, or on a waiver, the channel must be relinquished if it is subsequently assigned for commercial operation. With a sizeable investment in equipment the ETV operator is in an untenable situation, unless he

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Setting standards since 1970, there are five different models available. The MP-8 and SP-8 are the undisputed cost/performance leaders for the broadcast industry. Both feature balanced output; 0.05% distortion; 68 dB gain; +8 dBm out(+21 dBm max.); S/N: -77 dB; ± 1.0 dB RIAA; remote scratch and brilliance activation. Our top-of-the-line ESP-38 features improved performance specs like 0.03% distortion, S/N of -90 dB, ± 0.25 dB RIAA and +25 dBm out. The SP-8 and ESP-38 are also available in rack mounting versions.

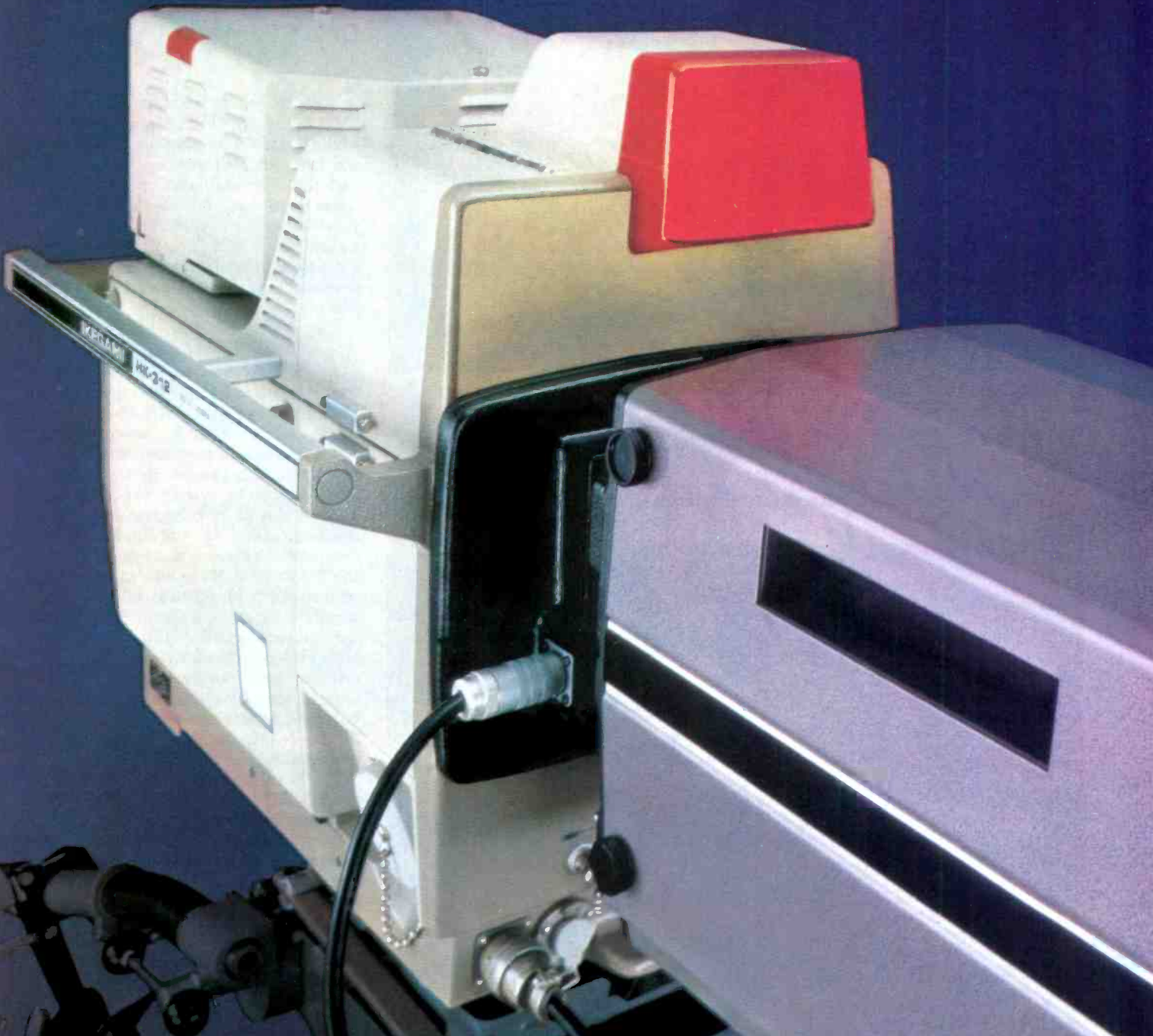
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Self starter

For a fast start, no other studio camera comes close to the HK-312. It comes air ready. Just unpack it and it'll give you superior performance the first time. And, it'll keep working. The HK-312 helped establish Ikegami's reputation for legendary reliability.

The HK-312 is also an extremely stable camera that doesn't require time consuming adjustment. Add the optional computer setup and you can trim your daily checkout time even more — to less than a minute. Computer setup that has already proven itself at many leading stations.

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superior picture quality and performance. High resolution. Superb colorimetry. Plus an excellent signal-to-noise ratio. And with Ikegami Triax, you can extend the normal 500 meter cable length to 1500 meters with no compromise in picture quality.

One simple demonstration will show you why so many networks and leading independents are convinced that the HK-312 is the finest studio camera ever built.

To get started, contact Ikegami.

Circle (22) on Reply Card

Ikegami

Ohio ETV



LEGEND

- Intercity duplex microwave system
- - - Network studio/transmitter link
- - - Network interconnect studio/transmitter link
- Private studio/transmitter link
- Ohio Valley Medical Television translator
- Microwave repeater/terminal

Outline of Ohio ETVN links.

is able to locate another acceptable channel assignment. The conversion of the translator to another UHF channel involves retuning the transmitter and receiver oscillators and in most cases will require replacement of receive and transmit antennas, at a considerable cost. The importance of employing a well-qualified consulting engineer and legal advisers becomes obvious.

Microwave linkage

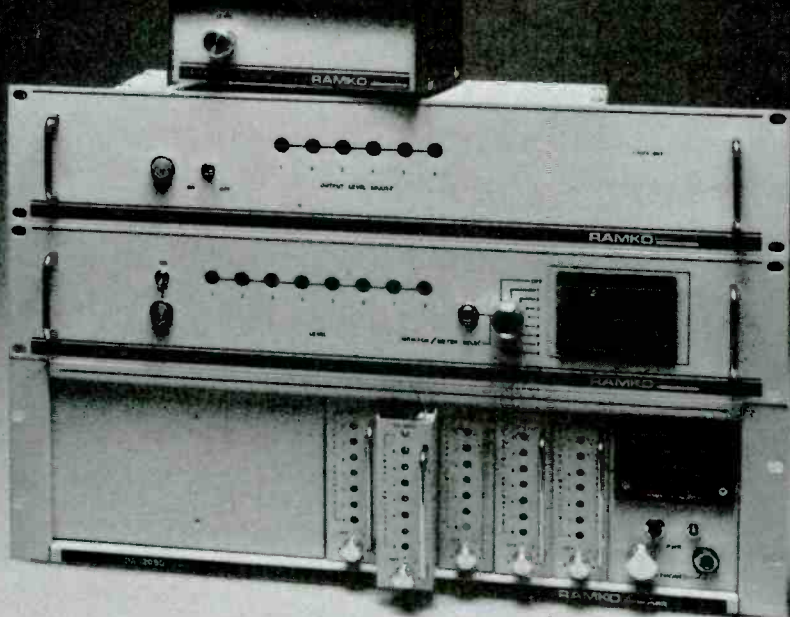
A full duplex microwave communications system is the backbone of the Ohio Educational Television Network, interconnecting seven major cities and nine state universities with the operations center in Columbus. The microwave system encompasses 2220 miles of microwave paths, 95 licenses, and 32 terminal/repeater locations. Frequencies involved lie in the 2, 7 and 13GHz bands. Most of the equipment is by Farinon and is completely solid state, featuring dual conversion receivers that allow operation with closely spaced RF channels and reduce interference susceptibility. Other features include balanced or unbalanced inputs and outputs, ease of tuning within each band and interchangeability of parts.

The aural portion of the TV signal (with 15kHz bandwidth) occupies a 6.7MHz subcarrier above the baseband video carrier. A double sideband suppressed carrier at 7.5MHz handles a maintenance orderwire system. The orderwire is a four channel party line multiplexed signal for engineering coordination, communications and program coordination from the operator at a remote site to the Network Operations Center (NOC). Alarms from all repeaters and terminals are received at the center. In addition, teletype interconnection is accommodated by the multiplexed channels. Considerable expansion capability exists for added message services and "DATE" stereo or multichannel audio circuits.

The alarms from the microwave system terminate in a display monitor panel at the NOC. That panel allows the duty operator to be aware of any transmitter power drop (3dB or more), automatic frequency control variance, loss of video, unmodulated signals, receiver carrier drops (to 5dB above threshold), total loss of signal, shelf alarms for receive and transmit, primary power failure, battery voltage low, excessive building temperatures, tower beacon or sidelight failures, and building intrusions.

System design involved a comprehensive computer study to ensure

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OHIO ETV INTERCITY SYSTEM
VIDEO LINK RF CHANNEL FREQUENCIES

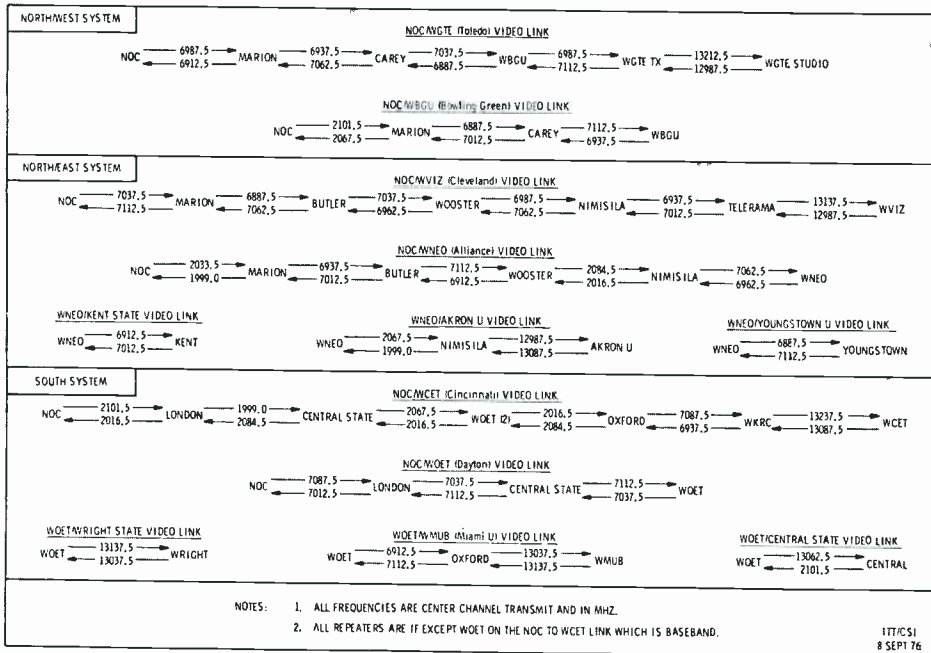


Chart of video link RF channel frequencies.

most efficient use of frequencies. The plan uses dual conversion receivers with high performance antennas using crossed polarization. As a result, co-channel frequencies are transmitted and received on the same tower in some cases. A study of weather and atmospheric conditions in the state for the last 50 years was of considerable value in establishing tower heights and path lengths to minimize weather related outage possibilities, specifications based on EIA standards RS250B. The link system has a design reliability of 99.99%.

Studies were conducted along 25 microwave paths ranging in length from a few miles to 33 miles. Path clearance was based on an earth radius of $K=1$ and a first Fresnel radius of $F=0.6$. All paths were calculated for fade margins of at least 40dB unfaded receiver carrier levels and are to be less than -38dBm. The fade margin is referenced to 33dB peak-to-peak video signal RMS EIA weighted noise ratio at the receiver output.

The microwave system has been quite reliable, requiring minimal maintenance. Morning fades are infrequent. The 13GHz links, one over

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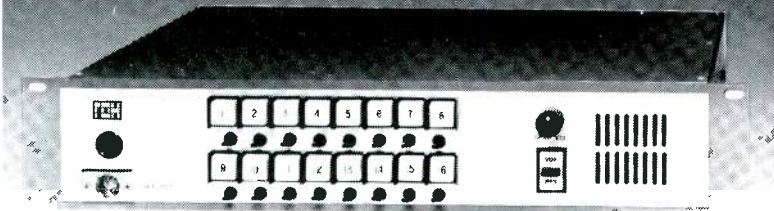
- Comprehensive servicing and support. Fully modular power supply, audio and transport electronics card frame. A small and highly dedicated dealer service network with factory trained and supported technicians.

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20 miles long, have not been rained out. During the 1977 blizzard the system remained in operation (some locations on backup battery), though some of the UHF primary stations were off the air because of ac power failures. No redundancy is available in terms of hot microwave standby equipment. A further study is, however, in progress for remote controlling of IF switching at relay points, to allow shunting around an out-of-operation link location in order to maintain system service.

The NOC

The Network Operations Center (NOC), adjacent to Ohio State University in Columbus, OH, serves as a routing and distribution facility for the affiliated ETV broadcast stations throughout Ohio. The central system element of the facility is the solid state routing switcher, accommodating 30 inputs, selectable to any of 30 output channels. All output channel line selector pads allow selection expansion for a future growth to 99 inputs. The selectors provide source-on-line and next up indications. A take button allows an operator to place the preview source immediately on the line or to provide a preroll of tape with an automatic delay of ten seconds before the on-line switch. Audio drop removes program audio from the source to the line; audio mix implements a 50% reduction in level for multisource mixing. A VU meter indicates effects of the 6dB level control of on-line audio. All operations of the switcher are under binary-coded decimal control for automation from the network computer. As an adjunct to the master routing switcher, another unit allows selection of 18 different sources for viewing in conference rooms or offices in the NOC building.

Because one foot of coaxial cable can contribute to a visible flesh tone error of two degrees, careful consideration was given to color error prevention. Potential problems exist when 20 or more video sources are being switched and routed. The sources—videotape, film islands and video processors are color timed. Selection of a supplier for switching facilities requires close attention to the care given by the manufacturer toward such timing problems through the switching matrix itself. The degree of accuracy should be less than one degree of error, for example, less than 0.77 nanoseconds. A concerted effort was made to achieve this accuracy factor throughout all areas of the Network Operations Center. All incom-



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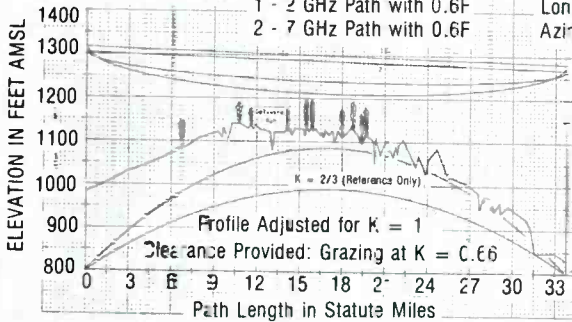
OHIO ETV INTERCITY MICROWAVE NETWORK

NOC (COLUMBUS)

Site Elevation: MARION RELAY
 Tower Height: 360 Ft. AGL
 Antenna Height: 2 GHz: 360 Ft. AGL
 7 GHz: 360 Ft. AGL

Frequency: 2 & 7 GHz
 Path Length: 33.8 Statute Miles
 54.3 Kilometers

Site Elevation: 829 Ft. ANSL
 Tower Height: 476 Ft. AGL
 Antenna Height: 2GHz: 454 Ft. AGL
 7 GHz: 440 Ft. AGL
 Latitude: 40° 00' 30"
 Longitude: 83° 02' 49"
 Azimuth: 353° 11' 41"



NOTE:
 An additional 2 GHz antenna was installed at Marion (354') and at NOC (425') providing two separate 2 GHz paths. These two paths are closely approximated by this Profile.

Path Profile
 MARION RELAY - NOC
 ITC COMMERCIAL SERVICES
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Ohio ETV

ing, outgoing and in-house signals are constantly monitored for compliance with the established standard.

Program recording

Nine RCA TR60/TR61 quadruplex videotape recorders and two RCA TK27 film chains fill the programming requirements of the affiliated ETV broadcast stations. All recordings at 15ips are highband color format. Quality of color tape playback from materials recorded at the NOC is controlled. Utmost care is taken to obtain the highest quality of which the tape is capable. Should the quality be substandard, signal processors or AD-DA frame store synchronizers help in obtaining an airable signal. The NOC averages a weekly total of 86 recordings or dubs for 53 hours of programming. Program feeds to the network average 500 (about 350 program hours) per week. These feeds may be carried by a number of lines simultaneously, for 22,000 plus hours of annual airtime transmission from NOC.

The computer system

To accommodate increased activities at the center, the Ohio ETV Network Commission contracted Vital Industries of Gainesville, FL, to design a fully computerized system. The system has brought the network the reputation of having the most sophisticated educational TV network in the country. The system consists of two processors—Nova 2 and Nova 3—which are interconnected. Each accesses ten megabytes of disc memory.

Each station communicates via microwave with the computer from a Texas Instruments Silent 700 terminal to find what programming is available, including PBS offerings, libraries of other events and taped university courses. The station arrives at an affiliate schedule, stating what

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OHIO ETV INTERCITY NETWORK
 END TO END PREDICTED PROPAGATION AVAILABILITY

VIDEO LINK	HOPS	HOP FREQS (GHz)	LINK LENGTH (Statute Miles)	PREDICTED ANNUAL OUTAGE (Seconds)	PRE-DICTED AVAIL. ABILITY
NOC-WVIZ	6	7,7,7,7,13	170.7	12,715 (1)	99.96 %
NOC-WNEO	5	2,7,2,7	156.5	1,252	99.996
NOC-WBGU	3	2,7	100.1	1,939	99.9939
NOC-WGTE	5	7,7,7,7,13	127.9	4,648	99.985
NOC-WOET	3	7,7,7	68.6	361	99.9969
NOC-WCET	6	2,2,2,2,7,13	134.5	514	99.9983
WNEO-AKRON					
U	2	2,13	40.9	2,874	99.991
WNEO-KENT					
ST	1	7	28.0	234	99.9992
WNEO					
YOUNGS-TOWN	1	7	19.5	16	99.99995
WOET					
WRIGHT ST	1	13	11.3	4,266	99.986
WOET-WPTO	2	7,13	35.3	1,554	99.995
WOET					
CENTRAL					
ST	1	13	20.2	6,136	99.9805
CENTRAL ST					
WOET	1	2	20.2	13	99.999969

NOTE: 1. High Outage Prediction Due to Two Interim Hops

End to End predicted propagation availability.

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The M508 and M512 are identical, except the M508 has 8 input channels and the M512 has 12. Both have 5 outputs and 4 mixing busses.

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Because you're serious.



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Introducing the only $\frac{3}{4}$ " time code editing system that performs 20 automatic edits from multiple sources. The Panasonic 700 B-2 Series Time Code Editing System.

**700
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SERIES**

Now Panasonic adds a new dimension to the speed and accuracy of time code editing with our new 700 B-2 Series Time Code Editing System. The AU-700 editing recorder, the AU-A70 programmable editing controller, and the AU-J10 multiple source adapter. Together they let you do what other time code editing systems don't. Perform up to 20 automatic, multiple-source insert and assembly edits. And the 700 B-2 Series is packed

with outstanding performance features.

The precision of direct drive.



Check out the excellent stability and precision of the AU-700's direct-drive video head cylinder and capstan servo motor. The superb performance and durability of our crystal-oriented HPF™ heads. All combine to produce an outstanding picture with horizontal resolution of 260 lines color, 330 lines

monochrome and S/N ratio of 46 dB color, 50 dB monochrome. You'll also get an edit with less video noise because video head switching has been moved to the vertical interval so it never shows up in the picture. At the same time, we incorporated DUB IN and DUB OUT connectors with separate Y/C signals and a flying erase head. And to keep that good-looking picture looking good, all circuitry is mounted in a durable annealed aluminum die-cast chassis.

The speed of microprocessors.



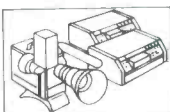
Another touch of ingenuity is the AU-700's microprocessor controls. Designed to work perfectly with the AU-A70 editing controller, they give you the speed, accuracy and versatility of full-logic, mode-to-mode switching. The AU-700 will accept SMPTE time code on a separate track or on audio track one as well as standard CTL pulses. And its electronic



Shown from left AU-700 editing recorder, AU-A70 programmable editing controller.

digital tape counter displays LED readouts of CTL pulses in minutes and seconds—even in fast forward and rewind.

Multiple source versatility.

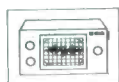


With our AU-A70 editing controller not only can you generate and read time code pulses, microprocessors let it perform up to 20 time code edits automatically. Add an AU-J10 multiple source adapter and it will accept inputs

from two source decks and one live line plus perform A/B rolls. Microprocessors also let you automatically go to specific tape locations. You can also search both ways at speeds of 1/20X, 1/5X, 1X, 2X, 5X plus pause with picture. Other features include program check, program exchange, insert programming and overflow indication. For editing convenience, separate address time and lap time indicators are included. The AU-A70's error codes pinpoint any procedural

errors to avoid incorrectly programmed edits. The AU-A70 can also be used with any Panasonic solenoid-operated 3/4" and 1/2" VHS™ decks. For worldwide versatility, there is a built-in voltage selector that is compatible with 100V / 120V / 220V / 240V AC, at either 60 Hz or 50 Hz.

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VIDEO SYSTEMS DIVISION

Ohio ETV

programs they desire to receive directly from the PBS network, what programs they wish recorded for future airing, and what library programs they want to use. The NOC computer merges the affiliate schedules to arrive at a master composite schedule, flagging any conflicts or overload problems, should they occur.

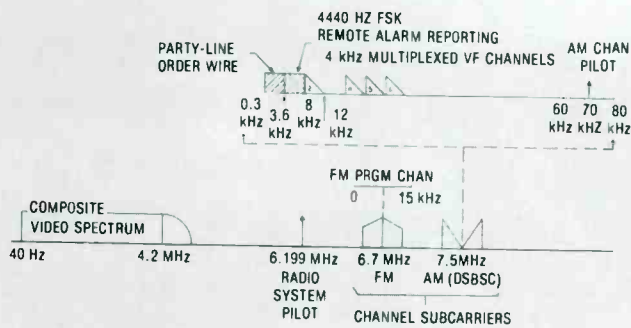
The operator of master control may use a CRT terminal to modify the

schedule including changing, deleting or inserting events, as well as assigning specific machines to meet the requirements. A split display shows the operator what is on air and what is up next. The format shows time, duration, source, ID source, recording machines, program origin, program code and stations receiving the program. The second portion of the split lets the operator view and manipulate past and future events, observe logs from the traffic center, call alternate

lists of events for insertion as needed, or retrieve an automatic sign-off procedure.

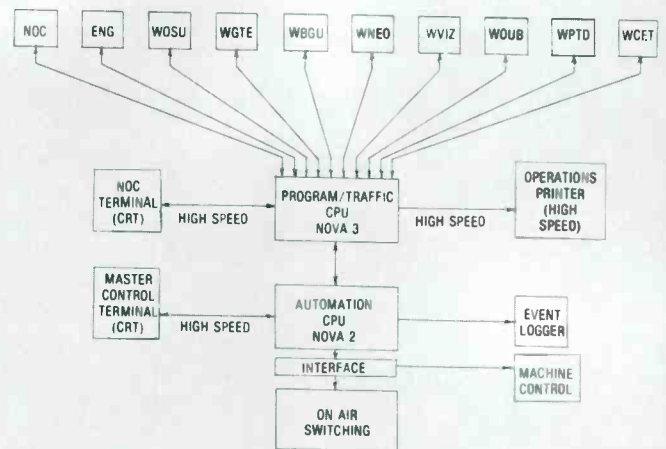
As the schedule day proceeds, the computer at Master Control automatically sets VTRs to record or playback, pre-rolls machines and airs events as scheduled. Under computer control, the switcher reflects preset sources and program indicators for each station, signals what is on-air for each station and what is up next. Also as events air, a printer logs the events

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Model 941 Encoder and Model 942 Decoder

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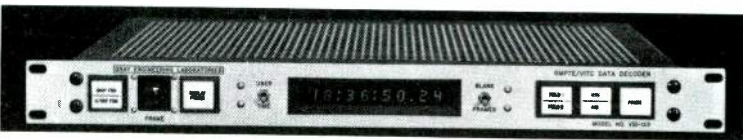
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Ohio ETV

exactly as they appear on air. Another terminal at the center displays diagnostic information and verifies whether the system is or has been working correctly. Though quite involved, the automation system functions efficiently with minimum maintenance.

Future plans

In addition to the statewide educational network, the Ohio ETV Network Commission recently began operation of a medical microwave link facility providing full duplex interconnection between Ohio State University Medical Center, three hospitals in Athens and Holzer Hospital in Gallipolis, OH. The facility allows for medical conferencing and continued medical education. Plans are considered for expansion of the medical system to a statewide medical network linking all medical schools in Ohio.

DATE	RECORD & DUB		PGM. FEEDS	
	NO.	PGM HRS	NO.	PGM HRS
10-7-79	6	3.0	52	32.0
10-8-79	10	5.0	69	54.25
10-9-79	19	13.5	73	51.0
10-10-79	7	3.5	91	58.75
10-11-79	13	7.5	75	62.25
10-12-79	12	6.0	88	58.5
10-13-79	19	14.5	42	30.5
TOTAL WEEK	86	53.0	491	347.25
AVERAGE/DAY	12	7.5	70	49.6
WEEKLY TOTAL AFFILIATE BROADCAST HOURS PROVIDED BY NOC		510 HRS.		
DAILY AVERAGE AFFILIATE BROADCAST HOURS PROVIDED BY NOC		72.8 HRS.		

NOC operational statistics.

Another study is underway for location of a satellite up and down link at the network operation center to allow ETV programming origination in Ohio to be carried nationally by the Westar PBS satellite transponders. Consideration is being made of digital video and audio developments and their possible enhancement of the Ohio network services. Laser beam and fiber-optic transmission capabilities and adaptability to the transmission and distribution service offer interesting possibilities of the future. Other state agencies, investigating use of TV distribution of training programs and a means of reducing travel costs, look toward the Ohio Educational Television Network for guidance. Current plans also include researching applications of teletext within the Ohio Educational TV Network.

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Plant tour:

Hitachi Denshi's Broadcast Equipment Plant

By Bebe F. McClain, president,
B.F. McClain Productions, Asheville, NC



Hitachi Koganei Works, Tokyo

Although Hitachi Denshi has three factories that are involved in the production of video equipment and tri-electrode tubes, this tour will concentrate only on Koganei Works located on the outskirts of Tokyo. Koganei Works manufactures broadcast cameras and 1-inch type C VTRs.

Hitachi is comprised of 40 consolidated subsidiaries, known as the Hitachi Group, and about 460 non-consolidated subsidiaries. Hitachi Denshi, one of the leading consolidated subsidiaries, manufactures broadcast video systems, radio communications systems and information processing systems.

The initial research and development for these products originates from Hitachi Central Research Laboratory, the heart of six laboratories, which services all Hitachi subsidiaries.

Other companies within the Hitachi Group develop and produce many of the electronic components used in manufacturing the broadcast equipment at the Koganei Works. Some parts that are supplied by other Hitachi divisions come to Hitachi Denshi with a certificate stating that each has been tested. Otherwise, all incoming parts are tested before being used in assembly.

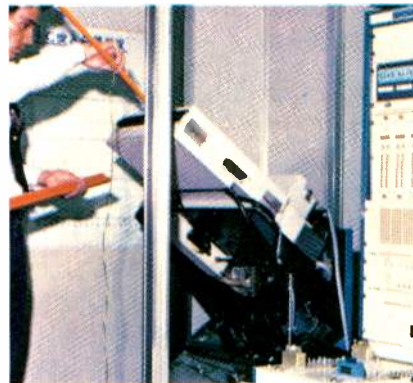
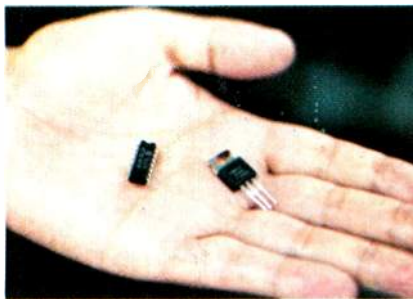
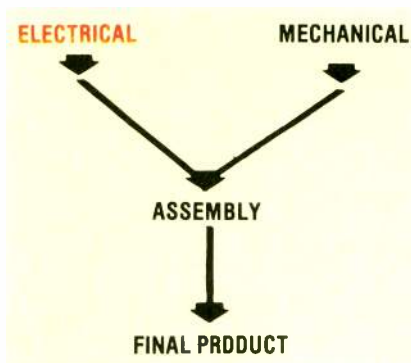
Electronic parts, sheet metal and ingots are the basic raw materials that come in the back door to be transformed into broadcast cameras and recorders. Separately, electronic parts go through an electrical assembling process and the sheet metal goes through a mechanical machining process. Eventually they come together for system assembly. At that point, the electrical circuit boards and machined parts are assembled, then extensively tested before packing and shipping.

Keeping these two separate processes in mind, it is possible to see how broadcast cameras and recorders are merged for final assembly by Hitachi Denshi.

Editor's Note: Occasionally **Broadcast Engineering** will take its readers on a journalistic tour of broadcast equipment manufacturing facilities. The first of these special reports is filed by the author on her trip to Japan following NAB'81. A companion report, an interview with the president of Hitachi covering technological trends in broadcasting, is scheduled for our October issue.

The intent behind these reports is to give our readers an insight into the companies that provide equipment to the industry. We will also cover some of the people in those organizations that make their products possible.

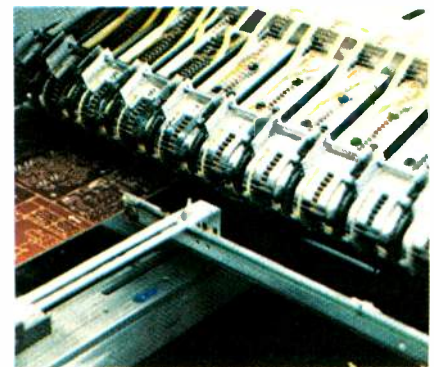
We would like to have some feedback from you to help decide whether or not to continue this special series. If you want to see more tours, circle 321 on the reader service card; if you don't find the series helpful, circle 322.



IC selection

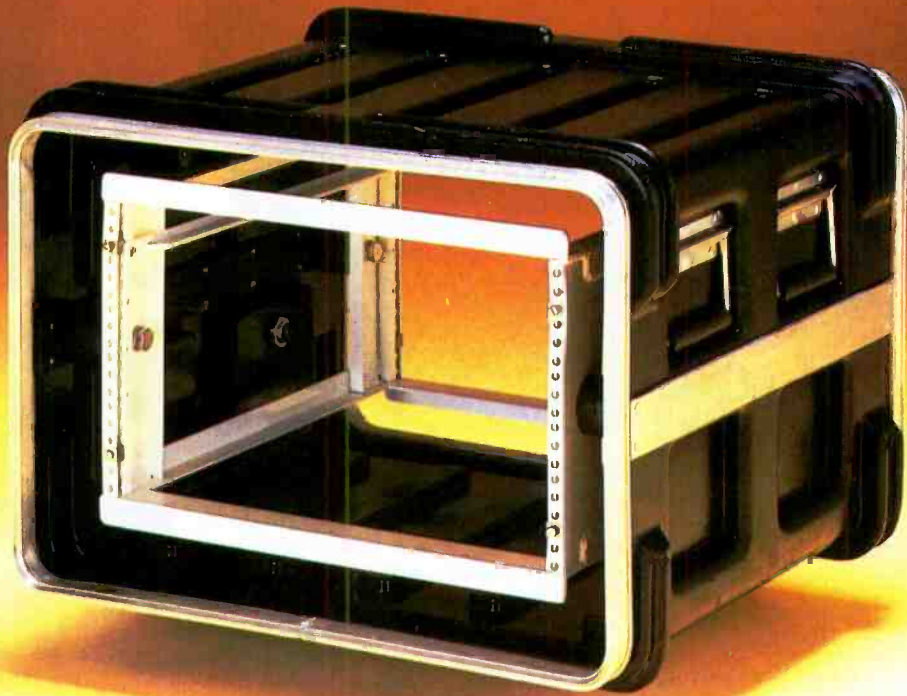
Individual ICs used in the production of broadcast equipment are tested using an automatic computer-controlled tester. They are packed into long sleeves and loaded into testing devices. The ground wires coming from the operator's wrist eliminate the

possibility of introducing static electricity into the ICs or the testing system. All parts undergo an acceptance test before the circuit boards are assembled.



Automated parts insertion

Instead of manually inserting each capacitor, transistor, etc., into the cir-



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Equipment typically rack-mounted for operation, storage or transportation comes in many standard sizes. So does the Rack-Pack. Eleven sizes to be exact, in EIA-RETMA dimensions ranging in rack height from 5.37 inches to 24.625 inches.

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The rack is constructed of 6061-T6 aluminum for durability and light weight. Front and back covers remove quickly by releasing the quarter turn latches, yet remain secure and water tight for storage and transportation. All hinges, latches and handles are mounted firmly without intrusive fasteners, leaving the unit virtually

water tight. Hardware can be easily replaced in the field, if damaged, using the patented expansion tool included in the optional field repair kit.

Rack-Pack's stack on interlocking ribs. They become a modular work station in any environment and are extremely secure.

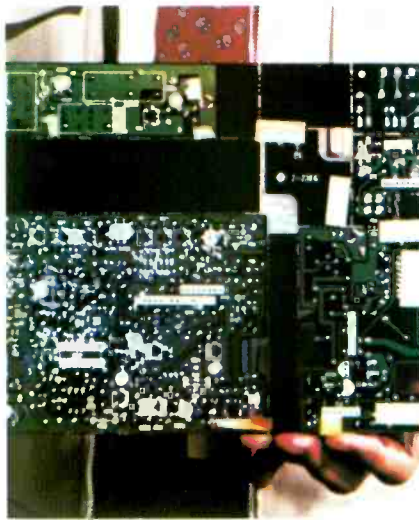
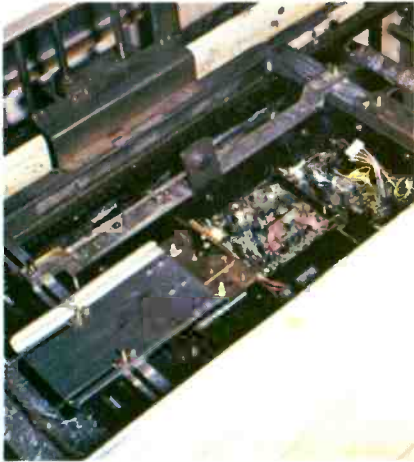
When you make the Rack-Pack your standard instrumentation case, you close the lid on shipping worries. Your equipment arrives as it left, in top condition. With Rack-Pack you get more than just the best case around, you get peace of mind. Thermodyne has it all, product, price and a delivery capability that will make you smile. Case closed.

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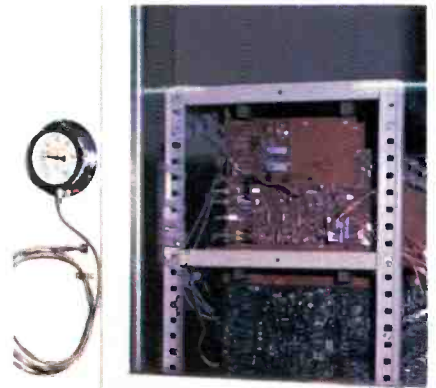
Plant tour/electrical

cuit board, this automatic parts inserter is used. The parts are packed on strips of paper rolled up in boxes, which permits the inserter claw to pick them off individually. The carriage holding the various boxes of parts moves according to the computer's instructions. Each part is therefore moved up and aligned with the board, picked up by the claw, and inserted into the board. This is all done rapidly and can proceed virtually unattended.



Board soldering

When the board contains all of the needed parts, it is passed through a solder bath in which all the parts are soldered simultaneously. The board first goes through a bath to remove any dirt that might result in a bad solder joint; then it travels down a path to a pool of molten solder. The board is treated with solder resist where no soldering is desired. The result is a clean, evenly soldered circuit board—accomplished in a few seconds.



Circuit board aging/testing

Once a group of circuit boards has been completely assembled, they are placed in an aging room. Placed in

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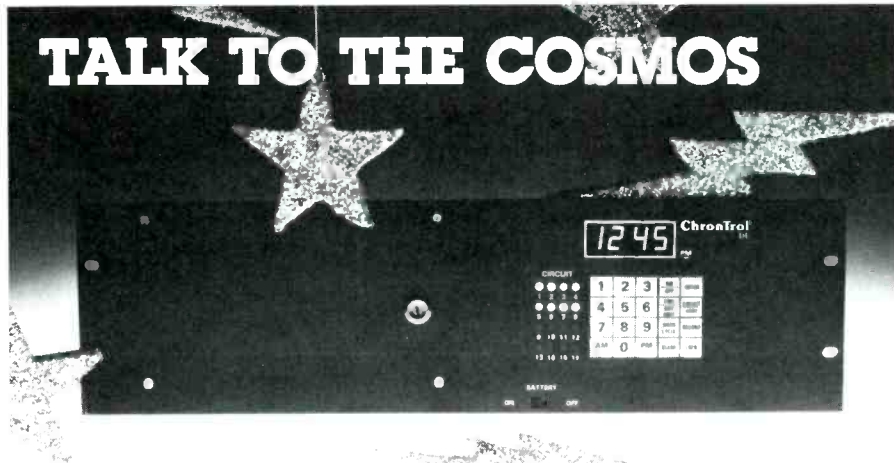


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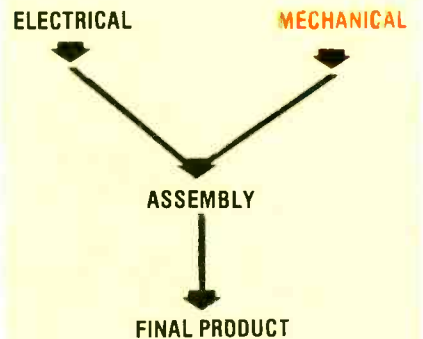
CHRONTROL

Photo: ChronTrol's rack mount model, one of many products for satellite communications, broadcasting, security systems, and industry.

Circle (41) on Reply Card

Plant tour/electrical

this heated room for hours, the parts undergo similar stress as what they would receive from days of operation. Both VTR and camera parts are held at 50°C to shorten the test time and find any failures. Many problems are eliminated by doing this in the parts stage instead of waiting until the entire product is assembled. The individual boards undergo a series of tests before they proceed to assembly.



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Computer-controlled cutting

Sheet metal is cut into pieces that are used for the chassis of the cameras and the cabinet of the recorders. The cutter is computer programmed for proper placement and cutting of parts. All the operator does is load the metal sheet. Often, the operators themselves write the programs for the various machine computers.



INNER VIEW 3: A closer look at Conrac Monitors

Comb Filter Separator: Resolution Solution at 3.58 MHz.

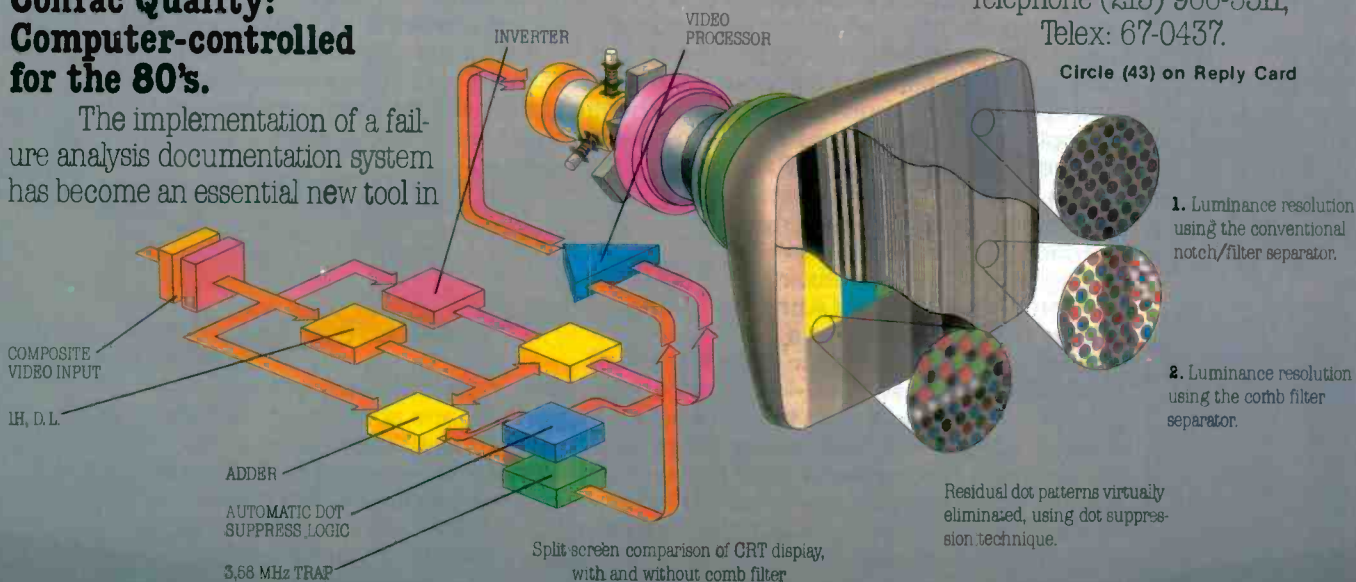
Conrac's Comb Filter Separator delivers the high resolution needed for today's high performance camera and taping equipment. It removes color information from the composite video signal without the luminance loss in the 3.58 MHz region produced by notch filters.

Conrac's Comb Filter takes advantage of spectrum interweaving to separate luminance from chroma, without reducing luminance bandwidth.

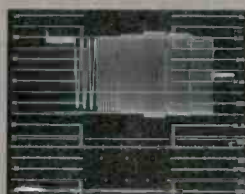
But the best part of Conrac's Comb Filter is that it gives you this improved picture clarity without the drawback of conventional comb filters. Because, unlike conventional comb filters which exhibit heavy dot patterns in the luminance path, Conrac utilizes non-linear techniques to virtually eliminate these patterns around vertical and horizontal transitions.

Conrac Quality: Computer-controlled for the 80's.

The implementation of a failure analysis documentation system has become an essential new tool in



1. Multiburst test signal with conventional bandpass and notch luminance/chrominance separator.



2. Multiburst test signal with Conrac's Comb Filter luminance/chrominance separator.

the quality factor. This system provides the capability of daily test analysis from four different product test and inspection areas. The net results are improvements in product quality and long term reliability.

Conrac Technology: Over 30 years of leadership.

Conrac's track record of technical innovations stretches back nearly three decades; and what we've learned since then goes into every monitor we make today. That is important to you because the more technology we pack into each monitor, the more performance you will receive from it.

Comb filter separator and computer-controlled quality are just two ways Conrac technology can save you time and money.

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1. Luminance resolution using the conventional notch/filter separator.

2. Luminance resolution using the comb filter separator.

Residual dot patterns virtually eliminated, using dot suppression technique.

Quality you can take for granted.

Plant tour/mechanical



Computer-controlled machining

One-inch VTR pieces such as the head drum assembly and main chassis are drilled out with great precision by a computer-controlled drilling machine. Various sizes of holes must be drilled into each metal drum. (At the top of the machine, you can see

the large selection of drill bits.) The computer (right) dictates which bit will be rotated along the track and delivered to the drill. The operator unloads the drum after the drilling is finished. Some other parts used are still machined by operators at lathes.



Mechanical sub-assembly

Although many phases of the manufacturing process are highly computerized, there are still some steps that can only be done by hand. Assembling the head drum is one of the most critical steps in the production process. Many components must

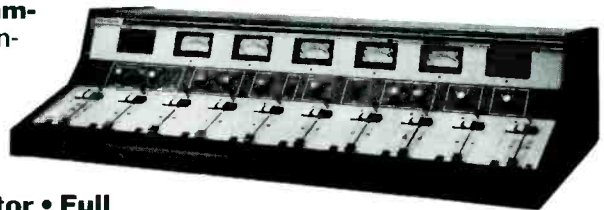
be expertly installed, often using a microscope to ensure proper alignment.



Mechanical parts testing

All parts that are sub-assembled must undergo a series of tests to assure they meet specifications. The

4 Models—8 and 10 mixer dual stereo with rotary or linear faders • Transformer Balanced Inputs and Outputs • 3 Inputs Per Mixer—internal pads allows mic/line selection on the same mixer • Two 4-Input Auxiliary Input Selectors—may be assigned to any mixer • Pre-fader Pushbutton Cue—in addition to normal CCW fader cue position • LED Status Indicators—color coded to aid in instant identification of function selectors • Momentary or Continuous Remote Control Contacts—internally selectable, also controls optional digital timer reset/start • Full Metering Capability—two meters standard, up to four meters and/or digital clocks and timers optionally available, all meters provided with LED peak indicators • Gain Selectable Microphone Preamps—provided with center tap access for phantom condenser microphone power, processor input/output port with buffer amplifier for outboard compressors, limiters, etc. • Programmable Muting Logic—internal pin-programmed matrix allows any selection of monitor and cue positions • Pushbutton Aural Phase Test • Announcer's Microphone Intercom-Air Selector • Full Dual Channel Operation— independent program and audition assignment push-buttons • Five Monitor Driver Outputs—four muted, one non-muted • All Mixers Switch-Selectable to Mono or Stereo • Ground-Plane Techniques Used Throughout for Increased RF Immunity • Selectable Internal or External Master Level Controls • Accessories and Options—mono mixdown, high impedance (cassette) line input plug-ins, reference oscillator/line input plug-in, additional microphone input plug-ins, digital clock, digital timer, linear faders.



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VP0010	0-10.5	.5	Toggle	.15	.2	3	4 3/8 x 2 3/8 x 1 1/16
VP0127	0-127	1.0	Toggle	.15	.3	14	4 3/8 x 2 3/8 x 1 1/16
VP0255	0-255	1.0	Toggle	.15	.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 3 1/16
VS0315	0-315	5.0	Strap	.25	.4	28	4 x 2 x 1 1/2
VS0635	0-635	5.0	Strap	.60	.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

Impedance: 75 ohms. *±.2db variation at any delay setting.
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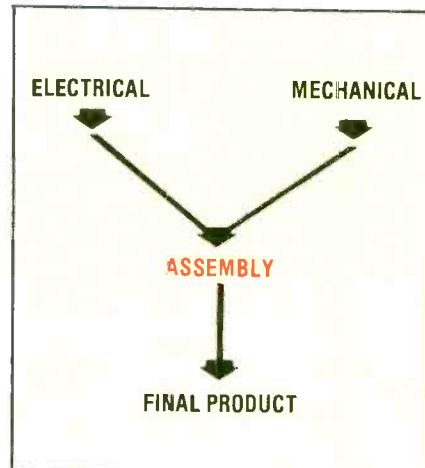
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Plant tour/assembly

head drum assembly is checked for roundness, and the diameter must be consistent or the part is rejected. Each day the tolerances are recalculated to account for changes in room temperature and humidity. These critical tolerances are recorded on a list that follows this product through to the final testing stage.



Chassis assembly

It is at this stage in the manufactur-

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Continental Electronic's new superpower broadcast transmitters are on the air at four overseas sites providing extended coverage and 24 hour operation.

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Fourteen transmitters are now in service and four more will follow shortly. This speaks well for Continental's transmitters design and for their choice of long life EIMAC power tubes.



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Follow Continental Electronics selection of EIMAC power tubes for your next transmitter design. From VLF to VHF, make EIMAC your choice. For full information write Varian, EIMAC Division, 301 Industrial Way, San Carlos, CA 94070. Telephone (415) 592-1221. Or contact any of the more than 30 Varian Electron Device Group Sales Offices throughout the world.



X-2159/8974



4CW25,000A

Plant tour/assembly

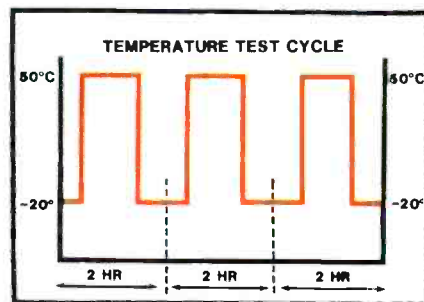
ing process that the assembled machined parts and the assembled electrical boards are brought together. One at a time, the cameras and the VTRs are built. Although several operators are involved in this stage, many assembly steps are performed by one operator. Thus, the production of broadcast equipment is not done in a typical assembly line fashion, but rather on an individual basis.



Systems adjustment/testing

Although testing is done after each step in the manufacturing process, all have not been shown. The results of these tests culminate in the production phase known as adjusting and testing. Here, for the first time, the completely assembled product is turned on and checked. Myriad minute adjustments must be made. A book full of checklists must be attended to item by item. The 1-inch VTR will have to move through five stations to check out all functions. Here the servo system is being checked, with the computer printing out the diagnosis. Next, the VTR will move to the audio test area and then to areas for testing other functions. Computers

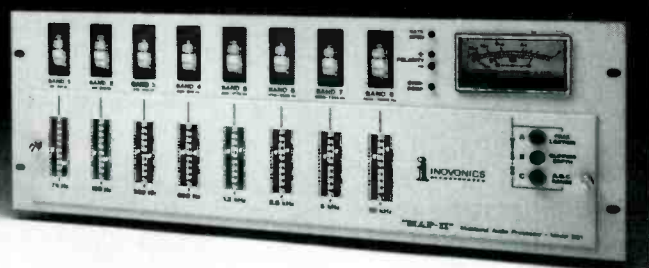
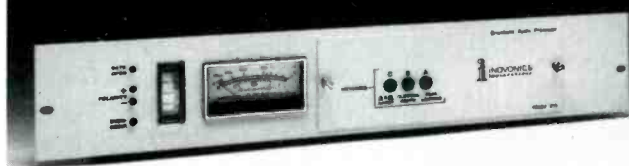
are also used to set up and adjust the cameras, and days are spent adjusting and testing each unit thoroughly.



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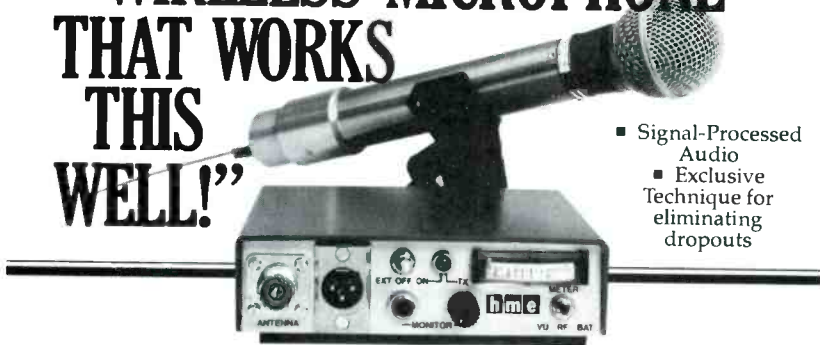
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Plant tour/assembly

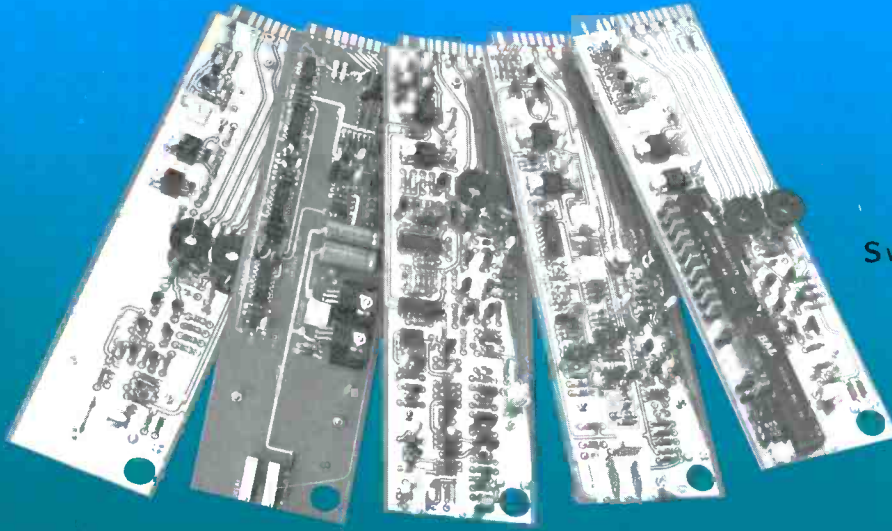
recorder is put through cycles of temperature extremes. VTRs are taken from -20°C to 50°C and cameras are taken from -20°C to 45°C. The obvious reason for doing this is to simulate the worst conditions in which the end user might be called upon to operate the equipment. The units are placed inside a sealed chamber, put into operation, and then monitored by test equipment. After this process, the equipment is tested again. Some units are taken below -30°C, depending on the customer's requirements.



Final testing

All cameras are checked with video monitors and readouts from test equipment. During the final testing, each camera is set up in a small studio-type area complete with lights, registration charts and colorful props. The operator sees the image on the monitor and checks that against waveform monitors, vectorscopes and other test gear. The recorded images of the VTRs are checked on the monitor and on a VTR Tape Tester. Using this instrument, the operator can actually take a look under a microscope at the recording on the tape and verify that the VTR is recording correctly according to the SMPTE type C format specifications.

SIX OUTPUTS!



VDA-661
Video Distribution Amplifier

VEA-660
Video Equalizing Amplifier

VCA-660
Video Clamping Amplifier

SVD-660
Switchable Video Delay Amplifier

PDA-660
Pulse Distribution Amplifier

FR-560 MOUNTING FRAME

- Two rack units.
- Two plug-in power supplies.
- Looping inputs.
- Any mix of up to ten amplifiers.

FR-661 MOUNTING FRAME

- One rack unit.
- One plug-in power supply.
- Looping inputs.
- Any mix of up to four amplifiers.

Full compatibility with 600 Series mounting frames and amplifiers.



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Leitch Video Inc., 7051 Clinton Street, Buffalo, N.Y. 14206
Tel: (716) 852-1535

Circle (52) on Reply Card

Plant tour/assembly



Packing/shipping

Cameras and VTRs are individually packed for shipping. By this time, there is a considerable investment in each unit. Numerous checklists accompany each camera or recorder because each will be individually checked out again when it reaches its first destination (for example, an Hitachi Denshi US import office) and again when it reaches its final destination (for example, an Hitachi Denshi sales/service location).

This is the final step in the manufacturing, but two supporting functions at the Koganei plant are worth mention.



Production engineering & research

Each plant has its own production engineering department. It is here that new ideas and designs are incorporated into the actual production process. Hand-drawn drafts of printed circuit boards are transferred to the computer where discs store various components libraries, as well as programs. The computer determines the optimum layout and makes the actual transparent original films that can later be used for production of printed circuit boards.

Also at the Koganei Works is an IC research area. In a special "clean" room, researchers test and develop new parts. By doing this at the plant site, new ideas can be incorporated into production models that are pulled off the line and used as test models. □

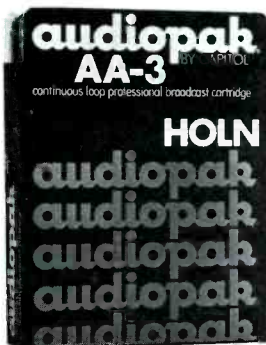
"The Missing Link to Reliable Cart Music Reproduction Has Been the Cart...Not the Cart Machine.

I've been using the Audiopak AA-3 at various stations for over two years, with gratifying results.

The AA-3 is capable of studio master music reproduction with excellent stereo phase stability.

It is durable and reliable in performance throughout its long life.

In my opinion, the AA-3 is the best cart we've tested."



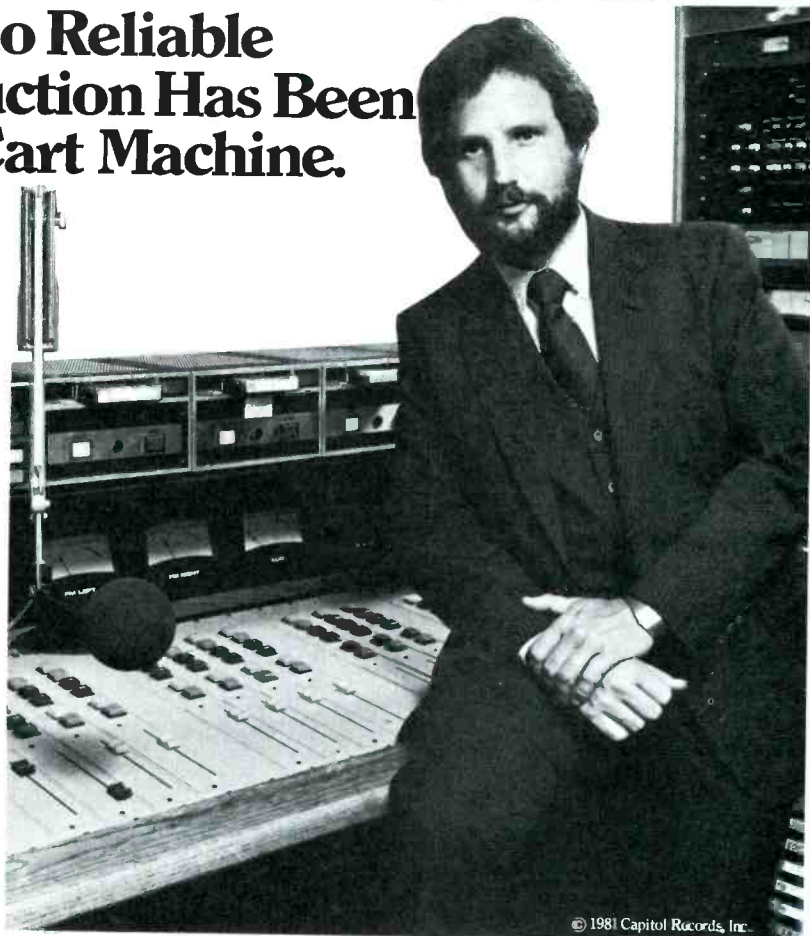
Elliott Klein

Corporate Director of Engineering,
Buck Owens Broadcasting Group
Chief Engineer, KNIX AM & FM,
Phoenix, AZ
Consultant to:
Scripps-Howard Broadcasting Co.
(Radio Division)
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AA-3 - The Missing Link for stations who care how they sound



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A Division Of Capitol Records, Inc.
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Circle (53) on Reply Card

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Take the Marconi MR2 (pictured above). It's a superbly-crafted machine from one of the world's most prestigious manufacturers. A 1" C Format VTR that has proven its quality and durability time and again.

Now add AFA. For more than a decade we've successfully designed and fabricated total video-tape systems and rebuilt and refurbished hundreds of VTR machines of every make and model.

Now, as the exclusive sales representative for all Marconi Broadcast Products in North America, we'll service your MR2 and other Marconi products with all the expertise and knowledge we've gained over the years. And we'll supply you with all the spare parts and components you'll ever need directly from our headquarters in Northvale, New Jersey. Guaranteed!

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Circle (54) on Reply Card

The AES convention replay

By Dennis Ciapura, general manager of telecommunications, Greater Media, East Brunswick, NJ

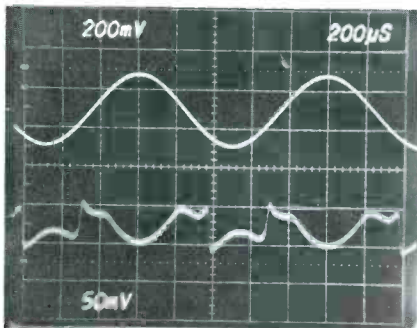
- 69th Technical Meeting & Exhibits
- May 12-15, 1981
- Los Angeles Hilton
- 7032 Attendees
- 186 Exhibitors

In the broadcast industry, audio has historically been treated as a means to an end, while, in the recording and sound reinforcement industry, audio is the end. However, as the state-of-the-art audio used by broadcasters improves with each passing year, the gap between broadcast audio and pro

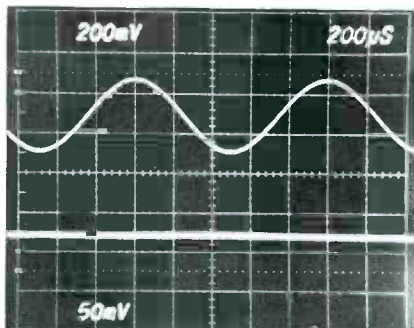
audio becomes narrower and the happenings at the Audio Engineering Society (AES) Convention become more important to broadcasters.

This year's West Coast Convention at the Los Angeles Hilton was one of the best and the following is a summary of some of the show's highlights that are of particular interest to **BE** readers.

For those who are using the Studer A-80 tape decks, Kdisc has introduced a plug-in improvement, the Kdisc 2572. This replacement output amplifier card reduces distortion by a factor of at least 10, improves signal-to-noise ratio by 10dB and increases the slew rate 16 times. Kdisc demonstrated the device by feeding test signals through a switch to either a standard card or the 2572 while monitoring the performance on a distortion meter and scope. This acid test graphically demonstrated the performance improvements that the little



Standard Studer line card



Kdisc 2572 line card

These photos illustrate the results of the Kdisc demonstration of its new Studer line amplifier replacement at the AES convention.

AKG

When we set out to "naturally" enhance the quality of sound, we came up with an idea that's reverberating around the world.

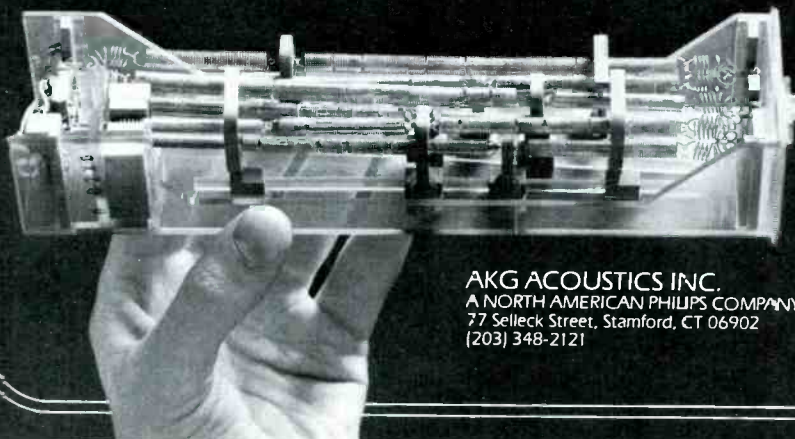
The patented AKG Torsional Transmission Line System shown here is the heart of our new BX5. It's the same principle as used in our world-famous BX-10E2 and BX-20E.

This AKG innovation gives you flutter-free performance and truly balanced reverberation at any of the selectable decay settings.

The TTL system is just one of the many advanced features you'll find in the same

reverberation units used in most major recording and broadcast studios around the world.

Ask your AKG dealer for a personal demonstration and hear the benefits of each AKG reverberation unit... "naturally."



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A NORTH AMERICAN PHILIPS COMPANY
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(203) 348-2121



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EYE-OPENERS

Just when everyone had their eyes wide open to the outstanding line of Ikegami broadcast and production color cameras, Ikegami introduced its color and B&W monitor line, engineered with the same innovative technology as its cameras. A great tradition of eye-opening continues with precision, quality and beautiful images.

The Ikegami color monitor line consists of the High Resolution Series RH Color Monitors and the High Performance Series 8 Color Monitors. The High Resolution Series RH Color Monitors are available in the 14" TM 14-2RHA and the 20" TM 20-8RH. Both provide precision color reproduction at 600 plus lines for professional studios, control rooms, remote vans, etc., and feature a high resolution CRT with High Density Dot Matrix, a switchable comb filter in the decoder, and the AFPC (Automatic Frequency Phase Control) system to maintain exceptional color reproduction. Both models are rack-mountable, with the TM

14-2RHA featuring plug-in circuit boards for easy maintenance.

The High Performance Series 8 Color Monitors are available in the 14" TM14-8RC, 20" TM20-8R and 25" TM25-8. The Series 8 monitors offer high quality color reproduction, a Shadow Mask Dot Matrix CRT, Pulse Cross Circuit, Active Convergence Circuit, low power consumption, and more.

The E&W Monitors are engineered to the same exacting Ikegami standards and are available in Triple 5", Dual 9", 5", 9", 12", 17" and 20" sizes.

Ikegami's Eye-Openers are available at most dealers. For details and additional information, contact Ikegami Electronics (USA) Inc., 37 Brock Ave., Maywood, NJ 07607, (201) 368-9171; West Coast: 19164 Van Ness Ave., Torrance, CA 90501, (213) 328-2814; Southwest: 350 North Belt East, Suite 223, Houston, TX 77060, (713) 445-0100; Southeast: 522 So. Lee St., Americus, GA 31709, (912) 924-0061.



Video Products built to Ideal Standards

 **Ikegami**

Circle (55) on Reply Card

plug-in device offers to owners of A-80 series machines.

Shure is offering the new SM85 for close-up work. Introduced for the first time at the AES Convention, the SM85 is specially designed to reduce mechanical noises and boominess in hand-held applications, while delivering a clean midrange with a little peak at about 10kHz for crispness.

Orban Associates Inc. did not have anything new to show at AES, but the company plans to introduce a TV version of the 8100A Optimod by the first quarter of 1982. This should be good news for TV broadcasters because station techniques become more important as the audio quality of hardware, distribution systems and customer receivers improves. No model number has yet been assigned to the new unit, and official specifications are not ready, but the TV version will essentially be the same as the FM version, without the stereo generator. The gated AGC will also operate differently. The gain returns to -20 rather than -10 so that film chain noises during program pauses are not obtrusive. A

prototype is being field tested in the San Francisco area and results thus far are impressive.

Otari showed its new MTR-10 2- and 4-channel mastering recorders, which offer super fidelity and unusual flexibility. Of particular interest to broadcasters are some of the built-in digital features designed to facilitate rapid testing. The machine contains built-in sine and square wave generators, as well as a special test function in which the machine goes through its various tape handling modes for quick functional testing on a daily basis.

Sontec exhibited limiters and digital cutter control equipment. Some broadcasters have undoubtedly wondered why Sontec has not adapted some of this equipment to FM broadcast application. Burgess McNeil, president of Sontec, said that the company would offer a high quality FM limiter featuring dc coupling wherever possible, polypropylene capacitors and the latest low T.I.M. active devices.

Inovonics demonstrated its line of acoustic test instruments. One device

that may be of particular interest to broadcasters is the Model 500 acoustic analyzer. This unit packs a pink noise source and 30 one-third octave bands of graphic display into a 7.7kG package. The device provides a rapid means of acoustic testing, including reverberation analysis, and

3M documents digital TV spot

A documentary videotape demonstrating SMPTE compatibility of 3M's digital audio recorder, synchronized with its "C" format videotape recorder, was shown for the first time at the Audio Engineering Society convention at 3M's demonstration suite.

The 17-minute tape, entitled "The Day It Came Together," documented the creation of one of the first network TV commercials produced with digital audio. The audio was recorded at Sound 80 Studios in Minneapolis, using a 3M 30-channel pre-mix digital audio recorder.

The SMPTE-compatible system used a standard controller and a small prototype VCO box designed by 3M.

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Introduces our Family of Products



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the New
COMPUVISION TITLING SYSTEM



Featuring:

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CREATIVITY TAKES FLIGHT ON AMPEX VIDEO TAPE.



BROADCASTERS AND PRODUCTION COMPANIES DEPEND ON AMPEX TAPE.

From videotape equipment to the video tape itself, broadcasters and production companies throughout the world depend on Ampex. High quality, durability, reliability, and prompt service are just some of the reasons.

Ampex 175 Highband Quadruplex Video Tape has proven itself under every conceivable type of operating condition within every video standard. Excellent color performance, low drop-outs, and a tough durable formulation with low headwear are features which have contributed to this dependability.

And now Ampex 196 High Energy Broadcast Helical Video Tape has been specifically engineered to fill the increasing needs of a particularly demanding group of video professionals—those who have chosen one of the new broadcast helical VTRs.

No matter what your video tape needs are, there's an Ampex video tape for you. And, once you've tried Ampex tape, you'll see why broadcasters and production companies have grown to depend on Ampex.



AMPEX

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Circle (57) on Reply Card

PLAIN



There's nothing fancy about the Knox K50. It's reliable; it's economical; it's basic; the simplest machine we make.

Come to think of it, it does have an independent preview channel... and shadow-edged characters... and a flash function... all as standard features.

Maybe it's fancier than we thought.



A DIVISION OF COMPUTER OPERATIONS, INC.
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301/489-2106 Telex 89-8327

Circle (5) on Reply Card




Do it with style. Better still, do it with *three* styles.

Knox calls it Multifont, and it's built into each Mod-16 character generator.

It's upper *and* lower case. It's accented letters. And it's resolution down to a *single scan line*.

It's just one of the features standard with every Mod-16.

It's also by Knox. Plain enough?



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5001-J Forbes Boulevard, Lanham, MD 20801
301/459-2106 Telex 89-8327

Circle (58) on Reply Card

AES

provides an instantaneous overview of electronic equipment response. This kind of test equipment is put to good use for tape deck alignment because a change in high frequency response due to a bias adjustment is immediately apparent, and quick correction for the new curve is possible.

The Gotham audio display of EMT broadcast products attracted a lot of attention at the show. The company

AES/Los Angeles Site of Major Audio Exhibits

Traditionally, the AES Technical Meeting and Exhibit provides a forum for manufacturers to bring their equipment to the attention of broadcasters and recording specialists. An early list of these exhibitors appears on Pages 28-32 of the April issue of **Broadcast Engineering**.

To illustrate how companies prepare for this show, **BE** took a look at what one firm, Eventide Clockworks, exhibited in Los Angeles:

- **H949 Harmonizer:** features pitch change, time compression/expansion, delay, reverb effect, flanging, time reversal and repeat. Options for the H949 include: mono or polyphonic keyboards; remote control board; and the PTC945 Precision Tape Controller to provide a time-squeeze system for audio, video and film producers.
- **BD955 Broadcast Digital Audio Delay Line:** offers memory capacity to delay signals up to 6.4 seconds; incorporates a special "catch-up" feature to eliminate need for a taped jingle or announcement.
- **SO2016 Programmable Effects Processor:** features reverb, Digi-plex echo, chorus effects, full bandwidth delay—16kHz, selective band delay, flanging and phasing, classical digital filters, full stereo operation, software subscription service and user-interactive controls.

Many manufacturers exhibited impressive products at the AES show. The exhibitors will be glad to provide detailed data sheets upon request. You may request material by using the exhibitor list from your April issue and addresses/phone numbers from the September **BE** Buyers' Guide.

From the Neumann Collection

We wait a long time before we add a new microphone to our collection.

First, we make sure it will add to our reputation.

This one  does. We fully expect NEUMANN's KMR 82 shot-gun condenser microphone to do nothing less than revolutionize the sound in the industry (just as NEUMANN's famed U 47 did over thirty years ago). It's that much better than anything now available.

Superb directional pattern down to the lowest frequencies and greatly reduced off-axis coloration, plus built-in high and low frequency roll-off switches, make the KMR 82 ideally suited for motion pictures, TV, broadcast remotes and the theatre. In addition, many innovative accessories insure optimum flexibility whether on location or in the studio.

To bring you the best, we waited a long time. But you don't have to. Write today for a brochure and the name of a nearby dealer.



GOTHAM
AUDIO CORPORATION
741 Washington St., New York, NY 10014
(212) 741-7411
West Coast Office: (213) 874-4444
Audio Export Georg Neumann & Co. GmbH
P.O. Box 1180, 7100 Heilbronn, West Germany

Circle (59) on Reply Card

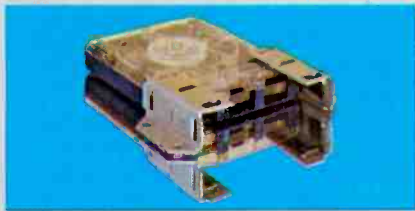
The New Benchmark Improved In Four Important Ways!

No. 1 Cart Machine

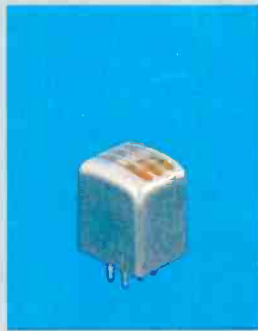
Today, one out of every two broadcast cartridge machines purchased worldwide is an ITC Premium Line machine. Now, four new features make this first-choice line an even greater value.

Improved Frequency Response

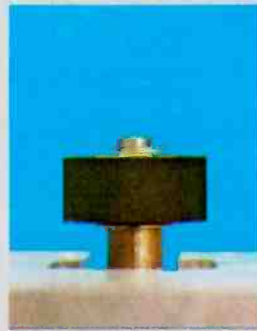
The head is new. The open-faced design is cylindrically shaped rather than hyperbolic. MuMetal laminations are surrounded by epoxy filler impregnated with aluminum oxide particles for shielding and durability. Core windows are wider than conventional designs. The end result is greatly improved frequency response without low end humps and bumps.



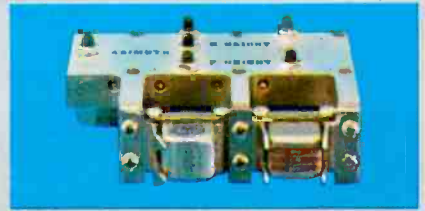
New Cart Hold Down



New Head Design



New Pressure Roller



New Removable Head Module

Removable Head Module

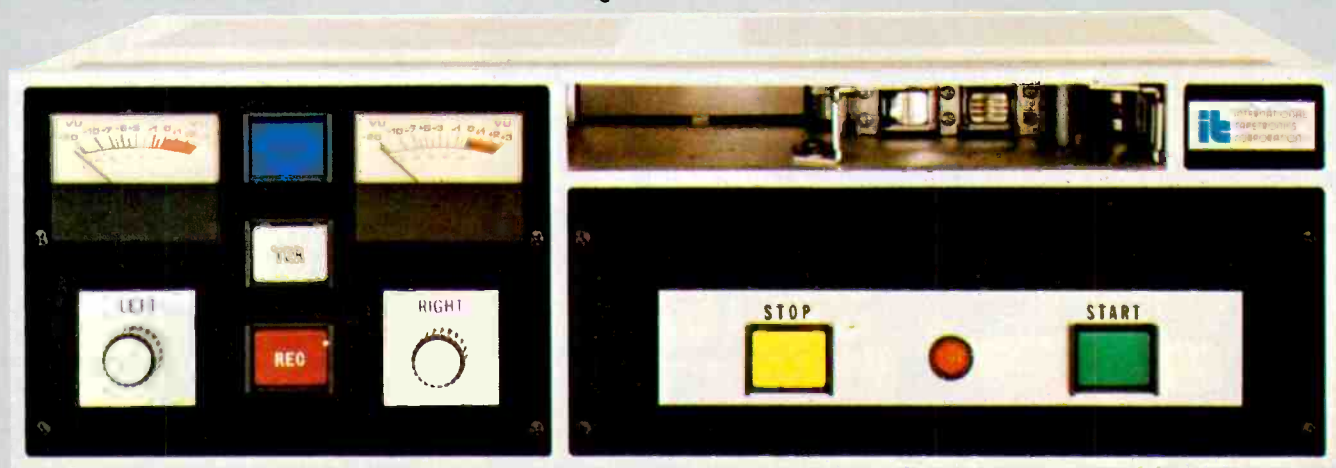
True center pivot design. Azimuth, zenith and height adjust independently. Locking one does not affect the others. Steel ball pivots and longer azimuth arms permit finer tuning.

Improved Tape-Head Alignment

New cartridge positioning system assures precise, rigid alignment of tape to head even when insertion is hurried or careless.

Long-Life Pressure Roller

The 525K pressure roller offers twice the pulling power and extended life. Tolerates common cleaning chemicals. Holds its durometer even in high humidity.



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Bloomington, Illinois 61701

Marketed exclusively in Canada by McCurdy Radio Industries, Ltd., Toronto

Broadcast Production Consoles

GREAT AUDIO STARTS HERE

FEATURES:

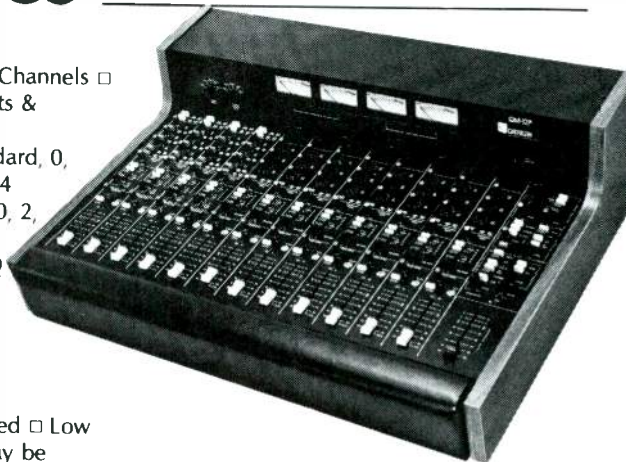
Stereo Outputs 8 or 12 Channels
 Up to 24 Inputs All Inputs &
 Outputs Balanced QM-
 8P, 4 Stereo Channels standard, 0,
 2 or 6 optional QM-12P, 4
 Stereo Channels standard, 0, 2,
 6, 8 or 10 optional.

Input Channels: 3 Knob EQ
 with In/Out Switch Echo,
 headphone and Cue Send
 Channel On and Remote
 Start High Quality
 Conductive Plastic Faders.

Output Channels: 4 Balanced Low
 Noise, Low Distortion May be
 Stereo or Mono.

Monitoring: 4 Independent Monitors
 Flexible Control Room Selection
 Talkback to Studio Muting

**QUANTUM offers the following
 options for the QM-8P and QM-12 P:**
 Phantom Power Supply 104 Point
 Patchbay 8 or 12 Channel Input
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Worth Their Weight Worth The Wait

Pressure molded fiberglass transit cases, valise cases and extra-heavy-duty cases... lightweight, incredibly durable protection for your delicate electronic equipment. Now available in shorter lead times from our stock case catalog... 62 standard sizes from 9.8 X 5.5 X 5.0 inches up to 30.25 X 26.25 X 28.0 inches...



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Circle (62) on Reply Card

AES

provided construction details of the rugged EMT 948 broadcast turntable with its massive deck and plug-in electronics. The preamp accepts either moving magnet or moving coil cartridges and provides state-of-the-art performance.

One of the most impressive systems available for review was the Matsushita electronic digital audio recording system, marketed in the United States by Technics, featuring 0.05% distortion and more than 90dB of dynamic range. It could easily reproduce anything that one could find to feed into it. The Technics R & B series professional speakers continued to impress auditioning audio engineers with their flat response and clean reproduction. Their relatively small size makes them ideally suited to broadcast monitoring applications requiring high performance speakers.

The new Audiotronics' 200 series on-air broadcast mixing console was displayed along with one of its large recording studio cousins, which made it look diminutive by comparison. However, it boasts better performance than many much larger and more expensive boards. Distortion is typically less than 0.04% and the line input signal-to-noise ratio is 83dB with a minimum of 30dB of head room.

White Instruments Inc. featured an attractive display of the company's one-third octave analyzers. For those desiring greater resolution, the White system 200 signal analyzer is available in a one-sixth octave version. The system 200 is an extremely flexible test instrument with eight non-volatile memories to allow accumulation of maximums and easy photographic documentation.

The equipment mentioned here represents a sampling of items at the AES meeting that will have a special appeal for broadcasters. Each attendee could find many more items on display at the show applicable to his or her broadcast station. There is no substitute for being there, so this review might encourage you to attend future conventions. The next show is scheduled for Oct. 30-Nov. 2 at the Waldorf-Astoria in New York.

If there is any criticism of the AES convention, it has to be the lack of facilities for doing critical monitoring of equipment demonstrated at the hospitality suites. In many cases, exhibitors attempt to "out blast" each other, thus producing about a -40dB acoustic noise floor, making it impossible to hear the low distortion and noise characteristics of the equipment on display. Soundproofed listening environments for the equipment demos would be highly desirable. □

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Camera Tubes**

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EEV Lead Oxide Camera Tubes

IMAGE

**Leddicons assure you dynamically
faithful pictures over a long life,
and they are rugged.**

That is why Leddicons are used in
virtually every country, and by
the major networks and television
camera manufacturers worldwide.

If you want to improve your image,
call or write for all the facts about our
2/3", 1" and 30mm Leddicon tube family.

Also ask about our Vidicons... the
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Members of the GEC Group of Companies

Circle (63) on Reply Card

The Royal Wedding, teletext/viewdata and closed captioning

By Bill Rhodes, editorial director

On July 29, 1981, an estimated 800 million viewers around the world watched the Royal Wedding ceremony of Lady Diana Spencer and his Royal Highness Charles Philip Arthur George, Prince of Wales.

I shared in the excitement of those viewers, however, the pageantry thrilled me for reasons beyond the glamor of the event. Eleven days before the wedding, I traveled the route from Buckingham Palace to St. Paul's Cathedral, observing the setup to be used for TV coverage. Later, when a camera shot was shown on the screen, I knew where the camera had been positioned. Because of this, the ceremony merely added action to the stage making the Royal Wedding an exciting review of beautiful London and the cathedral.

My only surprise was at the end of the ceremony when the cameras showed a glimpse inside Buckingham Palace. This was the first time the

world had viewed the Palace's chambers on television.

Even the sophisticated technology of cameras could not duplicate the beauty of the cathedral; there is no way to capture its magnificence on camera. To walk its aisles and side chapels is to stroll through England's history. Its beauty must be seen on location to be fully appreciated.

Teletext and captioning

But I was not in England to see preparations of the Royal event. I was invited by the British Consulate General to visit English companies to research the British advances in teletext, and captioning for the hearing impaired. Although it was not expected, it turned out to be a combination of the three (the wedding, teletext/viewdata and captioning). Through coverage of the event, they were all linked to advance the technology for broadcasters and the

public.

During my tour of England, I visited with people involved in all aspects of the teletext/viewdata and captioning technologies. Upon returning to the United States, I followed up this research by visiting with Field Electronic Publishing and WFLD-TV 32 in Chicago. In England, I saw maturing teletext and viewdata industries along with rapid acceptance of the British Teletext and Prestel-type technologies forming in Europe and Scandinavia. In Chicago, I saw adaptation of the British teletext development to US needs, on an experimental basis,



People with viewdata and teletext sets had available all the latest details of the Royal Wedding schedule. The teletext system now contains some 800 pages of continuously updated information. The commercial Prestel system contains over 180,000 pages of carefully developed and continuously updated text.

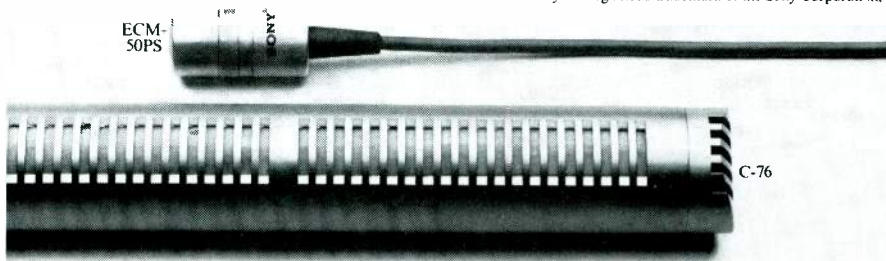
MICS THAT DON'T JUST MEET INDUSTRY STANDARDS BUT SET THEM.

The two mics shown here are obviously as different as a transistor is to a transformer. One is the smallest type we make, the other the largest. One goes on camera, the other off. Yet the Sony ECM-50PS lavalier mic and the Sony C-76 shotgun (both with conventional battery and phantom power source operation) have one thing in common. Sound engineers throughout the world consider them the standard of excellence.

So before you buy your next lavalier or shotgun mic, we ask you: "Would you rather have the microphones made by a follower, or the microphones made by a leader?"

SONY
Professional Audio

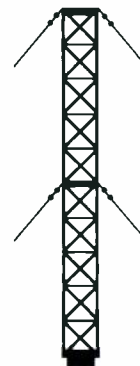
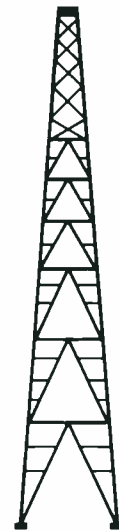
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Teletext/viewdata

together with some exciting and innovative plans.

In this report, the first of a series on

the emerging teletext and viewdata, I merely want to touch on the highlights of the research conducted. Succeeding reports will cover details of work completed in England and in Chicago that illustrate how these

technologies may shape the future of broadcasting and business communications.

Resources visited

The status of teletext/viewdata



Field Electronics Publishing (FEP) in Chicago has a qualified staff, is well equipped and foresees a bright future for US teletext. Signals go out over station WFLD-TV32 in Chicago. Experiments will soon include full-field teletext.

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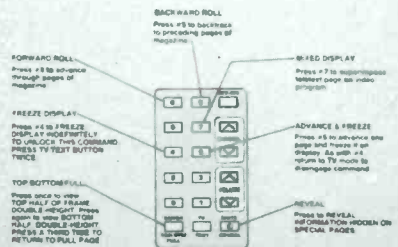
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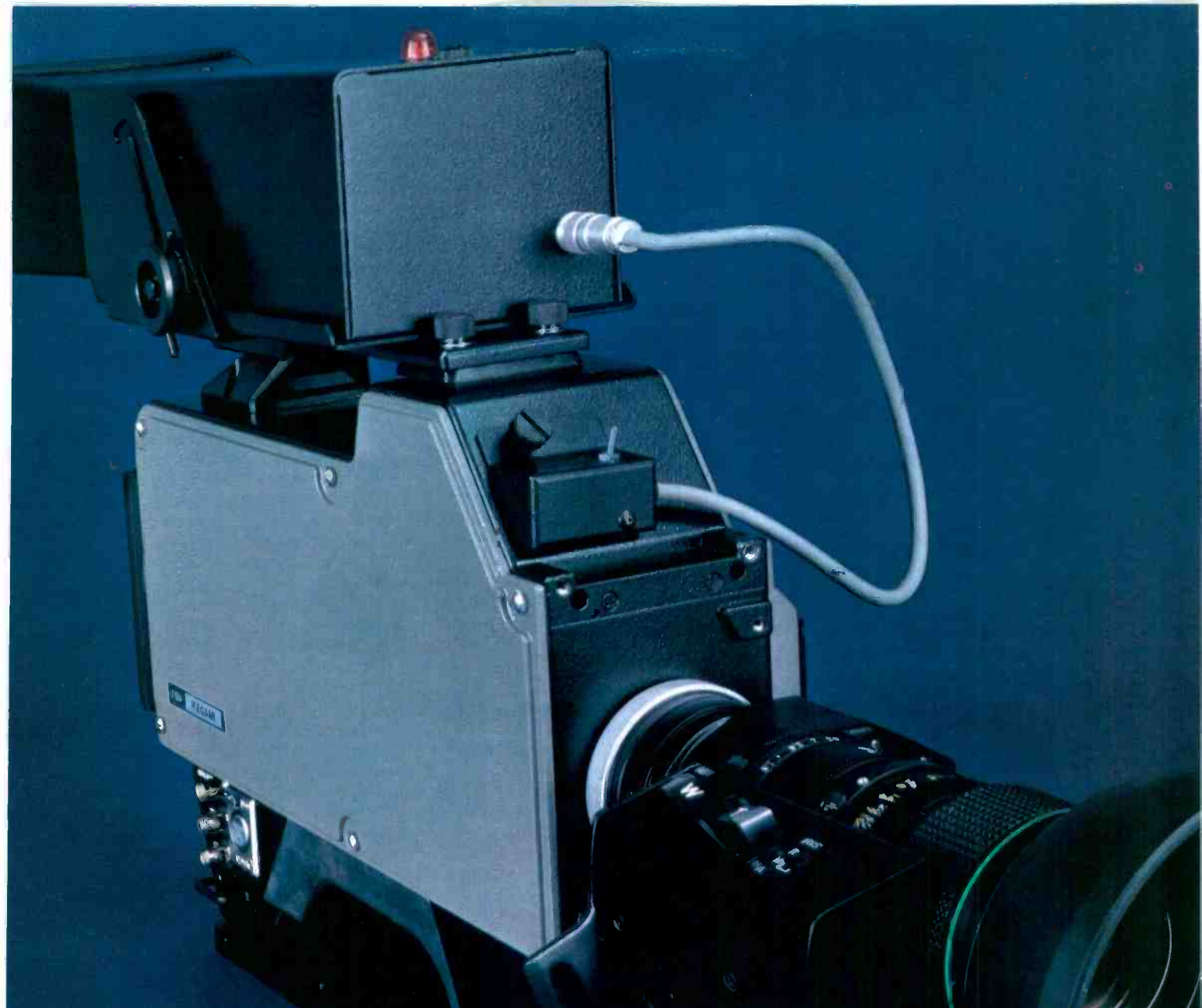
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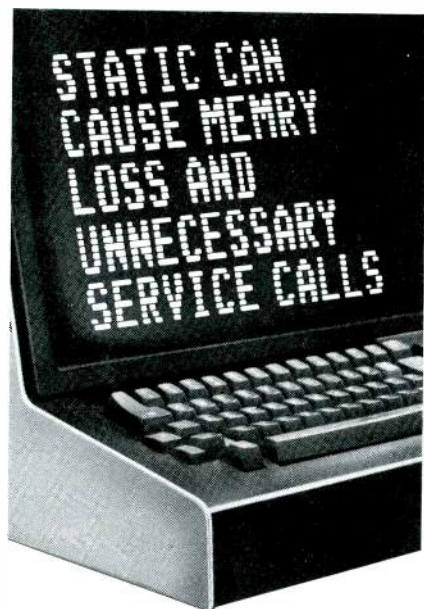
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Teletext/viewdata

technologies in England has been gained through nine years of development. Now both fields are maturing remarkably fast, but in significantly different ways.

Broadcasters and researchers

My research efforts encompassed works in progress at the following organizations:

- *Southampton University*—developing equipment for captioning for the hearing impaired and researching techniques to optimize subtitling for end users.
- *BBC*—creators of the CEEFAX teletext data base for channels BBC-1 and BBC-2.
- *London Weekend Television*—creators of ORACLE, the independent TV teletext data base soon to begin commercial trials.
- *British Telecom Research Laboratories*—the "Bell Labs" of England, the brains behind equipment and techniques for the British Prestel system.

Manufacturers/consultants

I also researched the following manufacturers and consultants, who had works in progress:

- *Alpha Numeric Keyboards*—equipment developers for the Stock Exchange viewdata systems.
- *Jasmin Electronics*—equipment developers for Prestel viewdata systems.
- *Mullard Ltd.*—developers of the LSI chips that make teletext and viewdata systems practical, including the French Antiope system.
- *Philips Croydon*—manufacturers of teletext consumer TV sets.
- *Thorn Consumer Electronics*—manufacturers of teletext consumer sets.
- *VG Electronics*—developers of viewdata equipment.
- *Logica*—consultants and equipment developers to spearhead worldwide adaptation of teletext and viewdata technologies, with strong activities in the United States.
- *Bernard Rogers*—technical consultant to the British Department of Industry in matters regarding teletext.

Commercial data bases

These commercial data bases were researched:

- *Viewtel*—data base operated by the Birmingham Post and Mail newspaper.
- *Fintel*—data base in London specializing in financial data.
- *Prestel*—data base operated by the British Post office.
- *Eastel*—data base in Norwich serving the farming industry.

- *Sealink*—data base tabulating schedules of the firm's commercial ships.

- *Stock Exchange*—operators of its own financial data base.

Much more information will be presented about the involvement of these organizations in developing the British teletext and viewdata technologies as this series continues.

Highlights

The Royal Wedding, teletext, viewdata and captioning for the hearing impaired—it all ties together in an interesting manner. No other event in recent history has so sparked worldwide interest as has the Royal Wedding, with the possible exception of the astronauts landing on the moon. Riding on this high level of public interest, operators of Prestel, CEEFAX and ORACLE carried up-to-the-minute schedules of wedding events for their viewers.

In terms of captioning for the hearing impaired, both BBC and ITV carried the wedding procession with real time subtitles. This marks only the second use in history of real time subtitles, the first being for Reagan's Inaugural Address. Different techniques were used by the two networks for this work, and the equipment used will be detailed later in this series.

In terms of industrial maturity, the growing acceptance of British teletext and viewdata technologies is impressive. By the end of this year, about a quarter million home receivers are expected to be equipped with teletext decoders. Most of these will be built-in, but there is a reasonable market for adaptor devices for existing sets as well.

October has been designated *Teletext Month* in England to commemorate the industry's achievements and to further acquaint the public with the system's features.

In this country, enthusiasm is high in Chicago for the success and public acceptance of teletext. Although it started late, Field Electronic Publishing (FEP) is gearing up to provide a viable service, and bold experiments are planned to spur growth.

As this issue goes to press, FEP is planning full-field teletext experiments for mid-August, the first tests of this type.

In the coming series on teletext/viewdata, **Broadcast Engineering** will expand on worldwide technological developments. Readers may wish to express their thoughts on these new and rapidly evolving fields. Those wishing to do so should address comments to our Teletext Editor, **Broadcast Engineering**, P.O. Box 12901, Overland Park, KS 66212 for inclusion in the series. □



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Part II

State-of-the-art FM audio: A practical guide

by Robert Orban, chief engineer, Orban Associates Inc., San Francisco, CA

This concludes an article on state-of-the-art FM audio by Robert Orban. Last month the article provided information on disc reproduction, tape and audio system considerations. This section focuses on production practices.

The role of the production studio varies widely from station to station. If the production studio is used only for creation of spots, promos, IDs, etc., then quality requirements are considerably relaxed compared to a production studio in which programming is transferred from disc to tape or cart. Our discussion centers on the latter case.

Choosing The Monitor Loudspeakers

The production studio monitor system is the quality reference for all production work, and thus, the air sound of the station. Considerable care in choice of equipment and its adjustment is necessary to assure a monitor sound that can be relied

upon.

The loudspeakers are the single most important influence on quality. They should be chosen to complement room acoustics. In general, a production studio is fairly small, and bookshelf-sized speakers must be used because of space limitations.

It is desirable to assess the effect of equalization or other "sweetening" on small speakers to make sure that excessive bass or high frequency boost has not been introduced. Such equalization errors may sound spectacular on big, wide-range speakers, while sounding terrible on small speakers with limited frequency response and power-handling capacity.

The Auratone Model 5C Super Sound Cube is the most common speaker used in the recording industry as a small-speaker reference. I recommend that every production studio be equipped with a pair of these speakers and that they be used regularly to assure the production operator that his work will sound good on table and

car radios.

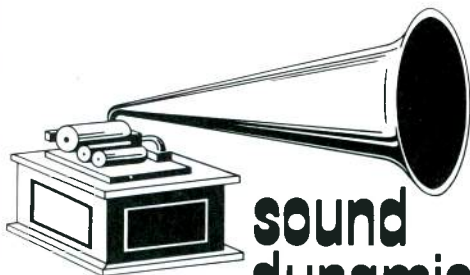
The main loudspeakers should be chosen for high power-handling capacity, low distortion, high reliability and long-term stability, controlled dispersion (omnidirectional speakers are not recommended), good tone burst response at all frequencies, lack of cabinet diffraction, relatively flat axial and omnidirectional frequency response from 40-15,000Hz, and physical alignment of drivers such that if all drivers are excited simultaneously by an impulse, then the resulting waveforms arrive at the listener's ears simultaneously (sometimes called phase-linearity).

Some feel that the professional bookshelf-sized monitors do not meet all of the criteria and that certain audiophile speakers are more accurate. An informed choice can be made by reading the loudspeaker reviews in *High Fidelity* and *Audio* magazines. In my opinion, the loudspeaker reviews in the underground publications are useful food for thought (and usually amusing to read) but entirely too subjective and unscientific to be relied upon as a sole guide for choosing a speaker.

Ultimately, the reviewers must be corroborated by your own listening tests. Your local discount hi-fi em-

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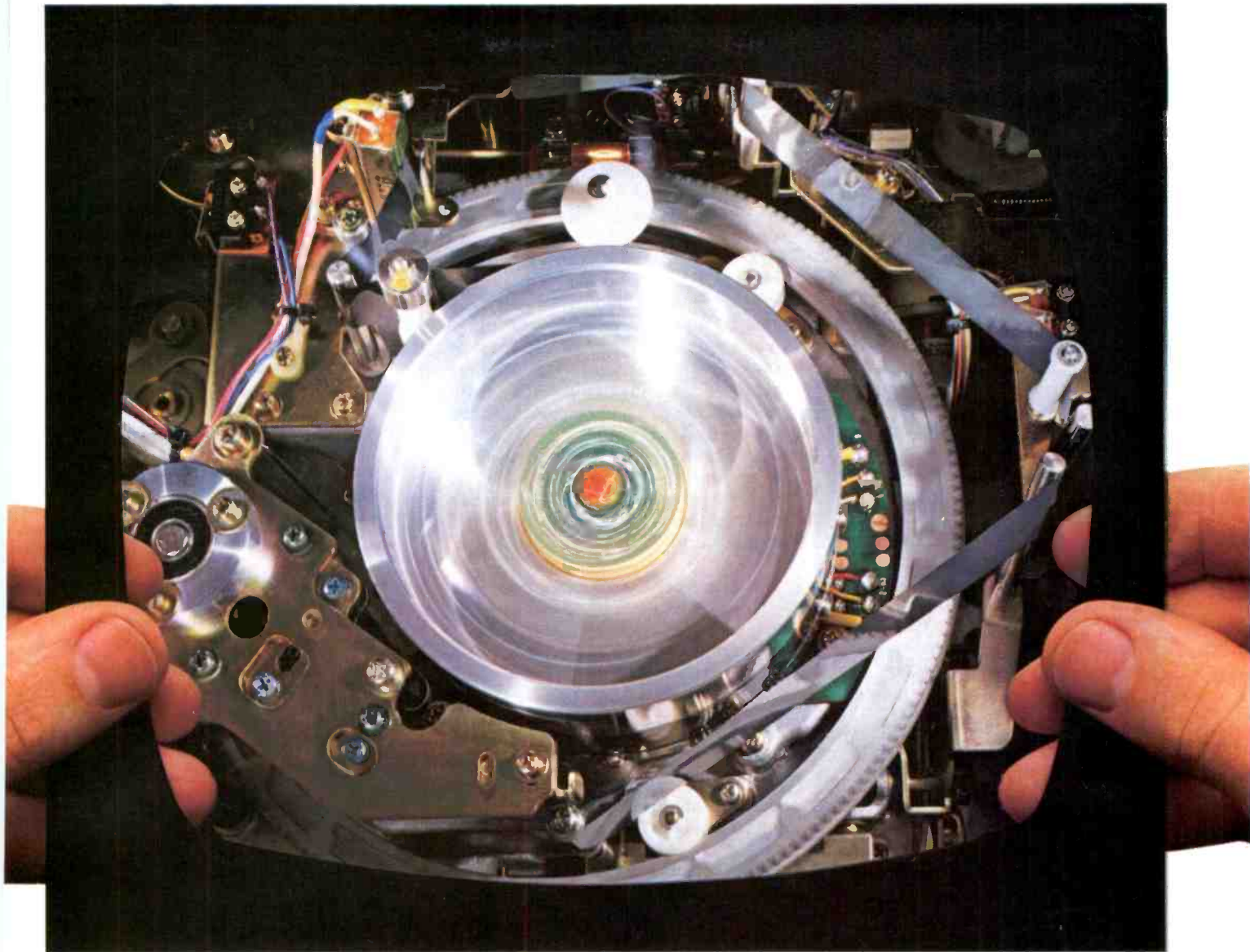
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FM audio

porium is not the place; the high-line audio salons tend to have more knowledgeable and helpful salespeople as well as better listening conditions.

Loudspeaker Location

The bass response of the speakers is strongly affected by their location in the room. Bass is weakest if the speaker is mounted in free air, away from any walls, and strongest when it is mounted in a corner. The corner location is probably against a wall at least 18 inches from any junction between walls. If the bass response is weak at this location because the speaker was designed for wall-junction mounting, it can be corrected by equalization.

It is important that the loudspeakers be mounted so as to avoid acoustic feedback into the turntable, as this can produce a severe loss of definition and muddy sound.

Loudspeaker Equalization

The performance of any loudspeaker is strongly influenced by its mounting location and room acoustics. Provided that room acoustics are good, the third-octave real time analyzer provides an extremely useful means of measuring any frequency response problems intrinsic to the loudspeaker, and of partially indicating problems because of loudspeaker placement and room acoustics.

By their nature, the third-octave measurements combine the effects of direct and reflected sound and may be misleading if room acoustics are unfavorable. Problems may include severe standing waves, reverberation time that is not well-behaved as a function of frequency, insufficient number of normal modes (Eigenmodes), lack of physical symmetry and a number of other problems which, if discussed in adequate detail, would fill several magazines.

There is a technique of measuring the loudspeaker/room interface, called Time-Delay Spectrometry (TM), which provides much more information about acoustic problems than does the third-octave real time analyzer. A certain number of sound contractors are now licensed to practice this technique, which is used primarily in tuning recording studio control rooms. The cost may be prohibitive for a small- or medium-sized station, particularly if measurements reveal that acoustics can be improved only by major modifications to the room.

Thus, the third-octave real time analyzer is probably the best com-

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promise for the typical radio station. If the station does not have a third-octave real time analyzer and pink noise source, these can usually be rented from a local sound contractor or instrument rental house. To obtain meaningful results from the analyzer, the calibrated microphone that comes with it should be placed where the production engineer's ears would ordinarily be located. Each loudspeaker should be excited in turn with pink noise, and the acoustic response observed on the analyzer.

I recommend the use of a dual-channel third-octave or parametric equalizer to tune the monitor system. The equalizer should be adjusted per manufacturer's instructions to obtain a real time analyzer readout that is flat to 5kHz and rolls off at 3dB/octave thereafter. (A truly flat response is not employed in typical loudspeakers and will make most records sound unnaturally bright and noisy.)

If the two channels of the equalizer must be adjusted differently to obtain the desired response from the left and right channels, this indicates room acoustic problems or poorly matched loudspeakers. The match is easy to check; just substitute one loudspeaker for the other and see if the analyzer reads the same.

It is revealing to move the microphone over a space of two feet or so while watching the analyzer to see how much the response changes. If the change is significant, then room acoustic problems or very poorly controlled loudspeaker dispersion is indicated. In this case, you should measure the response at several positions and average. (There are devices called microphone multiplexers available to do this automatically. They require the use of several microphones, and they average the microphone outputs in a phase-insensitive way.)

Although it is permissible to adjust left and right equalizers differently below 200Hz, they should be set close to identically above 200Hz (to preserve stereo imaging), even if this results in less than ideal curves indicated on the third-octave analyzer. In this case, the limitations of this analysis technique (as described previously) are coming into play.

Other Production Equipment

My general comments on disc reproduction, tape and electronic quality apply equally to the production studio. It is preferable to install audiophile-quality phono cartridges, arms and turntables here, and to be

certain that one person has responsibility for production quality and for making sure that the record playing equipment is not abused. The use of a single production director will also help achieve a consistent air sound, which is an important contribution to the big-time sound desired by many stations.

Although some people still swear by certain classic vacuum-tube power amplifiers (notably those manufactured by Marantz and McIntosh), the best choice for a monitor amplifier is probably a medium-power (100W/channel or so) solid-state amplifier with a good record of reliability in professional applications.

It may be tempting to dust off an old Gates or RCA vacuum-tube or low-powered solid-state power amplifier and place it in service as an economy measure. Don't. And do not use the monitor amplifiers built into your console either; they are usually so underpowered that considerable clipping will occur at high (but not dangerous, painful or unrealistic) monitor levels.

Production Practices

The following represents my opinion on production practices. I am aware that certain stations operate

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FM audio

under substantially different philosophies, but I feel that the recommendations below are rational and offer the best hope of achieving consistently high quality.

1. Audio processing should not be applied in the production studio. A good on-line processor provides all the processing necessary. Any further compression is not only undesirable, but also is likely to be very audible. If the production compressor has a slow attack time (thus producing overshoots that can activate gain reduction in the on-line processor), it will probably "fight" with the on-line processor, thus yielding air sound that is substantially worse than one might expect given the individual sounds of two units.

2. Substandard recordings may be "sweetened" with equalization to achieve tonal balance more typical of the best current product. However, excessive treble boost (to achieve a certain sound signature for the station) must be avoided if 7.5ips tape is used, because the tape is subject to high frequency saturation because of the high frequency boost applied by the recorder's equalization network.

Substantially more freedom can be obtained by using a combined compressor/limiter/HF limiter between the output of the production console and the input of the tape recorder or cart recorder. By adjusting the input attenuator on this device such that broad-band gain reduction never occurs when the console VU meters are peaking normally, only high frequency control will ordinarily occur, thus preventing high frequency tape saturation without adding unwanted broad-band compression. However, the broad-band compressor will come into play to prevent tape overload if the console output level is peaked too high.

3. A compandor-type noise reduction system should be used on all taped material (see section on tape).

4. Even greater care than that employed in maintaining on-air equipment should be used in production studio maintenance, because quality loss here will appear on the air again and again. The production director should be acutely sensitized to audible quality degradation and should immediately inform the engineering staff of any problems detected by ear.

5. Ideally, tape machines with noisy motors should be installed in alcoves under soffits, surrounded by acoustic

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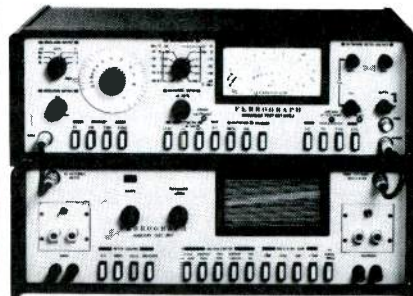
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treatment to prevent motor noise from leaking into the production microphone. In the real world of budget limitations, this is often not possible. Even in an untreated room, it is possible to use a directional microphone, such as a figure-of-eight, and to place the noisy machine on the dead axis of the microphone. Choosing the frequency response of the microphone to avoid exaggerating low frequencies will help. In particularly difficult cases, a noise gate or expander can be used after the microphone preamp to shut off the microphone except during actual speech.

6. Audio processing can be profitably applied to the microphone channel to give the sound more "punch." Suitable equalization may include gentle low and high frequency boosts to "crisp" sound, aid intelligibility and add a big-time quality to the announcer. (But beware of using too much bass boost; it can degrade intelligibility. Effects such as telephone and transistor radio can be achieved with equalization, too. Octave-band graphic equalizers offer a good compromise between cost and flexibility in this application. For ultimate flexibility and power, a parametric or parametric/graphic equalizer can be

installed.

The "punch" of production material can often be enhanced by tasteful application of compression to the microphone chain. But avoid using an excessive amount of gain reduction and excessively fast release time, lest room noise and announcer breath sounds be exaggerated to grotesque levels. (This problem can be minimized if the compressor has a built-in expander or noise gate function.)

The close-micing customary in the production studio can exaggerate voice sibilance. Also, many women's voices are sibilant enough to cause unpleasant effects. If high frequency equalization and/or compression are applied, sibilance will be further exaggerated.

These problems can be effectively controlled by means of a dedicated de-esser located after all other processing in the microphone chain. If the de-esser has a built-in mic preamp, it may make installation easier.

This article has touched only the surface of the techniques necessary to achieve audio quality in FM broadcast comparable to a typical high-end home stereo system. Because of the built-in limitations of the FM medium, audio quality equal to that delivered by state-of-the-art audiophile equip-

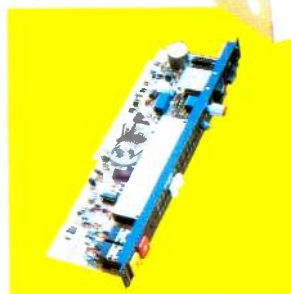
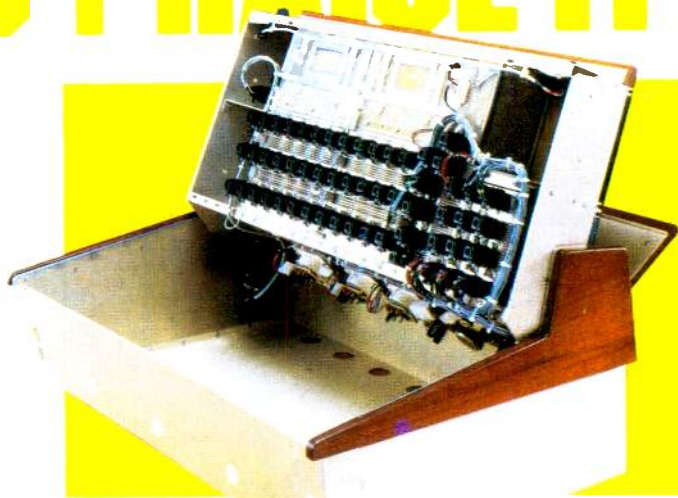
ment from top-quality discs or master tapes cannot be achieved, even if the signal entering the input terminals of the processor lives up to that quality level. This fact provides a useful guide to evaluating the cost effectiveness of any equipment and/or techniques that are proposed to improve quality. In particular, it leads to the conclusion that today's high quality IC op-amps are ideally suited as amplification elements in broadcast. Compromises in disc playback and tape are far more likely to be audible on the air, and extreme care must be used.

Maintaining a high level of on-air quality is a difficult task, requiring continued dedication and cooperation between air talent and engineering. With the constantly increasing quality of home receivers and stereo gear, the results of such dedication and cooperation are more and more easily perceived by the radio audience. One suspects that in the future, FM will have to deliver a state-of-the-art signal in order to compete successfully with the many other program sources vying for audience attention including videodiscs, digital audio, subscription television, direct satellite broadcast and many others.

The future belongs to the quality-conscious. □

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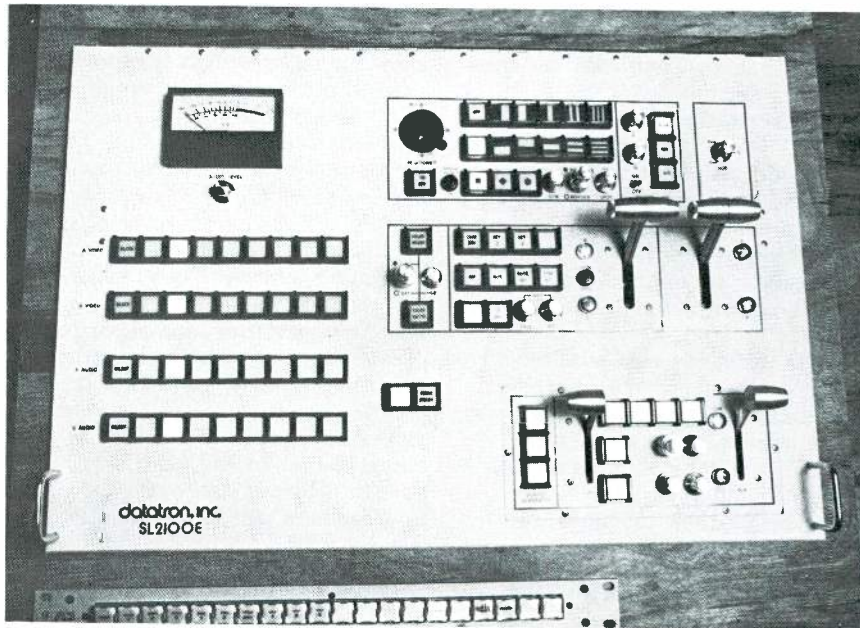


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Field test report: Vanguard videotape editor

By Dick Scott, president, Scott Video Systems, Tampa, FL



Datatron model SL2100E switcher is slaved to the Vanguard for dissolves and wipes. The Vanguard has total control over the switcher and automatically sets it up for the programmed effect when either a preview or actual edit is made.

In April 1980, Scott Video Systems Inc. was contracted by Video Productions Ltd., (VPL) for system design, purchase of equipment, installation and maintenance of a new production facility in Tampa, FL. Post-production editing was to be the primary service offered by the company, so the system had to be competitive with other production houses across the country. Because there were a number of good editors on the market, it was no easy task to decide which editor was best

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.

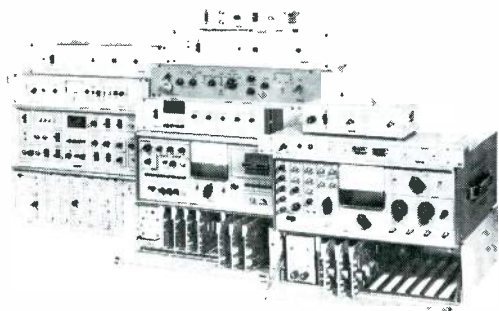
In each field report, the author will discuss the full applicability of the equipment to broadcasting, including personal opinions on good features and serious limitation—if any.

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

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suiting to meet the needs of VPL.

I looked at the editing systems offered by major manufacturers at the 1980 NAB show and narrowed the choice according to price tag specifications and delivery time. I needed a system in a given price range that could control three Sony BVH-1100 1-inch videotape machines, could interface to a switcher, and could use SMPTE time code. Delivery had to be possible within two or three months. The final decision was to buy the Datatron "Vanguard," which stayed within the allotted price range, controlled up to four play and one record VTR machines, allowed the required switcher interface, used SMPTE code for frame accuracy, and promised delivery within the specified time.

Some of the features offered by Vanguard that helped VPL make the decision included capability of changing machine sequences easily by pushing a few buttons on the keyboard, auto-assembly, scratch pad memory, programmable postroll, preroll and reaction times, as well as edit-out time exchange.

The Vanguard system arrived within a couple of weeks of the delivery date set at the time of purchase. The equipment, well-packaged, arrived undamaged. Datatron's policy

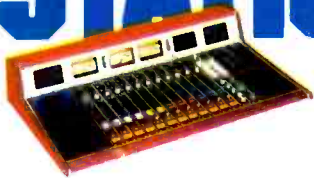


This is a view of Video Productions Ltd.'s editing suite. In the foreground are the Datatron Vanguard and SL2100E switcher along with the disc drive unit and teletype that are used for storing and saving an edit list. In the background are the Datatron time code generator and time code readers in the rack between the three Sony BVH-1100 type "C" 1-inch videotape machines. The Vanguard controls the Datatron switcher and all three Sony tape machines. The mainframe for the Vanguard is just out of sight in the bottom of the rack. The three racks on the left in the background contain all the system support equipment (DAs and sync generators). The center of the three racks contains the electronics for the American Data studio switcher and 10 routing switchers.



This view of the VPL system shows the RCA console on the left. The master monitoring equipment is shown on the right side of the console, and two of the three Ikegami HL79A camera control units and monitoring are on the left side.

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Vanguard

requests that the customer does not break the seal on the boxes, because Datatron sends a field engineer to unpack, install and check out the system. For VPL, Datatron sent several engineers, because the system involved *serial number 1* in the field, and they wanted to make certain things went well.

The installation proceeded smoothly until, on the second day, the main program chip blew. Some lint picked up by the blowers and forced

into the card nest across wire wrap pins created a static buildup that damaged the chip. The factory air-shipped a new device to cure the problem. However, because there are no filters on the blowers, *this remains a source of potential problems*. Lint and dust can (and do) build up inside the unit. The best solution, beyond adding filters, is to keep the unit in a clean environment and to take it apart routinely for cleaning.

Although I don't like having *serial number 1* of anything, this equipment has caused fewer problems than some equipment available on the market for

years. This demonstrates good quality control and the fact that the Vanguard is an expanded version of the Datatron "Tempo," which has been in production since late 1975. There are continual improvements being made even over the last few months, with several features now offered that were not available on the original model. The most noteworthy are slo-mo editing and the delayed source effect. (Datatron holds the registered trademark on the Smart-Scan program, which includes these two features.)

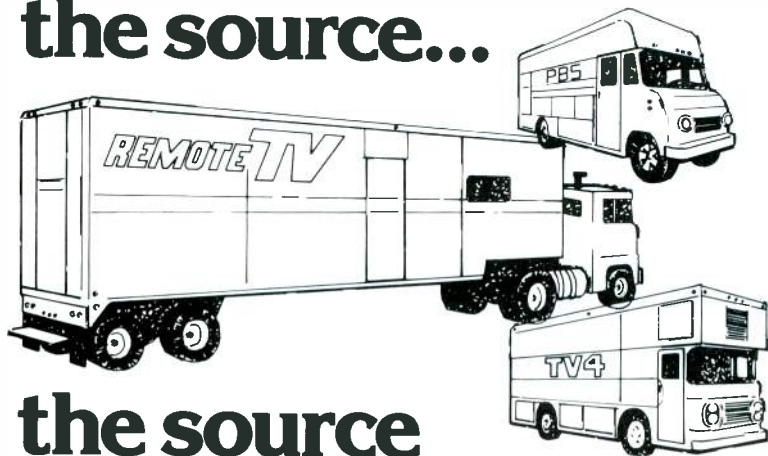
Smart-Scan

On a recent trip to the Datatron factory, I was given the chance to evaluate Smart-Scan with a hands-on editing session. The Vanguard system was attached to two Sony BVH-1100 and one Hitachi HR-200 type C machines, and was interfaced to a Grass Valley switcher. When using slo-mo editing, the play VTR goes into the "learn mode" at the edit-in time. In the learn mode, every motion made by the keyboard Varascan control level is stored in memory. Speeds (from 1/30 to 2 times play forward and 1/30 to 1/2 speed reverse), as well as direction, are memorized. When the operator previews or performs the edit, every move made manually is repeated exactly the way it was performed during the learning. But if you do not like what you did the first time, you can instruct Smart-Scan to "relearn" until the proper action is achieved.

Freeze-frame editing is available as well, but is actually a less complex procedure because all the VTR has to do is go into the freeze mode at the edit-in point. The freeze, however, can only be held, using a BVH-1100, until the machine times out and drops tension on the tape—approximately 3-3½ minutes, which is more than adequate for most freeze-frame applications. And if it is not, you can exchange the recorder times and add to the "still" for as long as necessary. Because I was pleased with the operation of Smart-Scan, I plan to incorporate that feature into the VPL system in the future.

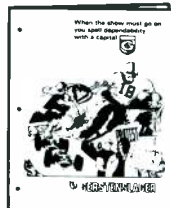
The delayed source effect allows the operator to make one less edit when going from a cut through a dissolve. The operator programs in the delay from the cut edit-in time to the dissolve point. For example, if 10 seconds are needed on the "A" play machine before a dissolve to the "B" machine is desired, the 10-second delay time is programmed into the system. The procedure previously took two edits, one to get to the dissolve and the second to include the dissolve. Delayed source effect saves editing time.

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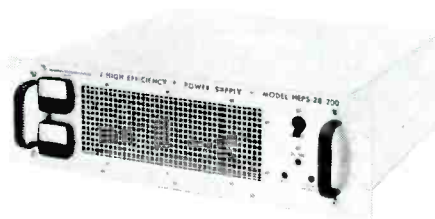
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Randy Cohen, Broadway Video



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Vanguard

Another feature of the new program, auto-exchange, will auto-

matically exchange the edit-out time of the record VTR or play VTR at the end of each edit to an edit-in point for the next segment. This may be selected from the keyboard. Auto-

This Vanguard Wall Chart is available in full color to thoroughly explain the CRT display and keyboard functions.

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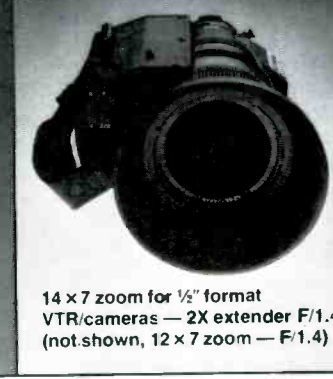
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Vanguard

exchange and delayed source effect are part of the same program included with the slo-mo editing Smart-Scan program. Although the program has been installed in the VPL system, giving the company's equipment all the up-to-date programming of the latest Vanguard systems, slo-mo editing does require some additional circuit cards as well as the program change.

A further update in the original machine is the capability of using either disc or teletype to dump a program without making wiring changes. The original equipment accepted only one or the other. The feature for either output is now standard on new units. The dump may be made on industry standard ASCII punched paper tape, on a hardcopy printer, floppy disc or through the RS232C TTY interface. Previously stored information can be read into the editing system from any of those sources as well.

Factory support

After installation, I looked for factory support. Datatron has performed well in this area also. The field engineers will try to help by phone, but if that does not work, a field engineer is usually on his way the

same day. The company has lived up to its warranty, and in some cases surpassed it. There have been very few problems with the Vanguard system at VPL and the down time of the system totals approximately one hour in eight months of operation. That hour involved an intermittent in the keyboard. The factory replaced the entire keyboard.

Another important factor is documentation. The manuals supplied with Vanguard are more than adequate. The operations manual is excellent. Every aspect of operation is explained in detail. Schematics are



This is a closeup view of the Vanguard keyboard and CRT display.

fairly complete, but there is no theory of operation or alignment procedures. The only adjustments to be made in the Vanguard deal with machine control. Because the system may be used with many different types of machines (more than 40 different makes and models of 2-inch quad, 1-inch Type C, ¼-inch cassette and multi-track audio, as well as the Rank-Cintel flying spot scanner), the factory has not printed alignment procedures for the interface cards. This is somewhat understandable, because they may change with machine changes. However, the customer *should* be provided with the alignment procedure for the interface cards used with a particular system. (Datatron promises to correct this situation.)

System limitations

So far I have pointed out what I like about the system. Now, for the few problems I have found. The major difficulty is in color framing when making dissolves and wipes. Vanguard color frames the record machine, but it will only sync the players. This may cause H-shifts when doing dissolves or wipes, because a 50/50 chance exists of hitting the proper color frame on each player. The technology is available to solve the problem if the designers will work on this single big-

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gest flaw in the entire system.

There is a way of getting around these H-shifts and getting the machines color framed properly. The procedure, suggested by Thom Belford, a field engineer for Datatron, involves several test edits to determine a frame relationship between the editor, the record VTR and play VTRs. First, a time coded tape is placed on the record machine. Then a cut insert is made, preferably using color bars. The duration of the edit is not critical. After exchanging the record edit-out time, another cut edit is made to the same color bar source. If, while playing back the edited cuts, an H-shift occurs, it means the editor and record VTR are not on the same frame. This is corrected on the Vanguard by going into utility mode and changing the system to the other frame. Once the editor and record VTR are aligned, the relationship will not change as long as a continuously time coded tape is recorded. Should the tape on the recorder be stopped while recording, then restarted, the relationship will need to be re-established.

Next, the frame relationship must be made between the play VTRs and the Vanguard. The first step is to make a dissolve of at least 30 frames from the color bar source to the "A" play machine. Replay that edit. If an H-

shift is noted, you must add or subtract one frame to the "A" VTR edit-in time. A shift may not appear on the first edit, but one may show up during the next edit. Once the "A" machine is set, make a dissolve between the "A" and "B" play machines after noting the odd-or-even frame relationship between the record and "A" VTRs. If, on the last edit between record and "A" (with no shift occurring) the record VTR had an odd frame number while the "A" machine exhibited an even number, that relationship must be maintained between those two machines during the session. If the dissolve between "A" and "B" shows a shift, add or subtract a frame on the "B" machine code. As long as a relationship is maintained between the three machines (even-odd-even, odd-even-odd) there should be no problem. If one is changed, however, the other two must also be changed. And if either play VTR is stopped and restarted while being recorded, the relationship may need to be re-established. Datatron is working toward a solution to the problem, but until they solve it, this trial-and-error system works.

In all fairness to Datatron, the color frame H-shift is an industry-wide problem, not a fault of the Vanguard editor. Most of the fault lies in the fact

that there has been no standardization by SMPTE on a color frame pulse location. When SMPTE arrives at a standard, then the manufacturers will be able to solve the difficulties with color framing.

The other problem I have found with Vanguard is in the use of the time code. The fact that audio track time code is used, rather than a vertical interval code, means that you must be careful in the jog mode to avoid developing slack on the tape. If slack occurs, the time code may become erroneous. The operator must go back and pick up the code again. Although this is not a big problem, more careful handling of the tape is required than if vertical interval time codes were used.

The bottom line

These problems are the only real difficulties I have found with the entire system. Other problems could occur with another installation using different tape machines and switchers.

But I imagine the bottom line to any field report would have to be: Would I make the same decision today that I made a year ago? My answer would have to be "Yes." □

The Vanguard system covered in this field report is manufactured by Datatron Inc., 2942 Dow Avenue, Tustin, CA 92680. Comprehensive literature on the system may be obtained by writing Datatron directly.

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Digital technology revolutionizing sound recording

by 3M

tion (BBC), 3M became the first company to market multi-track digital recording equipment for studio use.

Digital use today

Today these recorders are used throughout the United States, Europe and Japan. Many of the 30 US recorders are located on the West Coast. In the Los Angeles area, recorders are installed in (and/or rentable from) Record Plant, Warner Brothers Records, Walt Disney Productions, Westlake Audio and Yamaha R&D Labs. They are also available from Audio-Video Resources, San Francisco. Sound Ideas and Peter Scharf Communications in New York City have multi-channel 3M equipment, as does Universal Recording Corporation in Chicago. About 25 recorders are in use in the United Kingdom, France, Germany and Japan.

The first album to employ 3M equipment was released in December 1978 by Sound 80 Studios, Minneapolis—Copland's "Appalachian Spring," recorded by the St. Paul Chamber Orchestra. The prototype unit was experimentally used to back up direct-to-disc sessions. The digital tapes were judged of superior sound quality to the disc masters, so the record was produced from the digital tapes. The classical disc was nominated for three Grammy Awards and won Best Chamber Music Performance.

Some of the recording artists and groups who have used the 3M system include: Herb Alpert, Chicago, Christopher Cross, Ry Cooder, Billy Joel, Gordon Lightfoot, Kenny Loggins, Linda Ronstadt, Bonnie Pointer, Rod Stewart and Paul Williams. Many

The struggle for a digital standard may forestall digital instrumentation for broadcasters for some time. However, on the recording front, use of digital audio progresses. At the 69th Audio Engineering Society meeting in May, special sessions were devoted to this advancing technology. During this event, 3M demonstrated multi-track editing using 30-channel (32-track) digital audio recorders and its electronic editing system.

The following is a view by 3M on how digital audio technology is beginning to revolutionize the sound recording industry. If technology runs true to form, this trend should be an indicator for the future for broadcasters.

Digital audio recording, with its capability of capturing the greatest dynamic range of sound while eliminating the distortion and noise previously inherent in tape recording, has begun to have a major impact upon commercial sound recording.

Adaptation of computer technology to the audio recording process provides clarity and sound purity unattainable through conventional analog technology, according to Clark Duffey, market development manager for 3M's professional audio equipment.

3M has manufactured analog recording equipment for about 15 years and commercial magnetic recording tape for more than 30 years. In 1977, after four years of solo research and two additional years of joint research with British Broadcasting Corpora-

3M Digital update*

Installations since New York AES

Fifteen recorders have been installed during the past six months (number of recorders follow name of country or city): Universal Recording, Chicago (2); Disney Productions, Los Angeles (2); WED Enterprises, Los Angeles (1); Polar Music Studios, Sweden (2); Onkyo House Studio, Japan (2); Studio Continental, France (2); Studio 10, France (2); and Boney M. Studios, Germany (2).

Digital deliveries

Four international studios will receive recorders soon: Studio Master One (for digital cutting only); Dierks Studio, Boney M. Studios and Bauer Ton Studio, Germany.

Digital's success in Germany

"Parsifal" — the first digital multi-track recording of an opera — was released in April by Polygram. It was recorded on 3M's 32-track recorder in late 1979 by Herbert von Karajan, with the Berlin Philharmonic Orchestra, the chorus of the Berlin Opera and leading vocal soloists.

Nine digital recorders have been purchased in Germany during the past year. Boney M., a well-known German pop group, has purchased five machines for its own studios. Bauer Ton Studio is well-known for producing German folk music and jazz. Dierks Studio is most popular for rock recording, especially live concerts.

Digital classic

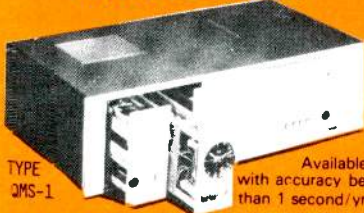
Isaac Stern's 60th Anniversary Celebration album, recorded by CBS Master Sound, has become one of the largest selling digital classics.

New digital application

About six TV commercials have been recorded digitally, showing an increasing interest in linking high quality audio to video. Studios involved: Sound Ideas Studios, New York City; Universal Recording, Chicago; and Sound 80 Studios, Minneapolis.

*Special status report for AES, May 12-15

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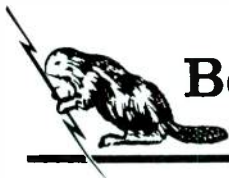
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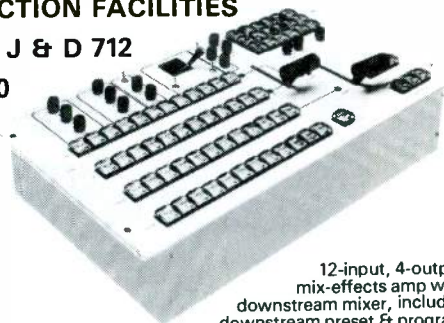
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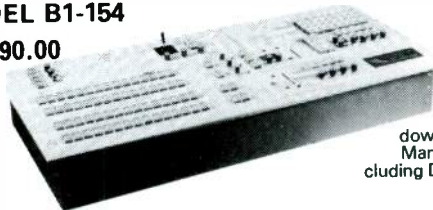
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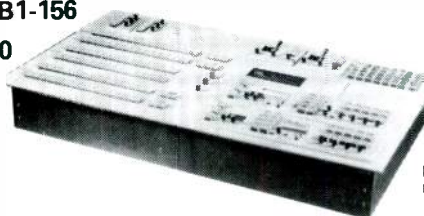


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MODELS 154 & 156

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- Tallies**
 - isolated dry contact relay closure on all inputs (2 amps at 50 v.)
- Mix-Effects Units (Includes Keying Function)**
 - One (1) used in Model B1-154
 - Two (2) used in Model B1-156.

Fades (or Supers), Wipes, Keys may be produced.

Positioner Joystick for each M/E positions patterns.

 - **Pattern Modulation** may be accomplished by an internal waveform generator. Modulating sources may be either (1) sine wave, (2) square wave, (3) saw tooth, or (4) an external customer generated source.
 - **Mix Key and Wipe Key** available.
 - **Soft Wipe and Soft Key** available with adjustable variations.
 - **Push to Preview** obtained by depressing knob on clip potentiometers (provides for M/E monitor output).
 - **Wipe Mode**—3 interlocked buttons select "NOR", "REV" or "N/R".
 - **Hard Wipe, Soft Wipe or Border** can be selected with degree of softness made by "Edge" control adjustment.
 - **Border** may be **Colorized** by adjustment of "Hue" and "Luminance" control.
 - **Symmetry of Pattern** may be adjusted by "SYM" knob.
 - **Preset Wipe Limits** are set by potentiometers. "H" and "V" vertical preset limits activated by Pattern Limit button.
 - **Spotlight** alternate action push button produces a 6 db. level difference between "A" and "B" input channels in the "Wipe" mode. (Operates on all patterns.)
 - **Pattern Assignment** is made by depressing "ASSIGN" button. Pattern select

feature may be "locked" to pattern matrix by depressing the "ASSIGN" button a second time on the same pattern. Patterns assigned appear on LED display on M/E control panel.

- **Non-Synchronous Inputs.** An "NS" indicator is provided. Tearing is prevented by not allowing a non-synchronous signal to be switched except at extreme position of fader handle where a "cut" transition occurs.
- **Key Input Sources** may be either (1) "A" bus video for self keying, (2) preview Key bus, (3) chroma key, or (4) an external key source.
- **Key Invert** selector provided to accommodate either positive or negative video as a keying source.
- **Key Fill** may be either "A" video for self keying or a colorized matte.
- **Mix/Key** provided a lieu of second Mix/Effects system for Model B1-154 switching system. Provides for all mix and keying functions of mix/effects system (as previously described) except for the pattern effects.

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 - Down Stream Keyer (DSK)** \$1,975.00
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 - Quad Split** \$1,900.00
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 - Aux Busses—(Model 156 only)** \$2,100.00
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 - Mix/Key amp fed by preview and program busses in 156 \$3,500.00*
- *Except those indicated with an asterisk.

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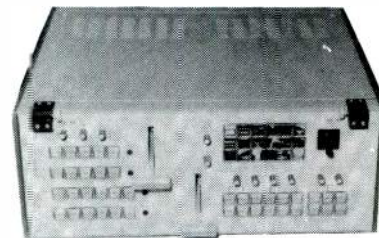
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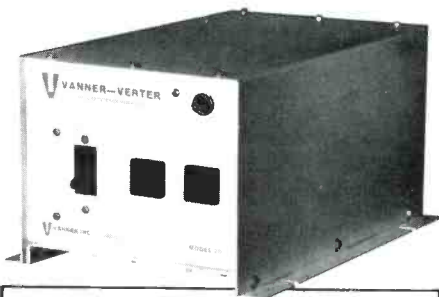
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Digital audio

classical groups have made digital recordings with this equipment, including the Berlin and New York Philharmonic Orchestras; the orchestras of Cleveland, Philadelphia and Minnesota; Montovani; and the Los Angeles and St. Paul, MN, Chamber Orchestras.

Digital vs. analog

Conventional analog recording, optimized to record the music of the '30s and '40s, tends to distort when recording loud sound levels at either end of the frequency spectrum. The problem is especially severe when recording peak transients. The result is muddy sound lacking definition, clarity or crispness.

Advantages of digital recording include the virtual absence of tape-generated noise, coupled with nearly 94dB signal-to-noise ratio and full, uniform frequency response from 20 to 20,000Hz.

Rather than recording complex waveforms on tape as with conventional equipment, the digital system converts all information about the sound into a numerical code that can encompass the loudest to the softest sounds across the audible frequency spectrum. This is updated 50,000 times a second to produce full fidelity. Because only numbers are recorded on the tape, noise and distortion generated by the tape and electronics are virtually eliminated. In playback, the code recreates the music identically. The sound is as transparent or as full as the source.

Distortion is a significant factor because the dynamics of music have changed since conventional sound recording technology was developed. Today's music generally contains much greater sound levels at low and high frequencies. With digital technology, direct or close multiple-micing placements can better record the highs and lows of individual or amplified instruments.

Another practical advantage of digital recording is the lack of deterioration in signal quality, especially the absence of noise build-up on multiple-generation copies made during dubbing and mix-down. This can significantly contribute to the quality of the typical record which, after repeated combining and editing of tracks in the mix-down process, may be 20 generations from the original.

Digital recording techniques represent an improvement over the direct-to-disc process, too, because disc mastering from the digital tape permits optimization of the groove pitch and cutting amplitude for the par-

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Digital audio

ticular sound levels coming into the disc cutting lathe. In direct-to-disc mastering, a certain amount of guesswork is inevitable. The use of tape permits an automatic pitch control unit to continuously adjust the proper spacing between grooves and more than one defect-free disc master. This assures better sound quality and allows more music to be placed physically on the record. Also, less than optimum groove cutting, disc electroplating or replicating can be corrected because there is a master tape.

In addition to extra sound quality and longer playing time, digitally mastered records offer the consumer a benefit in album price. Direct-to-disc records are by necessity limited editions, as only a relatively small quantity of record pressings can be obtained from a single disc master. With digital recordings, a master tape is obtained from which additional disc masters can be made. This allows the supply of records to equal demand and enables production costs to be absorbed or spread across a larger scale.

Digital recording has the added advantage of allowing mixing and editing at a later time, which often

leads to better sound balance and tonal quality, expanded composition possibilities and the elimination of performance fluffs.

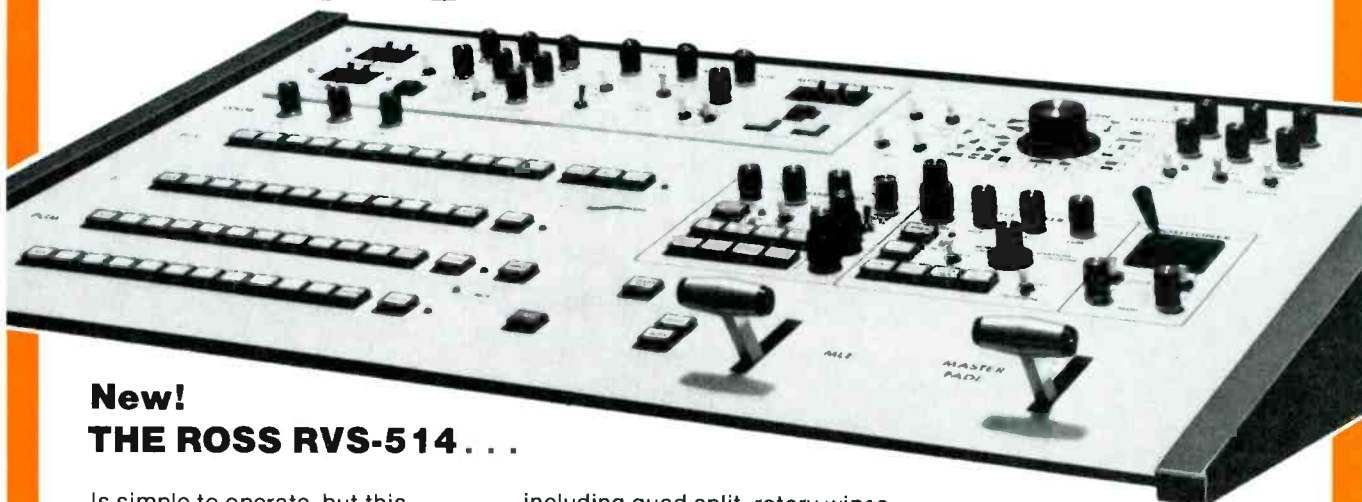
3M's digital development

Engineers working to refine 3M's analog equipment concluded that the law of diminishing returns was being approached rapidly within existing technology, and that further improvements would require an entire new approach. Computer technology appeared to hold the answer to noise-free and distortionless sound, if a number of technical problems could be solved.

After four years of research and significant progress, 3M approached the BBC, an acknowledged leader in audio and video research. The BBC had pioneered in network transmission of digital signals and had also been searching for a practical method of recording the programming material it transmitted digitally. A 2-year joint research project was soon launched to further refine the 3M system.

According to Bryce McCrerrick, director of engineering at the BBC, 3M's system represented a major technological achievement involving several significant breakthroughs. The

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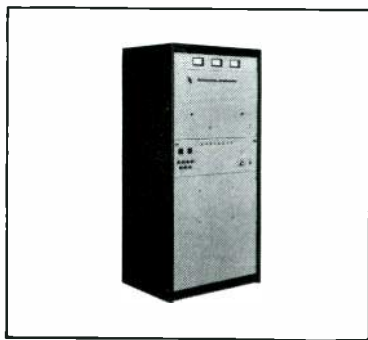
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Digital audio

most notable, he said, relates to the elimination of static-like noise on digitally produced tapes caused by tape dropouts that may be present because of minute tape imperfections or contamination of the recording surface. An innovative error-correction scheme was developed to successfully counteract this primary roadblock to acceptable digital recording.

A related question was how to store the huge quantity of musical data, plus error-correction information, from a practical tape use standpoint. To put this challenge into perspective, the multi-track recorder ultimately developed by 3M engineers can store 40 million bits of information for each second of music. Thus, for a 30-minute recording, more data is stored on a 1-inch tape (72 billion bits) than on 200 rolls of standard computer tape. This accomplishment required a joint effort in tape and equipment design.

The digital equipment installed in most studios has consisted of a 32-track (30 audio channel) pre-mix recorder and a 4-track stereo master recorder. These have the same capabilities already common in studios, such as overdubbing, punch-in remote control and in-sync track-to-

track recording.

The 32-track recorder and the 16-track version use a special 1-inch Scotch brand mastering tape also developed by 3M. The 4-track recorder uses a 1/2-inch version of this tape.

3M has also developed an electronic digital editing system and preview delay units for use in cutting record masters. The editing system permits precise, smooth multi-track edits and promises to expand the creative potential of the music editor.

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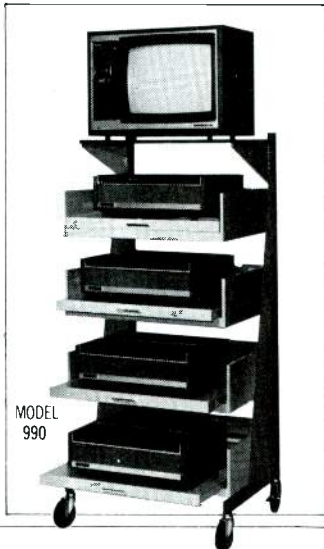
Reactions to digital

Industry reaction to the digitally re-created sound has been excellent, according to Duffey, who predicts that 30 to 40% of studios will employ digital technology within five years.

What are studio reactions? Lee Herschberg, director of recording and

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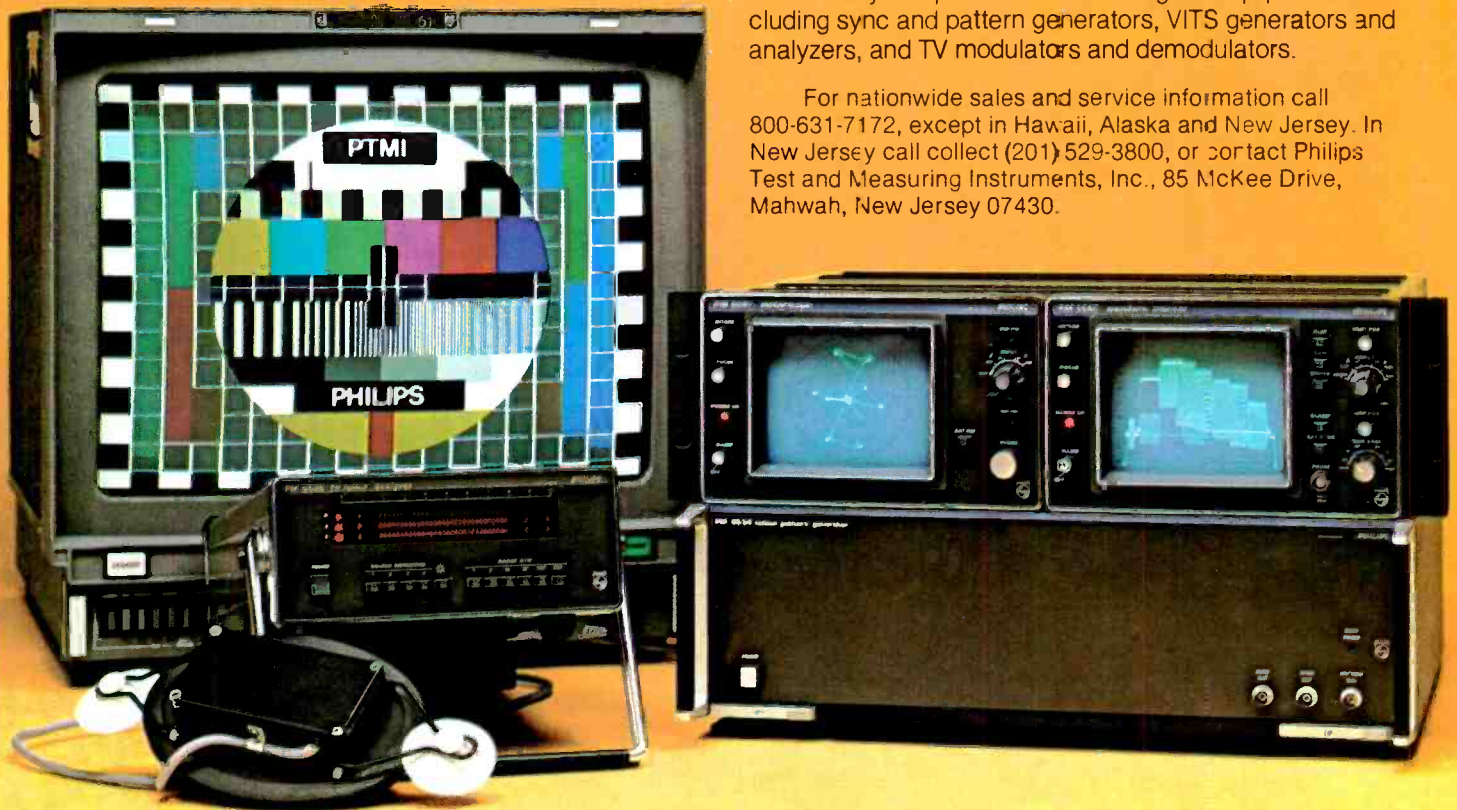
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Digital audio

engineering, Warner Brothers Records, said after using the 3M system to record and master several albums. "We hadn't been aware of how much was lost with analog recording. What's more, there is basically no generation loss in making copies or mix-down. Digital has also made some operations easier."

Tom Jung, former Sound 80 chief engineer said, "The striking thing is the purity of digital sound, the complete absence of anything foreign between the artist and the music. The intensity of sustained low notes, faithfully re-created transients and totally preserved overtone structure can't be duplicated."

Chris Stone, president of the Record Plant said, "Digital provides clarity we never thought we'd hear on tape and represents a new vista in sound recording. The advantages are readily apparent even to consumer ears. Digital recording is definitely the method of the future . . . and it's here today."

Digital for consumers
Although digitally recorded masters

are increasingly providing greater quality for today's hybrid records, the ultimate future consumer benefit will be home digital disc or tape systems to fully re-create the music of these masters in the living room.

When 3M announced and first demonstrated digital sound in November 1977, its ultimate impact upon the home appeared to be about 10 years in the future. But, the excitement that digital sound has produced at the studio has given the impetus, and emerging electronics much of the means to accelerate the time schedule. The latest prediction is that home digital equipment may be available from several manufacturers by 1982.

Digital audio is also increasingly being used to heighten the impact of video productions, because consumers want high quality sound and digital audio offers at least 30dB more than normal first generation audio from a video recorder.

Digital audio technology, the first real change since Edison invented the phonograph, will increasingly improve the quality of records and movie soundtracks, broadcast and cable TV programming and commercials. The coming of video and digital audio discs promises to hasten digital audio's revolution of sound recording. □

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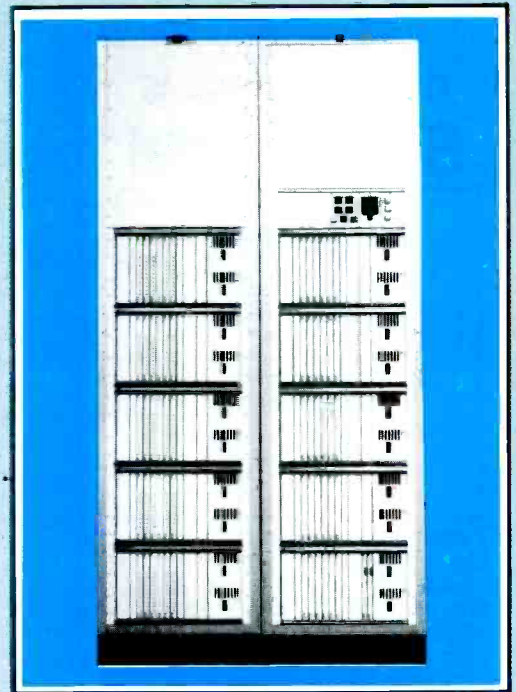
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KTRK TEST DATA BREAKDOWN

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Diff Gain05	.042	.05	0.1%
Diff Phase	0.1	.056	.08	0.12°
Diff Delay	1.0	.89	.95	± 1°
Freq Response05	.02	.05	± .12 dB
Hum & Noise	-79	-84.6	-80	-75 dB
Gain Uniformity, All Paths .....	.017	.006	.017	± .07 dB
Input Return Loss	46	51.2	46	40 dB
Output Return Loss	45	48.8	46	40 dB
AUDIO				
Crosstalk @ 20 KHz	-80	-84.7	-81	-75 dB
Hum & Noise	-88	-91.8	-90	-85 dBm
THD 30 Hz - 20 KHz				
@ 0 dBm .....	.017	.011	.015	0.1%
@ +24 dBm .....	.24	.13	.17	0.5%
Gain Uniformity, All Paths	0.1	.044	.09	0.2 dB
Common Mode Rejection	80	88.3	83	70 dB

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The First Class ticket

By John M. Cummuta, operations manager/chief engineer, KNEI AM-FM, Waukon, IA

The First Class Radiotelephone License was eliminated effective Aug. 7, 1981. Can small market radio stations resist the temptation to reduce their concept of engineering quality to ON THE AIR/OFF THE AIR?

In its explanation of the rationale behind the elimination of the first phone, the FCC described the operator requirements as an engineering overkill. The FCC cited the remarkable improvements in equipment reliability since the inception of the deceased regulations and painted a simple picture of a complex industry.

Although they may have a reasonable argument, considering the prostitution of the license by the "quickie courses," there are two potential problems that do not fall equitably across the industry: The distribution of the modern, reliable equipment is heavily in favor of the larger markets; and the lack of competent engineering support is mainly evidenced in the smaller radio markets where older, less reliable equipment collects. It is there, at broadcasting's understruc-

ture, that one of the common disagreements about the consequences of the license removal occurs.

Chris Payne, assistant to the vice president of engineering for the National Association of Broadcasters said that he thought the benefits of the first phone elimination could lie mainly with small market stations, because of their inability to attract technical people to their staffs. Now they will be able to hire outside of radio broadcasting if they wish, he said.

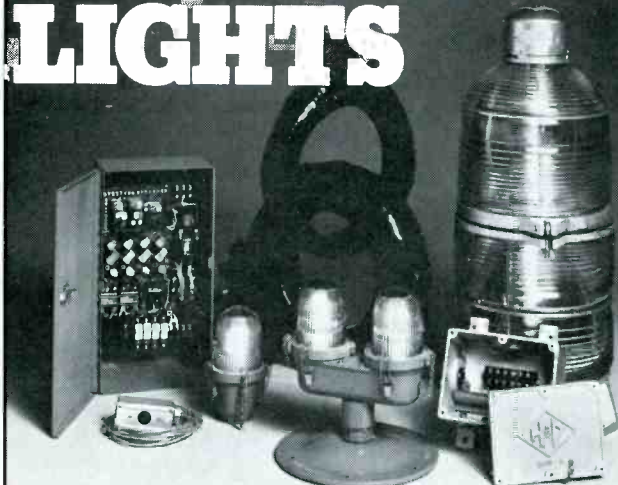
Payne said that businessmen could now choose their own levels of quality in broadcasting. They could spend less money for engineering if they wanted to, but would have to live with the possible consequences, such as fines given at inspection time.

The NAB is an organization of station and network owners and licensees, according to Payne, and does not represent station employees, but rather, management and ownership.

Payne said that stations could now hire people who did not have licenses for maintenance of the radio station.

Abe Voron, a member of the Na-

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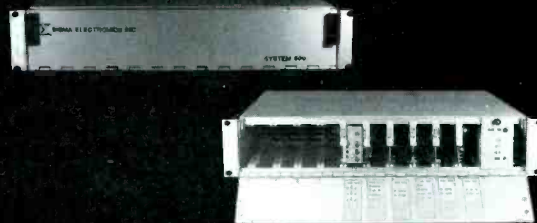
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tional Radio Broadcasters Association, was worried about that very thing. "There'll probably be guys who think they can get their local TV repairman...all he knows how to do is change tubes."

On the other hand, Payne said that the NAB saw this as a chance to bring in more talented people.

"We realize that they might not know anything about the broadcast rules, and in this area, we appreciate at NAB the sort of transition that may take place here. We are talking with the Society of Broadcast Engineers and we believe that we're going to work up some relationship where we will help them with their certification program," Payne said.

Payne indicated that the NAB was also working on the publication of a set of guidelines that would help employers in reading resumés and interviewing technical people.

Reviewing the realities of the small radio market and the electronics industry in general, a few problems can be seen: The local TV repairman or phone company tech is not likely to travel any great distance or burn much midnight oil preparing for SBE certification; not many electronics technicians from other industries are likely to turn down starting salaries of \$20,000 plus to accept \$14,000 or less

at a small market radio station; and the equipment in those smaller radio operations is the most likely to be in need of attention.

This would seem to nullify the compelling reasons for the elimination of the ticket and its requirements in broadcasting, except for the fact that some people feel that the ticket did not serve any purpose.

"The first class ticket was meaningless," Voron said. "The thing is that many hundreds of people who had first class tickets didn't know any more than the do-it-yourselfer broadcast owner. They didn't know any more about what was required. I can't tell you how many times we have run into people with first class tickets that don't know a tube from a capacitor."

Many small market radio station operators do their own maintenance. This could lead to problems if they misinterpret the elimination of the first phone requirements and its associated assurance about modern equipment reliability as saying that anyone who knows something about electronics could keep them in legal standing. The elimination could also be misconstrued as a slacking off of the technical requisites. It is possible that non-technical operators could let critical parameters drift or leave them in the hands of someone who may

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know electronics, but who lacks cognizance of what the FCC expects from a broadcast station. If so, the results could degenerate to chaos.

"If they perceive this as a relaxation of the standards," Voron said, "what you say is indeed going to happen. But of course this is not a relaxation of the standards. The station still has to perform like it always has and the guys who were not conscientious about it before are not going to be conscientious now."

The elimination of the first phone requirements reveals many potential problems for the industry resulting from just one aspect of the change. Many first-phone positions resulted exclusively from the regulations' requirements and a good deal of these positions will be eliminated.

The effect will be a temporary loss of apprenticeship programs, according to Payne, because of the trimming of technical staffs of radio and TV stations. It will become harder for people to enter the field of broadcast engineering because many of the subordinate positions will be eliminated.

The disintegration of the training grounds afforded by the apprenticeship situation and the attrition of broadcast electronics oriented education programs (possibly because of lack of an identifiable symbol of achievement—the first phone) could eventually lead to a drying up of the pool of technical people available to licensees at all market levels. This could conceivably result in a situation exactly opposite that envisioned by those aligned with management.

According to the NAB, the intent is to simply give managers the same hiring/firing freedom in the engineering area as they have in other departments.

"It doesn't mean that there'll be less qualified people," Payne said. "It doesn't mean that the salary structure will change necessarily. It just means that those who did not happen to go through the FCC licensing procedure can be considered as candidates for jobs in engineering."

If salary incentives from other electronic industries and the loss of prestige and the apprenticeship process should lead to a shortage of qualified technical people, several things could happen.

First, the small market radio operations couldn't compete economically, so they would be reduced to using the local electronics talent without cognizance of FCC broadcast requirements. Secondly, that talent still available to the broadcast industry, especially with identifiable credentials, would no longer settle for the meager salaries prevalent in many markets. There could be insufficient technical talent available to the less affluent markets and expensive technical talent for those willing to pay.

There are discussions of scholarships to help prospective broadcast engineers get education and various organizations are combining forces to help smooth out the transition. Nevertheless, it appears that the bottom of the totem pole will feel most strongly the emptiness of the void left by the elimination of the first phone.

Will small market, and maybe not-so-small market radio stations fly economy class and forgo qualified engineering support?

"I think the answer is that in the world of business there are lousy hardware stores and there are good hardware stores," Payne said, "and presumably the lousy hardware stores are free to be lousy if they want—and eventually go out of business. If an owner of a station wants to make a choice of trying to do these things (engineering) or to hire people who may not be qualified to do these things, he's giving it a try at his own peril." □

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4CX250K	120.00	4-500A	165.00	5879A	3.75	8890	1785.00
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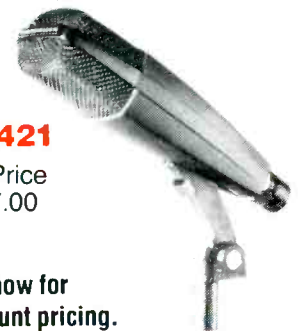
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Understanding FM crosstalk measurements

By Dennis Ciapura, general manager of telecommunications, Greater Media, East Brunswick, NJ

No other area of the FCC equipment performance regulations generates as much confusion among FM broadcasters as the crosstalk specification. Everyone knows how to test for crosstalk and most FM engineering departments do so with some degree of regularity, but the confusion persists. In fact, many stations are trying to achieve virtually impossible phase linearity for no good reason and are left feeling guilty about substandard performance when they fail.

First of all, it is important to understand that sub-to-main and main-to-sub crosstalk has nothing to do with stereo separation unless the crosstalk occurs in the stereo generator, transmission system or receiver decoder.

Any phase or amplitude imbalance fed into the stereo generator will simply be reproduced at the receiver. This is not to say that accurate stereo channel balance and differential phase linearity is not important, but rather that these errors will simply be repro-

duced by the stereo multiplexing system and will not affect the stereo separation or the capability of the stereo generator to maintain whatever level of crosstalk suppression is possible. Figure 1 illustrates this point.

This is why popular signal processors that have internal stereo generators, such as Orban Optimods, include separate test jacks for making the stereo performance measurements. In fact, attempting to adjust a stereo generator that is being fed with test signals that do not have perfect differential phase and amplitude response will result in misadjustment of the stereo generator and less than optimum performance. Feeding the test signals from the studio console inputs may create just such a situation.

The purpose of the crosstalk measurement is to insure the integrity of the main and subchannels carrying the L+R and L-R components. In a perfect stereo generator, if exactly equal and in-phase signals are applied

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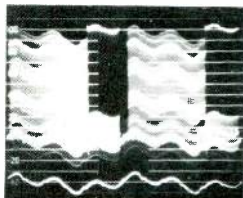
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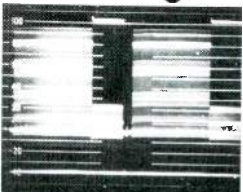
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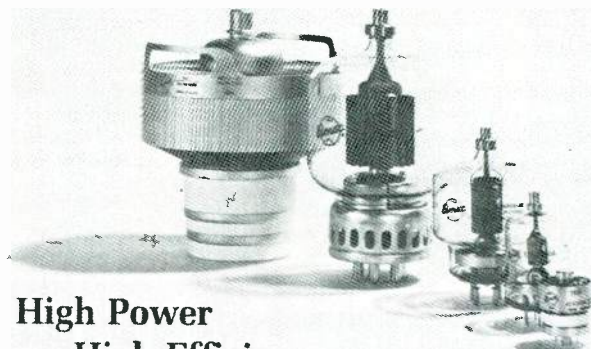


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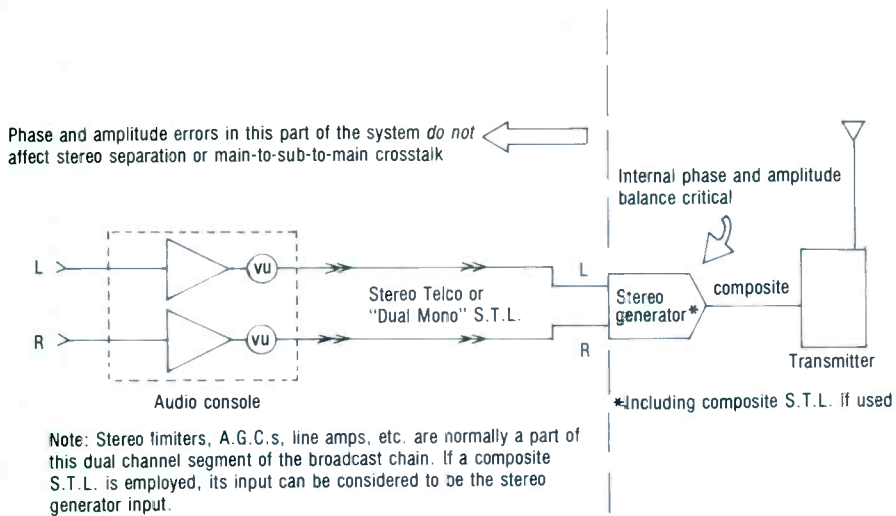
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Note: Stereo limiters, A.G.C.s, line amps, etc. are normally a part of this dual channel segment of the broadcast chain. If a composite S.T.L. is employed, its input can be considered to be the stereo generator input.

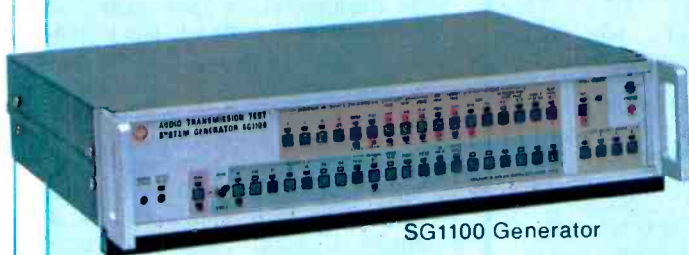
Figure 1. Highly simplified stereo broadcast system illustrating dividing line beyond which phase and amplitude balance errors noticeably affect crosstalk and separation performance.

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Crosstalk

to the left and right inputs, there should be no L-R component whatsoever. Of course, such perfect cancellation does not occur in the real world and some L-R residual will always exist (hopefully below the -40dB level specified by the FCC). It is the magnitude of this residual that describes the system crosstalk performance. Conversely, exactly equal and 180° out-of-phase inputs should produce no L+R component at all.

The reason that the crosstalk per-

formance within the stereo generator circuitry is so important is that the listener's receiver circuitry will assume perfect crosstalk performance in the transmission system. If it is not, correct decoding will not be possible, even if all of the other stereo generator performance parameters are perfect. Optimum stereo performance will not be achieved at the receiver.

It is important that crosstalk be minimized at all frequencies within the system bandpass. The crosstalk

measurement itself is simple, but it is extremely important that it be done properly, for one incorrect procedure can render the whole test series invalid and useless.

The easiest way to provide an exactly equal L+R input to the stereo generator is to use one signal source and simply feed it into both channels. Most stereo generators are not adversely affected by simple paralleling of the inputs. This eliminates the need for any splitting components or networks. If such a network is used, it is extremely important that the components be of the highest precision obtainable. A small amplitude or phase imbalance will seriously degrade the crosstalk measurement.

Actually, a simple solid-state inverter is preferred over transformers. Several suitable designs are illustrated in Walt Jung's, *IC Opamp Cookbook*. However, if transformers are used, be sure that two identical, and preferably phase and amplitude matched, units are employed. Extreme linearity in the 50 to 15kHz range is most easily achieved with transformers spaced at 10Hz to 50kHz range response. A pair of UTC-21s or 111 repeat coils can frequently be found that are balanced close enough to yield 50dB or better crosstalk figures. These are expensive transformers, and unless they are already available a simple IC inverter is suggested.

Bear in mind that two elements must be closely matched to insure optimum crosstalk figures: the amplitude response and the phase response. The new 8100A Optimod has front panel facilities to allow direct connection of one of the audio channels to the main or sub carrier portions of the generator, thus providing an ideal crosstalk test condition because the validity of the measurements is not at all dependent upon perfectly matched input signals. Harris and Moseley generators have balanced inputs that lend themselves to simple inversion and easy testing.

The correct crosstalk test procedure starts with tweaking the left or right input sensitivity control, if there is such an adjustment, for minimum L-R with an L+R input. Most stereo generators do not have input level sensitivity controls, but have internal adjustments to accomplish the same thing. If good results are not immediately obtained, the schematic should be checked to see if such an adjustment is available. Before that adjustment is made, it is critical to double check the input sources to be sure that equal amplitude and phase signals are being applied to the stereo

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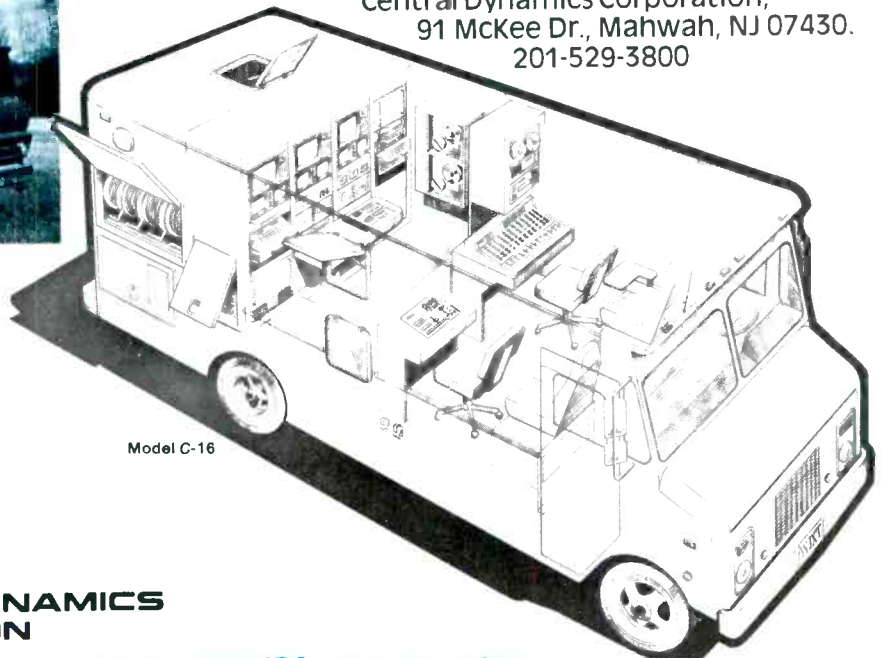
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Model C-16



Photos courtesy Wolf Coach (Models A, C, D), Shook Electronics (Model B)

A-10: 10-11' production area, 1-2 cameras, 1 portable VTR, audio mixer, video switcher, audio cart recorder, and ancillary equipment.

B-14: 12-14' production area, 2-3 cameras, 1 studio VTR, audio console, production switcher, audio cart and reel/reel recorder, intercom, and ancillary equipment.

C-16: See illustration to right. 16-18' production area, 2-4 cameras, 1-2 studio VTR's, other equipment similar to B-14.

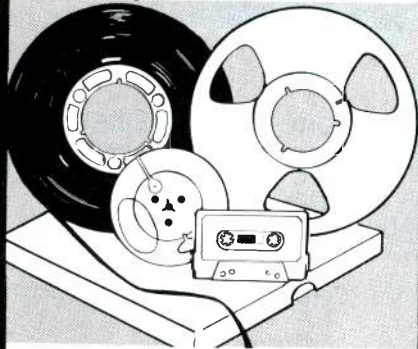
D-22: 18-24' production area, 3-6 cameras, 1-3 studio VTR's, A/V routing switcher, 2 audio cart recorders, telephone system, other equipment similar to B-14.



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Crosstalk

generator.

It is equally as critical to be sure that the modulation monitor is correctly calibrated. A mono FM input should produce little (-50dB or more) L-R on the stereo monitor. If not, recalibration is in order. Actually, a low frequency spectrum analysis of the baseband is best.

Start the test run at 400 or 1000Hz and then continue to test at the other standard frequencies through the passband to find out if the crosstalk figures hold up as the frequency is varied. *No readjustment of input balance or internal nulling should be made as the frequency is changed.* To do so is to completely invalidate the test procedure, for we know of no stereo generator manufactured to date that has a little elf installed inside with instantaneous response to make balance adjustments when program material is fed through the system.

L-R crosstalk into L+R is tested in the same way, except that one input is inverted to generate the L-R signal or the L-R circuitry in the stereo generator is fed directly. No readjustment of any stereo generator balances should be required if the circuitry and

monitoring equipment is operating properly. If any such adjustments are made, the test is invalid. If L+R into L-R is good and L-R is not, spectrum analyzer inspection of the baseband is in order.

The following scenario illustrates the sequence of events that usually leads to completely worthless crosstalk measurements despite the investment of a great deal of time and effort:

The test signals are applied to the console inputs in the studio main control room and are fed through the entire system including telco or microwave STL equipment and signal processing equipment at the transmitter. A quick spot check of the L+R crosstalk into L-R reveals only 36dB of attenuation, so the engineer adjusts the signal processor input level control of one channel or the other to null out the crosstalk. This is the first problem area because what he has actually done is probably misadjusted the signal processor input sensitivity balance to compensate for slight channel balance errors in the cumulative balance of the system leading back to the test generator at the studio. Assume that the engineer intends to



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make the entire program chain part of this signal source to the stereo generator and the crosstalk measurements continue.

The first measurement was made at 400Hz and after a little input level "tweaking" a crosstalk figure of -44dB was achieved, so the test continues through the other standard test frequencies. 1000Hz still looks good, about -42dB, but at 5kHz the reading is only -38dB, so the engineer once again readjusts the input level control to null out the crosstalk at 5kHz. And so the test continues with a little renulling at each test frequency until a satisfactory crosstalk test series has been completed. There are problems with these crosstalk measurements.

First of all, as we pointed out earlier, it is absolutely unnecessary to run the test signals through the entire system. They are more properly applied directly to the input of the stereo generator. It is an enormous undertaking to attempt to get an entire broadcast program chain phase and amplitude linear enough so that its irregularities do not result in dissimilar signals at the stereo generator input. This is not to say that it is not a good idea to have the frequency response of

each program channel as good as it can be and the two as identical as they can be, but that is no way to test a stereo generator. The FCC rules certainly do not require such a procedure. Differences in frequency response between the channels of greater than 1dB should be avoided, because these errors in excess of 30 degrees will cause loss of high frequency response in the main channel, which is what the mono listener is hearing, and requires additional energy in the subcarrier just to reproduce the phase error. In practice though, most broadcast chains are better than that. Differential channel balance vs. frequency within .5dB and differential phase within 15 degrees is achievable and represents excellent audio performance. However, such a program chain would still be marginal with regard to measured crosstalk performance at the output of the stereo generator. Furthermore, renulling at each test frequency merely compensates for any amplitude imbalances that may exist either within the stereo generator or in the signal sources feeding the unit. This makes the crosstalk measurements for all except the first frequency invalid. □

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Music series becomes production challenge

Most remote productions require full use of the staff's energies and resources. One remote that was more demanding than usual was the recording of the Spoleto '81 Chamber Music Series at the historic Dock Street Theater in Charleston, SC.

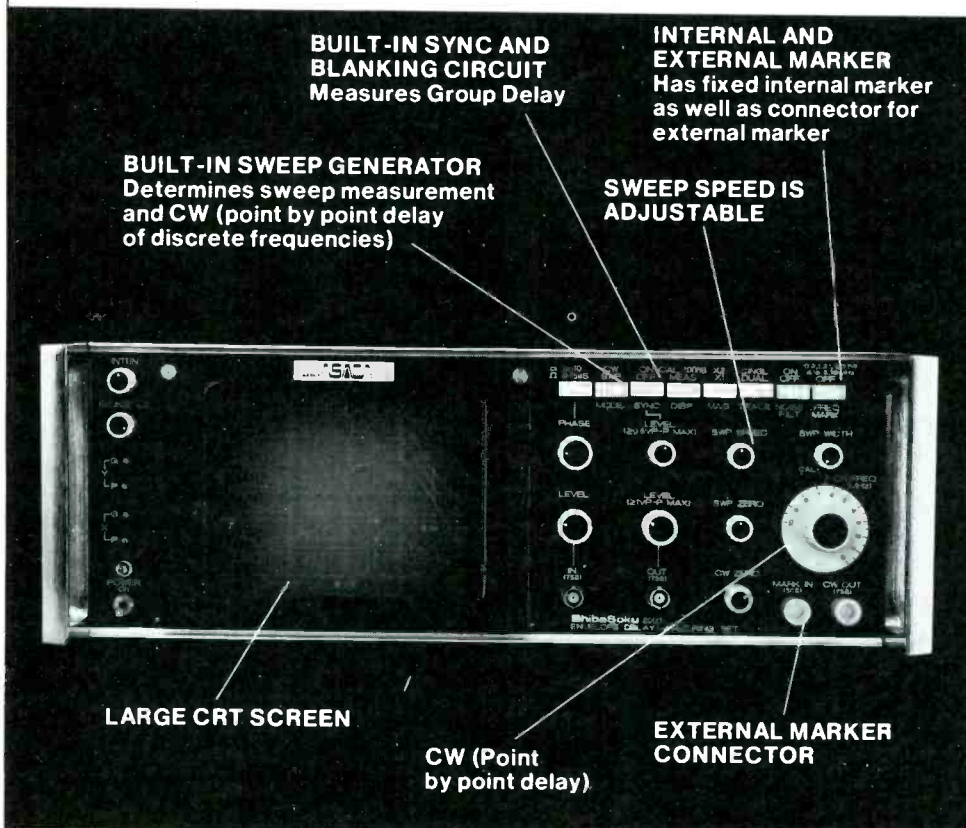
Setting up the remote production studio proved to be an arduous and sometimes dangerous endeavor, ac-

ording to Sam Gilliam, technical consultant to the 10-program series for the South Carolina Educational Radio. All of the recording equipment had to be carried to a projection booth up a steep iron circular staircase, which was the only access. The steps are 2 feet wide and angular, tapering off from the 8-inch center to practical-ly nothing at the center pole. Each

piece of equipment, including two Studer Revox B67 recorders, a mixer and Gilliam's personal Revox B77, had to be carefully maneuvered up the steps.

Because only five microphones were needed (three Neumann U89s for stage overhead and Martin Bookspan, the announcer, plus two auxiliary Cetec wireless units), a com-

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(Left to right) Sherry Hutchinson-Craighead, producer; Sam Gilliam, technical consultant; and Martin Bookspan, announcer, recording the Spoleto '81 Chamber Music Series.

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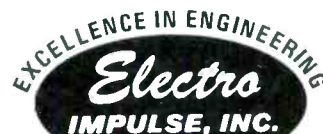


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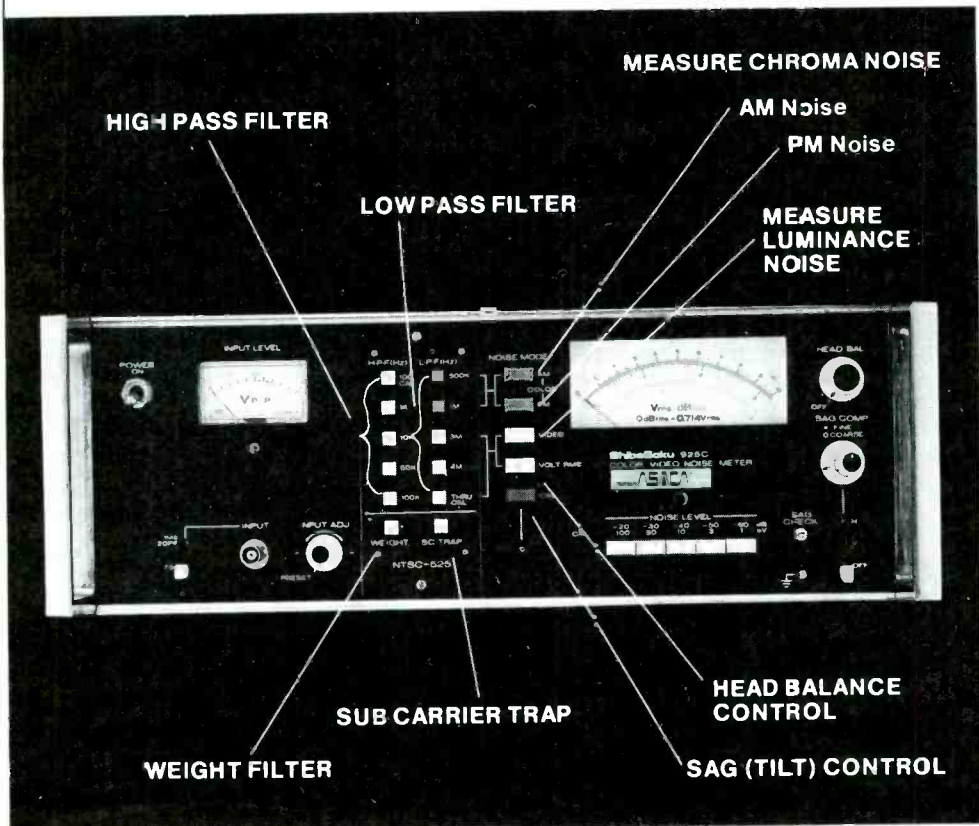


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Music series

pact Studer 169 mixer provided enough inputs for the job.

Also, excessive heat and humidity caused concern about the working conditions for the operators as well as for the equipment. Temperatures crept into the upper 90s with a high percentage of humidity. To add to the oppressive weather factor, the broadcast booth did not have air conditioning.



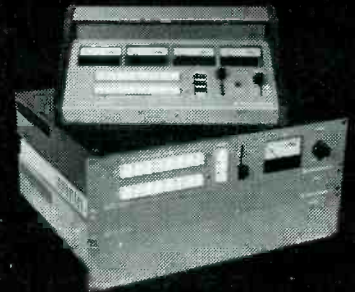
The South Carolina Educational Radio moved its entire production studio up and down this staircase for the Spoletto '81 Chamber Music Series remote. Sam Gilliam, technical consultant, carries a Studer B67.

"We were a bit concerned about recording for such a critically demanding audience under these conditions," Gilliam said, "But the master tapes all came out with superb sound quality. Our only problem was some rumble from the house air conditioning. We couldn't eliminate that entirely, at least not without risking damage to instruments from warpage and asking the audience to suffer the way we did."

The Spoletto Chamber Music Series broadcasts were scheduled for Sunday afternoons from June 7 to Aug. 9, 1981 on the NPR network. Also, Chicago's WFMT, a classical music station, plans to air the concerts under a separate arrangement. WFMT will air the original master tapes directly from its facility. □

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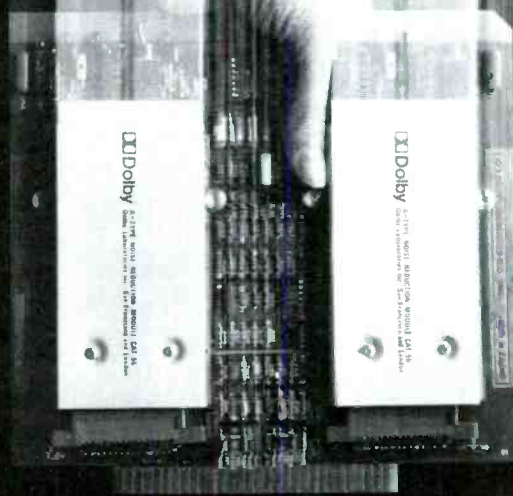
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- **Product section begins on page 116.**
 - **Manufacturers' addresses section begins on page 190.**
 - **Dealer/distributor section begins on page 210.**
-

Since our first edition of the Buyers' Guide 13 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 has nearly 710 product categories, lists more than 865 manufacturers, and contains more than 255 advertisers. It's the result of a dedicated staff effort to make it our finest tool for purchasing the industry's hardware, software and services.

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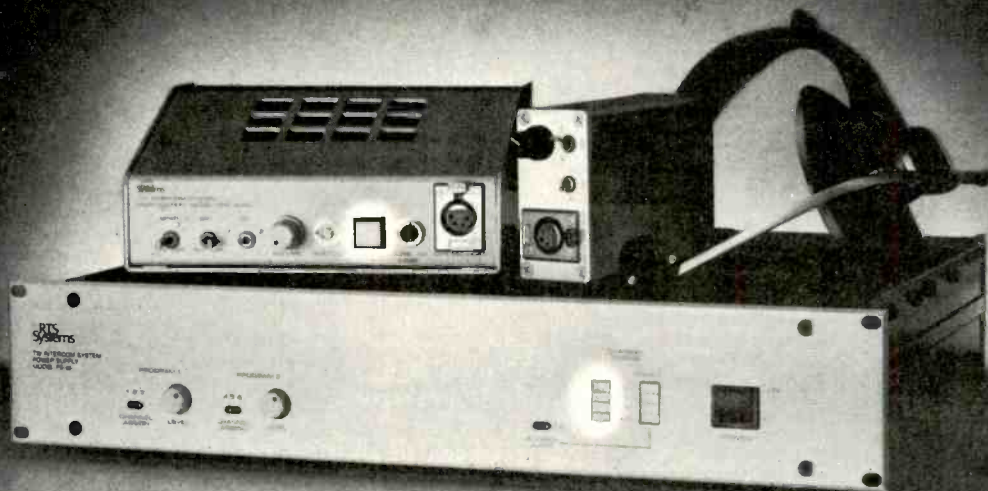
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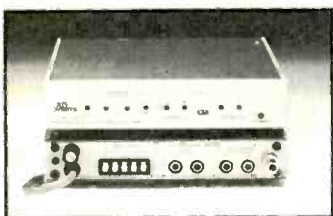
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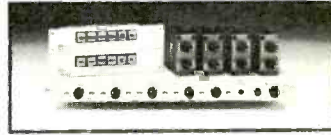
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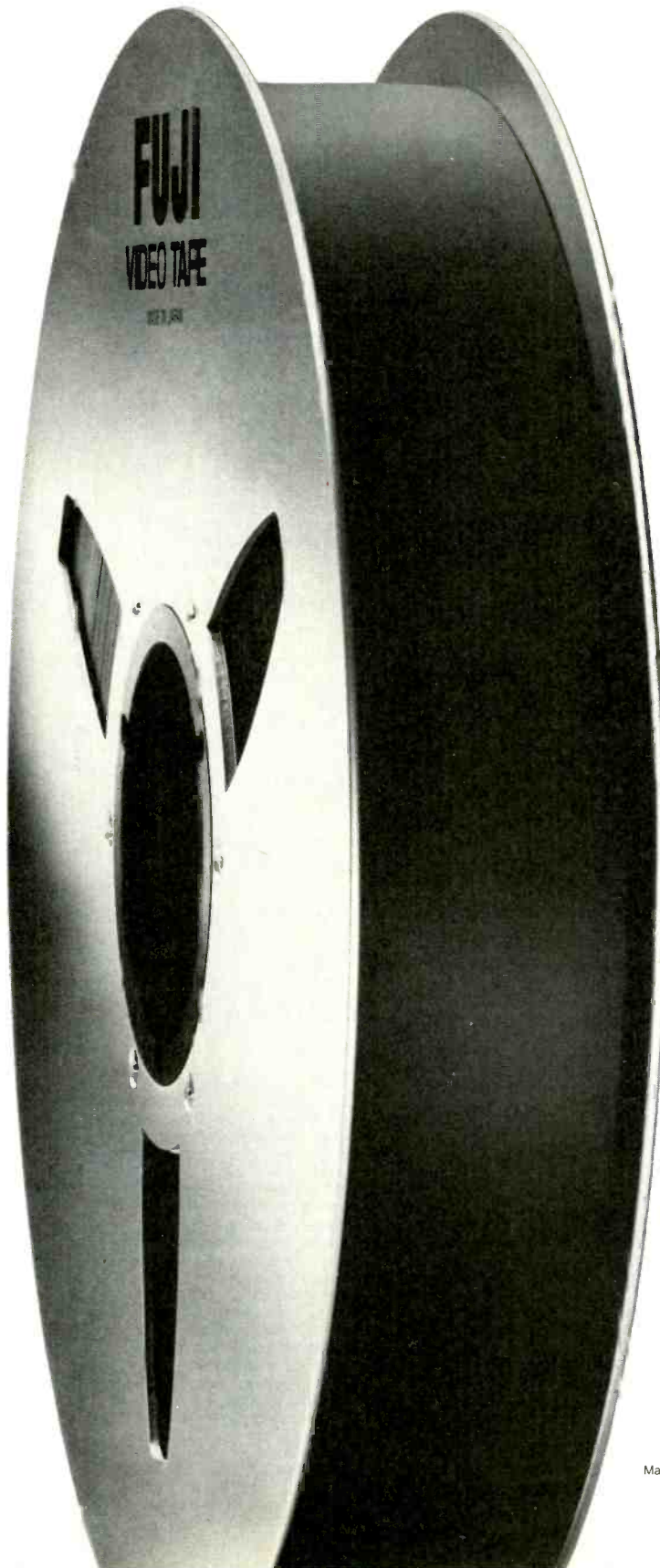
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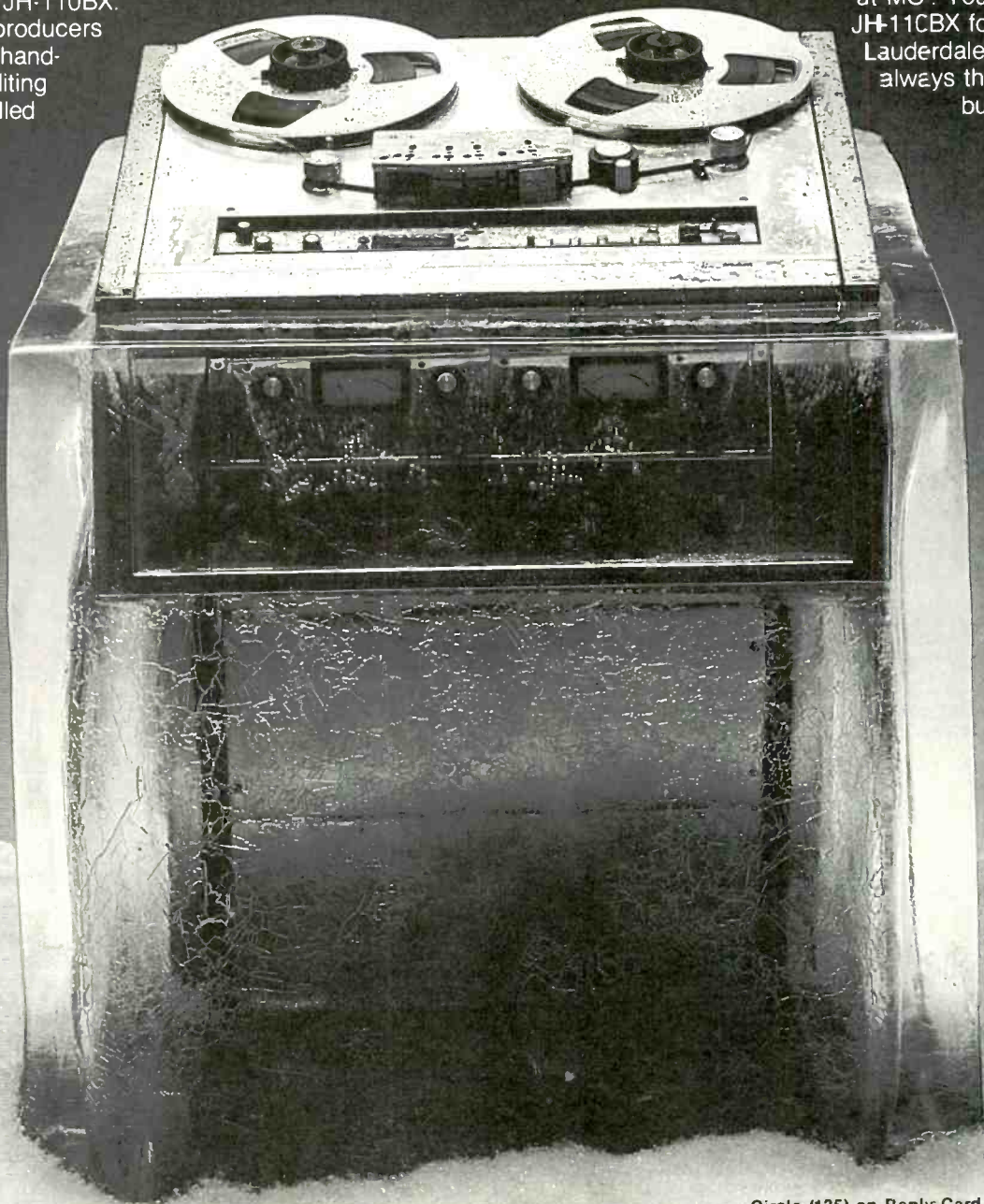
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Scantex Labs Inc.
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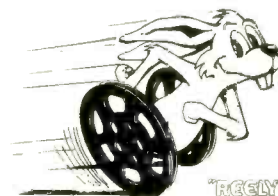


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Gabriel Electronics, Inc.
Harris Corp. Broadcast Products Div.
Harris Corp./Farinon Video
Lora Microwave Communications
Terracom
Maury Microwave Corp.
Micro Communications, Inc.
Microwave Assoc. Communications
NEC America, Inc. Broadcast Equip. Div.
Nurad, Inc.
Polarad Electronics, Inc.
Prodelin Inc.
Scientific-Atlanta, Inc.
Tayburn Electronics, Inc.
Wold Communications

Antennas, Remote Pickup

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Scala Electronic Corp.
Scientific-Atlanta, Inc.
Tayburn Electronics, Inc.

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Gorman-Redlich Mfg. Co.
Harris Corp. Broadcast Products Div.
Harris Corp./Farinon Video
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Marti Electronics
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Microwave Assoc. Communications
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Nurad, Inc.
Prodelin Inc.
Scala Electronic Corp.
Swager Tower Corp.
Tayburn Electronics, Inc.
Utility Tower Co.

Antennas, Transmitting AM

Cetec Broadcast Group
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HN Engineering Inc.
Harris Corp. Broadcast Products Div.
Marconi Communication Systems Ltd.

Antennas, Transmitting FM

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Cetec Broadcast Group
Comark Communications, Inc.
Comark Industries Inc.
Continental Electronics Mfg. Co.
Dielectric Communications A Unit of General Signal
Harris Corp. Broadcast Products Div.
Marconi Communication Systems Ltd.
Marconi Electronics Inc. Broadcast & Communication Div.
McMartin Industries, Inc.
Micro Communications, Inc.
Phelps Dodge Communications Co.
RCA Broadcast Systems
Scala Electronic Corp.
Shively Laboratories, Inc. Div. of Howell Labs, Inc.

Antennas, Transmitting HF

Comark Communications, Inc.
DHV, Inc.
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Antennas, Transmitting MF

Cetec Broadcast Group
Continental Electronics Mfg. Co.
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Harris Corp. Broadcast Products Div.
Marconi Communication Systems Ltd.
Marconi Electronics Inc. Broadcast & Communication Div.
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- Comark Communications, Inc.
- Dielectric Communications A Unit of General Signal
- Harris Corp. Broadcast Products Div.
- Marconi Communication Systems Ltd.
- Nurad, Inc.
- RCA Broadcast Systems
- SWR Inc.
- World Tower Co. Inc.

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- Harris Corp./Farinon Video
- Lora Microwave Communications Terracom
- Marconi Communication Systems Ltd.
- Micro Communications, Inc.
- Microwave Assoc. Communications
- Nurad, Inc.
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- Harris Corp. Broadcast Products Div.
- Harris Corp./Farinon Video
- Hughes Aircraft Co. Microwave Communications Products
- Marconi Communication Systems Ltd.
- Microdyne Corp.
- Microwave Assoc. Communications
- Pinzone Communications Products Inc.
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- ADM Technology, Inc.
- AKG Acoustics, Inc.
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- Altec Lansing Int'l.
- Analog Devices, Inc.
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- Shure Brothers Inc.
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- Waters Mfg. Inc.

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- The Finney Co.
- Gerard Tech
- Harris Corp. Broadcast Products Div.
- Harris Corp. PRD Electronics Div.
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- Kay Elemetrics Corp.
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- Merrill Cable Electronics
- Mu-Del Electronics, Inc.
- The Narda Microwave Corp.
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- Tech Laboratories Inc.
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- Texscan Corp.

Attenuators, Microwave

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- Kay Elemetrics Corp.
- Kings Electronics Co., Inc.
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- RHG Electronics Laboratory, Inc.
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- Tektronix Inc.
- Texscan Corp.
- Triple Crown Electronics, Inc.
- Trompeter Electronics, Inc.
- Vidaire Electronics Mfg. Corp.
- VIZ Mfg. Co.

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- Applied Technology Corp.
- Arrakis Sytems Inc.
- Audio & Design Recording, Inc.
- Audio Technology
- ESE
- Logitek Electronic Systems, Inc.
- Quad-Eight Electronics
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- dbx, Inc.
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- Rupert Neve, Inc.
- Peters Productions, Inc.
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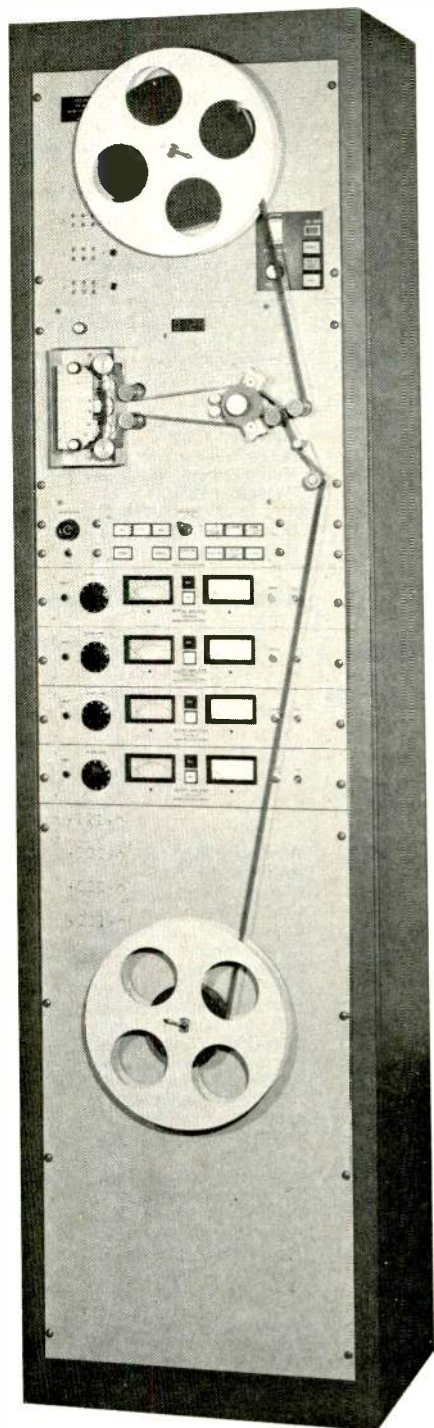
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Automation, Tape Control, Cartridge

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 IGM Communications
 Microprobe Electronics, Inc.
 Otari Corp.
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 Studer Revox America
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 Productions
 Telex Communications, Inc.
 VIF International

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 Potomac Instruments, Inc.
 Sharepoint Systems Inc.
 Soll, Inc.
 Sono-Mag Corp.
 TFT Inc./Formerly Time & Frequency
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 Harris Corp. Broadcast Products Div.

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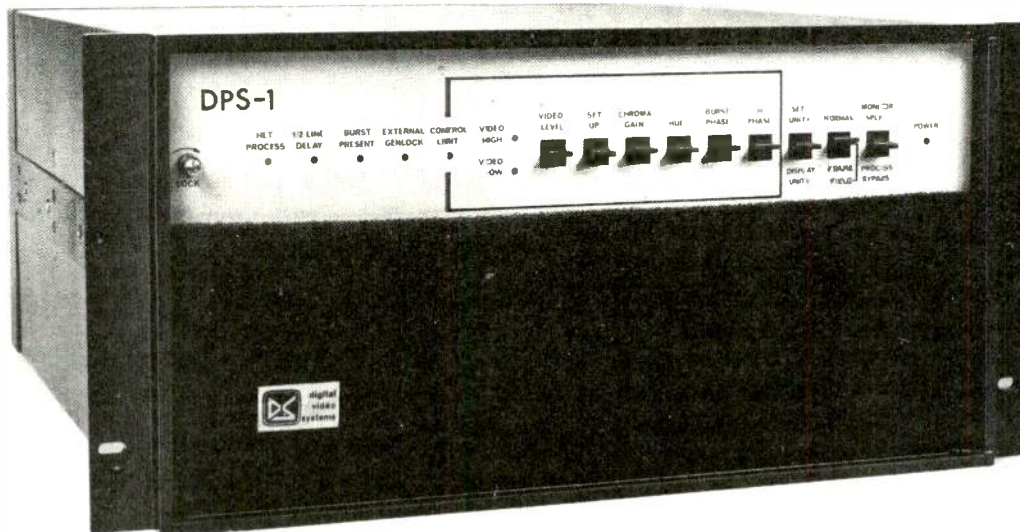


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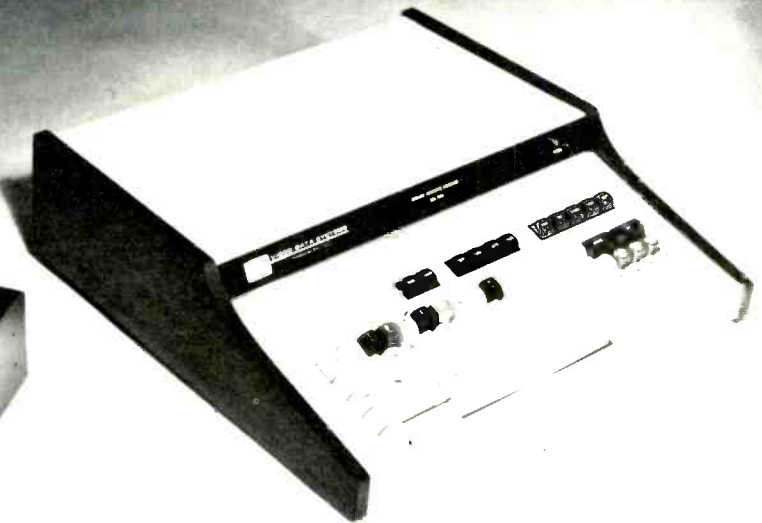
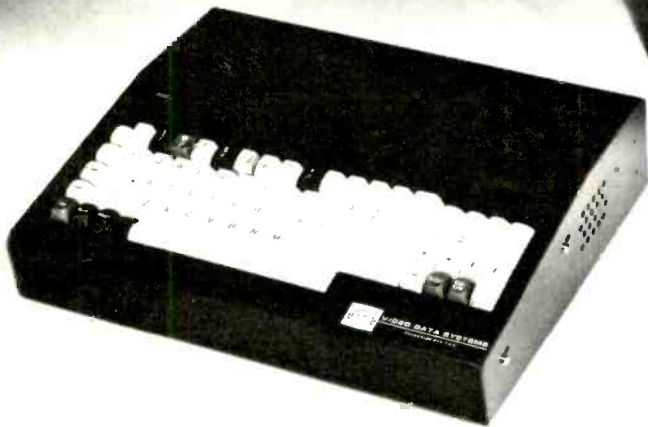
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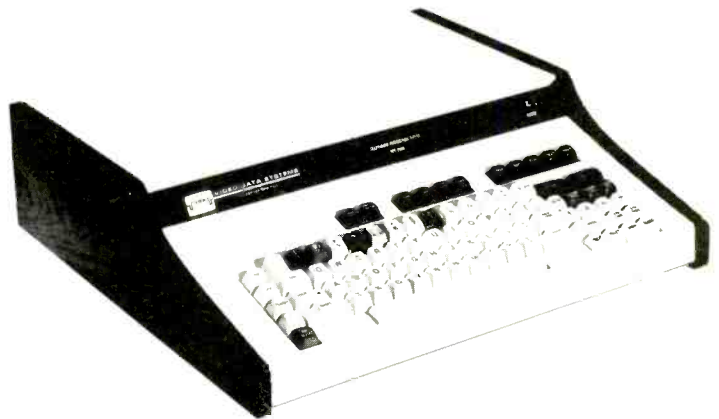
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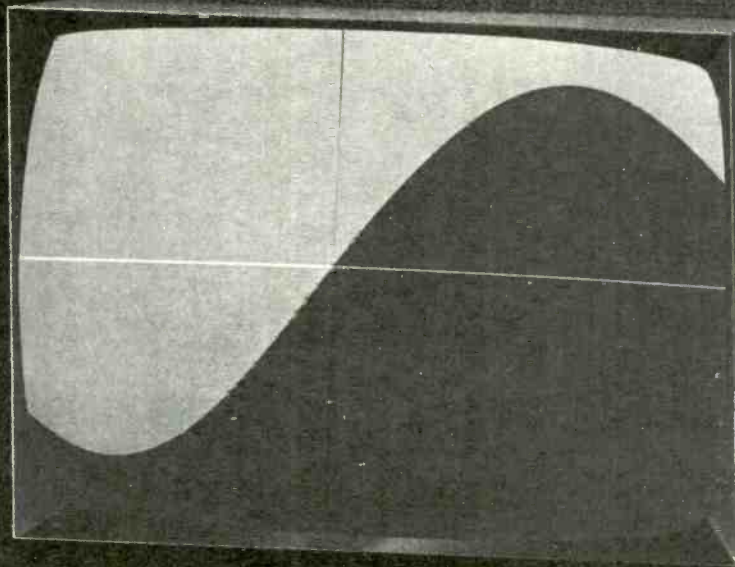
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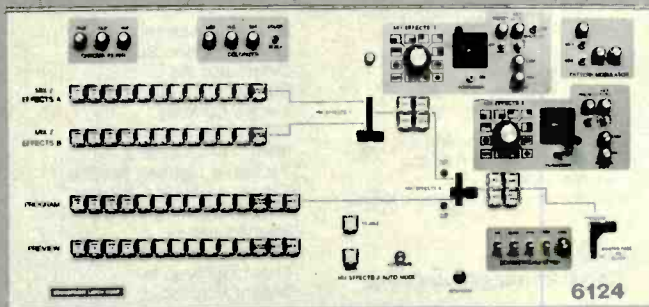
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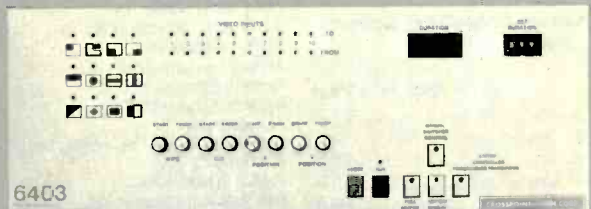
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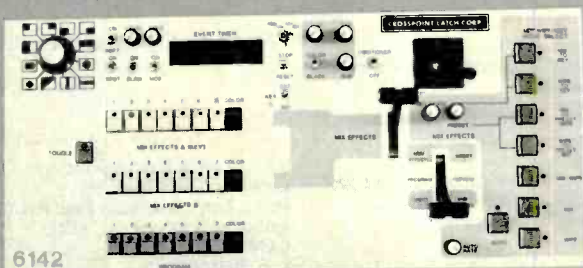
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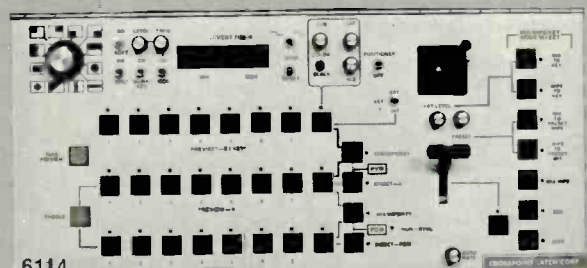
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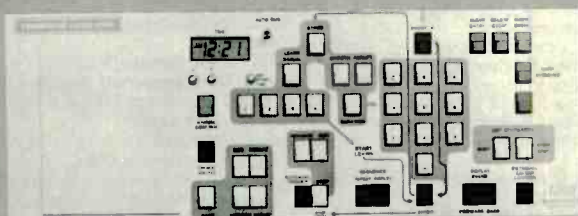
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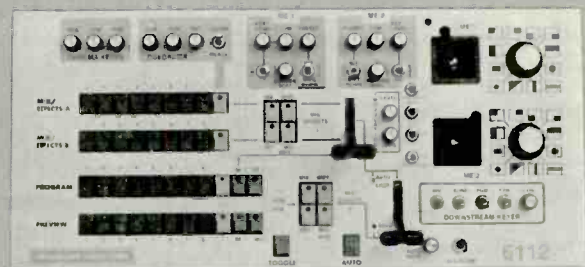
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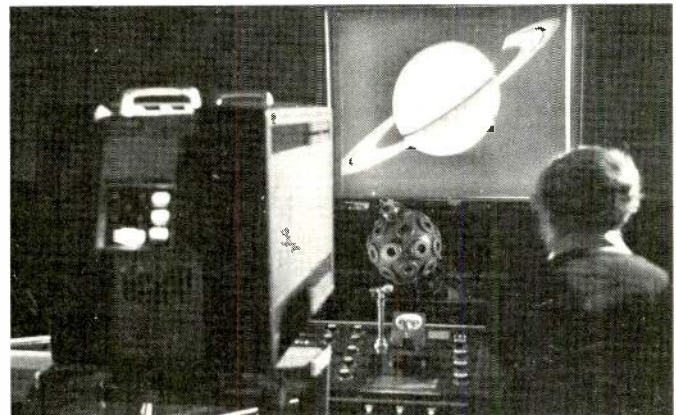
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PJ 5050	1250	500	650	750	300	1600	2150	525 li./60 fps; 625 li./50 fps	(1)
PJ 5800	550	200	280	750	600	1200	1600	875 lines, 60 fps	(2)
PJ 5850	1250	500	650	750	600	1600	2150	875 lines, 60 fps	(2)
PJ 5100	550	200	280	750	650	1200	1600	1023 lines, 60 fps	(2)
PJ 5150	1250	500	650	750	650	1600	2150	1023 lines, 60 fps	(2)

MONOCHROME PROJECTORS

PJ 7000	1000	600	750	800	400	1000	1350	525 li./60 fps; 625 li./50 fps	(3)
PJ 7050	1700	1000	1250	800	400	1000	1350	525 li./60 fps; 625 li./50 fps	(3)
PJ 7055	3300	2000	2400	800	400	1500	2000	525 li./60 fps; 625 li./50 fps	(3)
PJ 7800	1000	600	750	800	650	1000	1350	875 lines, 60 fps	(3)
PJ 7850	1700	1000	1250	800	650	1000	1350	875 lines, 60 fps	(3)
PJ 7855	3300	2000	2400	800	650	1500	2000	875 lines, 60 fps	(3)
PJ 7100	1000	600	750	800	750	1000	1350	1023 lines, 60 fps	(3)
PJ 7150	1700	1000	1250	800	750	1000	1350	1023 lines, 60 fps	(3)
PJ 7155	3300	2000	2400	800	750	1500	2000	1023 lines, 60 fps	(3)

Line Power, All Projectors: 117 or 240 v., ± 10%, 50/60 Hz

*Resolution measurements made with wide-band video input.

**Video Input Key: (1) NTSC or RGB, (2) RGB, (3) Wide-Band.

***For use at other scanning rates, contact General Electric (VDEO) for special application/model information.

GENERAL  ELECTRIC

Circle (134) on Reply Card

Film Sound Transfer Equipment

See Adv. Page

- Dolby Laboratories, Inc.** 111
- Magna-Tech Electronic Co., Inc.** 129

Dolby Laboratories, Inc.
Impact Case Sales Ltd.
Magnasync/Moviola Corp.
Magna-Tech Electronic Co., Inc.
Multi-Track Magnetics, Inc.
Orange County Elec. Int'l., Inc.
Quad-Eight Electronics
RCA Broadcast Systems
Sontec Electronics
Steenbeck, Inc.
Tangent Systems, Inc.
Westrex
Wide Range Electronics

Film-to-Tape Transfer Equipment

Fernseh Inc.
Image Transform, Inc.
Impact Case Sales Ltd.
Magnasync/Moviola Corp.
Multi-Track Magnetics, Inc.
Rangertone Research Inc.
Warren R. Smith Co.
Steenbeck, Inc.

Filters, Antenna

Allen Avionics, Inc.
Bird Electronic Corp.
Comark Industries Inc.
Continental Electronics Mfg. Co.
The Finney Co.
G C Electronics Div. Wallace Murray
Harris Corp. Broadcast Products Div.
Kappa Networks, Inc.
Micro Communications, Inc.
Multronics, Inc.
Nurad, Inc.
Phelps Dodge Communications Co.
Shively Laboratories, Inc. Div. of Howell Labs, Inc.
T T E, Inc.
Texscan Corp.
Wide Band Engineering Co., Inc.

Filters, Audio

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- Inovonics Inc.** 52
- T T E, Inc.** 240
- United Recording Electronics Industries** 67

ADM Technology, Inc.
Allen Avionics, Inc.
Altec Lansing Int'l.
Amber Electro Design, Ltd.
Aphex Systems Ltd.
Audico, Inc.
Audio & Design Recording, Inc.
Audisar
Bayly Engineering Ltd. Member of AEG-Telefunken Group
Broadcast Controls Div. Of Automated Broadcast Controls
Coastcom
Coherent Communications
Comark Industries Inc.
Crown International, Inc.
Datatronix, Inc.
DYMA Engineering, Inc.
EMT-FRANZ GMBH
ESC Electronics Corp.
Frequency Devices Inc.
Gotham Audio Corp.
Harris Corp. Broadcast Products Div.
Inovonics Inc.
Ivie Electronics, Inc.
Kappa Networks, Inc.
Micro-Trak Corp.
Microprobe Electronics, Inc.
Modulation Associates Inc.
Monroe Electronics, Inc.
Rupert Neve, Inc.
Orange County Elec. Int'l., Inc.

Panasonic Company
Pulse Techniques Inc.
QEI Corp.
Quad-Eight Electronics
Richmond Sound Design, Ltd.
Rohde & Schwarz Sales Co.
Sescom, Inc.
Sontec Electronics
Spectra Sonics
Spectrum Instruments, Inc.
T T E, Inc.
United Recording Electronics Industries
VIF International
Wavetek Rockland, Inc.

Filters, Microwave

North Hills Electronics, Inc.
Tayburn Electronics, Inc.
UTE Microwave, Inc.

Filters, Noise

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- United Recording Electronics Industries** 67

Audio & Design Recording, Inc.
Robert Bosch GmbH
Broadcast Video Systems, Ltd.
Comark Industries Inc.
EMT-FRANZ GMBH
Fernseh Inc.
Frequency Devices Inc.
G C Electronics Div. Wallace Murray
Gotham Audio Corp.
Orange County Elec. Int'l., Inc.
Panasonic Company
Pulse Techniques Inc.
Quad-Eight Electronics
Spectra Sonics
T T E, Inc.
Tektronix Inc.
Topaz, Inc.
United Recording Electronics Industries
Vidaire Electronics Mfg. Corp.

Filters, Passive

Allen Avionics, Inc.
Andersen Labs, Inc.
Audisar
Broadcast Video Systems, Ltd.
Coastcom
Comark Industries Inc.
Peter W. Dahl Co., Inc.
Datel-Intersil Inc.
ESC Electronics Corp.
Frequency Devices Inc.
Kappa Networks, Inc.
Lightning Elimination Assoc., Inc.
Maury Microwave Corp.
Modulation Associates Inc.
Mu-Del Electronics, Inc.
North Hills Electronics, Inc.
Orange County Elec. Int'l., Inc.
Panasonic Company
Pulse Techniques Inc.
QEI Corp.
Quad-Eight Electronics
T T E, Inc.
Television Equipment Associates
Texscan Corp.
Varian Associates Electron Device Group
Wide Band Engineering Co., Inc.

Filters, Variable and Fixed Tuned

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- United Recording Electronics Industries** 67

Amber Electro Design, Ltd.
Andersen Labs, Inc.
Aphex Systems Ltd.
Audio & Design Recording, Inc.
Audisar
Blonder-Tongue Lab., Inc.
Comark Industries Inc.
Datatronix, Inc.

EMT-FRANZ GMBH
The Finney Co.
Frequency Devices Inc.
Gotham Audio Corp.
Kappa Networks, Inc.
Maury Microwave Corp.
Microprobe Electronics, Inc.
North Hills Electronics, Inc.
Orange County Elec. Int'l., Inc.
Potomac Instruments, Inc.
Pulse Techniques Inc.
Quad-Eight Electronics
Spectrum Instruments, Inc.
T T E, Inc.
Texscan Corp.
UTE Microwave, Inc.
United Recording Electronics Industries
Varian Associates Electron Device Group
Wavetek Rockland, Inc.

Filters, Video

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- Tiffen Mfg. Corp.** 74

Allen Avionics, Inc.
Andersen Labs, Inc.
Broadcast Video Systems, Ltd.
Coastcom
Comark Industries Inc.
Datatek Corp.
ESC Electronics Corp.
Faroudja Labs
Fernseh Inc.
Kappa Networks, Inc.
Modulation Associates Inc.
North Hills Electronics, Inc.
Panasonic Company
TRW, LSI Products
T T E, Inc.
Television Equipment Associates
Tiffen Mfg. Corp.

Frame/Field Storers, Digital

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- Digital Video Systems Inc.** 227

ADDA Corp.
Asaca/Shibasoku Corp.
Robert Bosch GmbH
Digital Video Systems Inc.
Elector
Fernseh Inc.
Harris Corp. Broadcast Products Div.
Harris Video Systems
MCI/Quantel
Marconi Communication Systems Ltd.
Microtime, Inc.
NEC America, Inc. Broadcast Equip. Div.
Vital Industries Inc.

Frame/Field Storers, Floppy Disc

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- Arvin/Echo Science Corp.** 125

Arvin/Echo Science Corp.
Asaca/Shibasoku Corp.
Eigen Video
Elector
MCI/Quantel
Oktel Corp.

Frame Synchronizers -- See Synchronizers

Framers, Color

A. F. Associates, Inc.
Central Dynamics Corp.

Frequency Standards

John Fluke Mfg. Co., Inc.
Global Specialties Corp.
Maury Microwave Corp.
Rohde & Schwarz Sales Co.
Tracor Inc. Industrial Instruments Div.

Generators, Audio Sine

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- Modular Audio Products** 104
- Tektronix Inc.** 13

Amber Electro Design, Ltd.
Audisar
B & K Precision Dynascan Corp.
Bald Mountain Lab
Broadcast Electronics, Inc.
Comex Systems
Datatronix, Inc.
DYMA Engineering, Inc.
Exact Electronics, Inc.
Frequency Devices Inc.
Global Specialties Corp.
Harris Corp. Broadcast Products Div.
Hickok Elec. Inst. Co.
ITT Components & Instruments Div. Metrix
Leader Instruments Corp.
Leasametric, Inc.
Marconi Instruments Div. of Marconi Electronics Inc.
Modular Audio Products Unit of Modular Devices, Inc.
Opamp Labs, Inc.
Potomac Instruments, Inc.
Quad-Eight Electronics
Rohde & Schwarz Sales Co.
Sencore, Inc.
Sescom, Inc.
Sound Technology
Spectra Sonics
Tektronix Inc.
VIZ Mfg. Co.

Generators, Audio Sweep

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Amber Electro Design, Ltd.
Audisar
B & K Precision Dynascan Corp.
Bald Mountain Lab
Bruel & Kjaer Instruments, Inc.
DYMA Engineering, Inc.
Exact Electronics, Inc.
Hickok Elec. Inst. Co.
Leader Instruments Corp.
Leasametric, Inc.
Marconi Instruments Div. of Marconi Electronics Inc.
Rohde & Schwarz Sales Co.
Tektronix Inc.
United Recording Electronics Industries

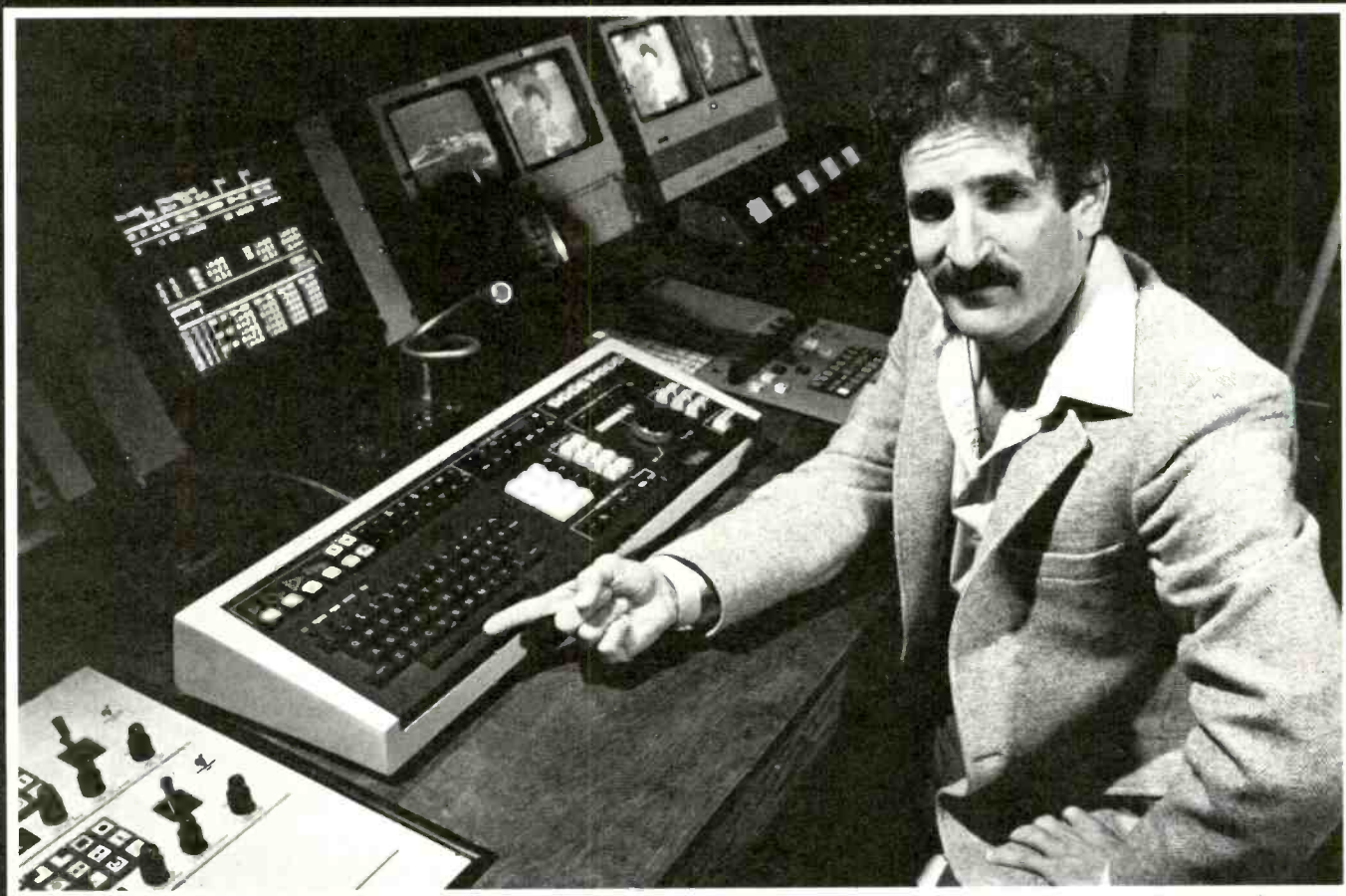
Generators, Background Color

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- Tektronix Inc.** 13

American Data Corp. Div. of Central Dynamics Corp.
Automation Techniques, Inc.
Beaveronics, Inc.
Robert Bosch GmbH
Broadcast Video Systems, Ltd.
Central Dynamics Corp.
Crosspoint Latch Corp.
Fernseh Inc.
For-A Corp. of America
Grass Valley Group, Inc.
Harris Corp. Broadcast Products Div.
Industrial Sciences, Inc. (ISI)
Lenco Inc. Electronics Div.
Marconi Electronics Inc. Broadcast & Communication Div.
Philips Test & Measuring Instruments, Inc.
Shintron Co. Inc.
Tektronix Inc.
Video Data Systems

**“At half CMX’s price,
how good can the Commander be?”**



“Better!”

**says Andy Maisner, owner of the American Film Factory,
Venice, California**

“I was prepared to pay whatever it took to bring American Film Factory’s facilities up to state-of-the-art standards. But I wasn’t willing to just sign a blank check—so we thoroughly evaluated all the leading computer-assisted videotape editing systems on the market. I was really surprised to discover the United Media’s new Commander. I was capable of everything CMX could do and more—and at half the price. Half the price!

“Let me get specific—the biggest Commander advantage is complete computer control of multiple mix-effect banks for double re-entries. Sure, CMX can do that with a Grass Valley Switcher, but equipping it with E-MEM costs almost as much as the entire Commander II system.

“The other big advantage is Commander’s tremendously flexible list management. Everybody has it, but

Commander’s degree of sophistication far exceeds the others.

Commander offers a lot of useful features—like sync step, independent audio and video dissolve, and split audio/video edits in and out in one pass. Again, most other systems can cope with these editing needs somehow, but Commander handles them with true automation.

Reliability is excellent—in a year of operation, we’ve never had a hardware failure. In fact, we’ve already bought our second Commander II system. Commander II is fully CMX-compatible which reassures my clients—and it’s easier to use and much more versatile, which excites my editors.

With the Commander’s built-in total capability and realistic price, it’s certainly the best system you can buy.”

COMMANDER II

**United
Media**

4075 Leaverton Court, Anaheim,

CA 92807 • 714/530-8020

Circle (141) on Reply Card

Generators, Burst

See Adv. Page

- Dynair Electronics, Inc.** 238
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- Tektronix Inc.** 13

Amber Electro Design, Ltd.
Automation Techniques, Inc.
B & K Precision Dynascan Corp.
Broadcast Video Systems, Ltd.
Central Dynamics Corp.
Crosspoint Latch Corp.
Datatek Corp.
Dynair Electronics, Inc.
Fernseh Inc.
For-A Corp. of America
Grass Valley Group, Inc.
Harris Corp. Broadcast Products Div.
Industrial Sciences, Inc. (ISI)
International Nuclear Corp.
Jatex, Inc.
Leitch Video Ltd.
Lenco Inc. Electronics Div.
Marconi Electronics Inc. Broadcast & Communication Div.
Philips Test & Measuring Instruments, Inc.
Rohde & Schwarz Sales Co.
Sencore, Inc.
Sigma Electronics, Inc.
Tektronix Inc.
Video Aids of Colorado
VIZ Mfg. Co.

Generators, Color Bar

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- Leader Instruments Corp.** 5
- Philips Test & Measuring** 95
- Tektronix Inc.** 13

Asaca/Shibasoku Corp.
Automation Techniques, Inc.
B & K Precision Dynascan Corp.
Broadcast Video Systems, Ltd.
Cohu, Inc. Electronics Div.
Crosspoint Latch Corp.
Echolab Inc.
For-A Corp. of America
Harris Corp. Broadcast Products Div.
Hickok Elec. Inst. Co.
ITT Components & Instruments Div. Metrix
Industrial Sciences, Inc. (ISI)
Jatex, Inc.
Leader Instruments Corp.
Leasametric, Inc.
Lectrotech Inc.
Leitch Video Ltd.
Lenco Inc. Electronics Div.
Link Electronics Ltd.
Marconi Electronics Inc. Broadcast & Communication Div.
Panasonic Company
Panasonic Co. Video Systems Div.
Philips Test & Measuring Instruments, Inc.
QSI Systems Inc.
Sencore, Inc.
Shintron Co. Inc.
Sigma Electronics, Inc.
Tektronix Inc.
Telaudio Centre
Telemet Div. A Geotel, Co.
3M Co.-Professional A/V Equip.
Magnetic Audio/Video Prod. Div.
Video Data Systems
VIZ Mfg. Co.

Generators, Color Sync

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- Dynair Electronics, Inc.** 238
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Asaca/Shibasoku Corp.
Robert Bosch GmbH
Broadcast Video Systems, Ltd.

Crosspoint Latch Corp.
Dynair Electronics, Inc.
Echolab Inc.
Edutron, Inc.
Fernseh Inc.
For-A Corp. of America
Grass Valley Group, Inc.
Harris Corp. Broadcast Products Div.
Industrial Sciences, Inc. (ISI)
Jatex, Inc.
Leader Instruments Corp.
Leasametric, Inc.
Leitch Video Ltd.
Lenco Inc. Electronics Div.
Link Electronics Ltd.
Marconi Communication Systems Ltd.
Panasonic Company
Panasonic Co. Video Systems Div.
Philips Test & Measuring Instruments, Inc.
QSI Systems Inc.
Rohde & Schwarz Sales Co.
Sencore, Inc.
Shintron Co. Inc.
Sigma Electronics, Inc.
Tektronix Inc.
Telaudio Centre
Telemet Div. A Geotel, Co.
Video Aids of Colorado
Video Data Systems
Vital Industries Inc.
World Video Inc.

Generators, Convergence

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- Tektronix Inc.** 13

Broadcast Video Systems, Ltd.
Grass Valley Group, Inc.
Harris Corp. Broadcast Products Div.
ITT Components & Instruments Div. Metrix
Leader Instruments Corp.
Lectrotech Inc.
Leitch Video Ltd.
Lenco Inc. Electronics Div.
Link Electronics Ltd.
Philips Test & Measuring Instruments, Inc.
Sencore, Inc.
Sigma Electronics, Inc.
Tektronix Inc.
Telaudio Centre

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- Lenco Inc.** 137

Echolab Inc.
Harris Corp. Broadcast Products Div.
Lenco Inc. Electronics Div.
Siegel Electronics
3M Co.-Professional A/V Equip.
Magnetic Audio/Video Prod. Div.
Video Aids of Colorado

Generators, Digital Metronome

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- United Recording Electronics Industries** 67

Skotel Corp.
United Recording Electronics Industries

Generators, Digital Sync

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Robert Bosch GmbH
Broadcast Video Systems, Ltd.
Central Dynamics Corp.
Crosspoint Latch Corp.
Fernseh Inc.
Grass Valley Group, Inc.
Harris Corp. Broadcast Products Div.

Industrial Sciences, Inc. (ISI)
Leitch Video Ltd.
Lenco Inc. Electronics Div.
Marconi Communication Systems Ltd.
Marconi Electronics Inc. Broadcast & Communication Div.
Rohde & Schwarz Sales Co.
Sigma Electronics, Inc.
Video Data Systems
Vital Industries Inc.

Generators, Digital Video Effect

Aurora Imaging Systems
Central Dynamics Corp.
Crosspoint Latch Corp.
Elector
Fernseh Inc.
Grass Valley Group, Inc.
Industrial Sciences, Inc. (ISI)
MCI/Quantel
MPB Technologies Inc.
NEC America, Inc. Broadcast Equip. Div.
Texscan/MSI Corp.
Weathercaster, Inc.

Generators, FM Subcarrier

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- Tektronix Inc.** 13

Broadcast Electronics, Inc.
CSI Electronics, Inc.
Circuit Research Labs, Inc.
Harris Corp. Broadcast Products Div.
Leader Instruments Corp.
Marti Electronics
McMartin Industries, Inc.
Micro Control Associates, Inc.
Moseley Associates, Inc.
QEI Corp.
Sencore, Inc.
Solid Electronics Labs
TFT Inc./Formerly Time & Frequency Technology Inc.
Versa Count Engineering
Wilkinson Electronics, Inc.

Generators, Monoscope

Telemet Div. A Geotel, Co.

Generators, NTSC Signal Test/Pattern

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- Leader Instruments Corp.** 5
- Lenco Inc.** 137
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Asaca/Shibasoku Corp.
B & K Precision Dynascan Corp.
Broadcast Video Systems, Ltd.
Harris Corp. Broadcast Products Div.
Leader Instruments Corp.
Leasametric, Inc.
Leitch Video Ltd.
Lenco Inc. Electronics Div.
Marconi Electronics Inc. Broadcast & Communication Div.
Marconi Instruments Div. of Marconi Electronics Inc.
Philips Test & Measuring Instruments, Inc.
Rohde & Schwarz Sales Co.
Tektronix Inc.
Telaudio Centre
Telemet Div. A Geotel, Co.
VIZ Mfg. Co.
World Video Inc.

Generators, Power (Electric Motor)

Harris Corp. Broadcast Products Div.
Lampkin Lab. Inc.
North Wind Power Co., Inc.

Generators, Power (Gasoline and Diesel Engine)

Belden Communications, Inc.
Centro Corp.
E-N-G Corp.
Harris Corp. Broadcast Products Div.
Lampkin Lab. Inc.

Generators, Power (Solar Energy)

North Wind Power Co., Inc.

Generators, Power (Wind)

North Wind Power Co., Inc.

Generators, SCA

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- Micro Control Associates, Inc.** 110
- Moseley Associates, Inc.** 223
- TFT Inc./Formerly Time & Frequency Technology Inc.** 201

Broadcast Electronics, Inc.
CSI Electronics, Inc.
Circuit Research Labs, Inc.
Harris Corp. Broadcast Products Div.
Leader Instruments Corp.
Marti Electronics
McMartin Industries, Inc.
Micro Control Associates, Inc.
Moseley Associates, Inc.
QEI Corp.
Sencore, Inc.
Solid Electronics Labs
TFT Inc./Formerly Time & Frequency Technology Inc.
Versa Count Engineering
Wilkinson Electronics, Inc.

Generators, Safe Area

Broadcast Video Systems, Ltd.
Gray Engineering Labs

Generators, Signal AF

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- Marconi Instruments Potomac Instruments, Inc.** 103
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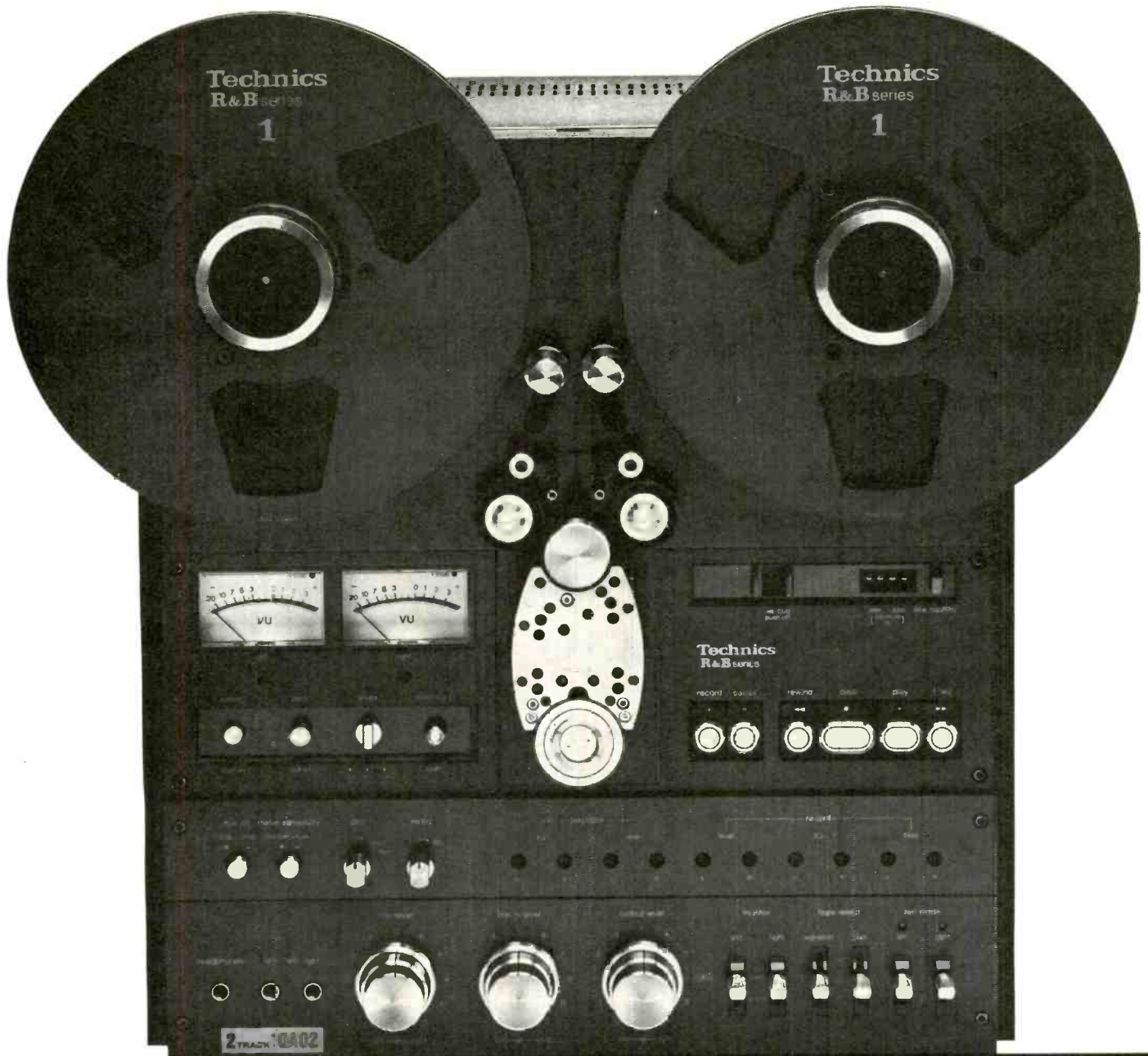
Amber Electro Design, Ltd.
Audisar
B & K Precision Dynascan Corp.
Bald Mountain Lab
Delta Electronics Inc. (N.C.)
Exact Electronics, Inc.
Frequency Devices Inc.
Global Specialties Corp.
Hickok Elec. Inst. Co.
ITT Components & Instruments Div. Metrix
Ivie Electronics, Inc.
Lampkin Lab. Inc.
Leader Instruments Corp.
Marconi Instruments Div. of Marconi Electronics Inc.
Opamp Labs, Inc.
Potomac Instruments, Inc.
Rohde & Schwarz Sales Co.
Sencore, Inc.
Spectra Sonics
Tektronix Inc.
VIZ Mfg. Co.

Generators, Signal Dot Bar

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- Philips Test & Measuring** 95
- Tektronix Inc.** 13

Asaca/Shibasoku Corp.
B & K Precision Dynascan Corp.
Broadcast Video Systems, Ltd.



The technology that made Technics turntables the No.1 choice will make this Technics deck your No.1 choice.

You'll choose Technics RS-10A02 tape deck for the same reason 85 of the top 100 radio stations choose Technics turntables: The performance and reliability of Technics' quartz-locked direct drive.

Like our turntables, the RS-10A02 gives you the precision of a quartz-locked direct-drive motor. But you also get Technics' isolated loop tape transport system which optimizes tape tension to virtually eliminate signal dropout while reducing modulation noise and wow and flutter.

Studio pros will appreciate the RS-10A02's full complement of ten front-panel controls. Like playback and recording EQ adjustments, bias controls and playback and recording level calibrators. When used with the built-in test-tone oscillator, these controls will give you optimum recording performance no matter what kind of tape you use.

The RS-10A02 also has extremely durable SX Sendust heads, IC logic controls and just about everything else you could want in a professional 2-track deck.

So before you buy any reel-to-reel deck, audition the RS-10A02 and see why it's your No. 1 choice.

For more information on the Technics R&B Series, call 201-346-7470.

Technics
R&B series

Circle (146) on Reply Card

Cohu, Inc. Electronics Div.
 Colorado Video Inc.
 Fernseh Inc.
 Grass Valley Group, Inc.
 Hickok Elec. Inst. Co.
 ITT Components & Instruments Div.
 Metrix
 Leader Instruments Corp.
 Lectrotech Inc.
 Leitch Video Ltd.
 Lenco Inc. Electronics Div.
 Philips Test & Measuring Instruments, Inc.
 Sencore, Inc.
 Tektronix Inc.
 Telemet Div. A Geotel, Co.
 VIZ Mfg. Co.

Generators, Signal Marker

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B & K Precision Dynascan Corp.
 Eaton Corp., L.A. Plant Elec. Instrumentation Div.
 ITT Components & Instruments Div.
 Metrix
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 United Recording Electronics Industries
 VIZ Mfg. Co.

Generators, Signal Pulse

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B & K Precision Dynascan Corp.
 Eaton Corp., L.A. Plant Elec. Instrumentation Div.
 Global Specialties Corp.
 Kay Elemetrics Corp.
 Leitch Video Ltd.
 Lenco Inc. Electronics Div.
 Marconi Electronics Inc. Broadcast & Communication Div.
 North American Soar Corp.
 Philips Test & Measuring Instruments, Inc.
 Rohde & Schwarz Sales Co.
 TM Systems, Inc.
 Tektronix Inc.
 Xedit Corp.

Generators, Signal RF

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B & K Precision Dynascan Corp.
 Boonton Electronics Corp.
 Delta Electronics Inc. (VA)
 Eaton Corp., L.A. Plant Elec. Instrumentation Div.
 John Fluke Mfg. Co., Inc.
 Global Specialties Corp.
 Harris Corp. PRD Electronics Div.
 ITT Components & Instruments Div.
 Metrix
 Lampkin Lab. Inc.
 Leader Instruments Corp.
 Marconi Instruments Div. of Marconi Electronics Inc.
 Microdyne Corp.
 Motorola Communications and Electronics Inc.
 Philips Test & Measuring Instruments, Inc.
 Polarad Electronics, Inc.
 Potomac Instrumts, Inc.
 Rohde & Schwarz Sales Co.
 Scientific-Atlanta, Inc.

Sencore, Inc.
 Sound Technology
 Tektronix Inc.
 Texscan Corp.
 VIZ Mfg. Co.

Generators, Signal Square Wave

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Amber Electro Design, Ltd.
 Asaca/Shibasoku Corp.
 Audisar
 B & K Precision Dynascan Corp.
 Exact Electronics, Inc.
 Global Specialties Corp.
 Hickok Elec. Inst. Co.
 ITT Components & Instruments Div.
 Metrix
 Leader Instruments Corp.
 Leitch Video Ltd.
 Philips Test & Measuring Instruments, Inc.
 Rohde & Schwarz Sales Co.
 Sencore, Inc.
 Tektronix Inc.
 VIZ Mfg. Co.

Generators, Signal TV Synchronizing

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Dynair Electronics, Inc. 238
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Sigma Electronics, Inc. 98
Tektronix Inc. 13

Asaca/Shibasoku Corp.
 Robert Bosch GmbH
 Broadcast Video Systems, Ltd.
 Colorado Video Inc.
 Crosspoint Latch Corp.
 Dage-MTI, Inc.
 Dynair Electronics, Inc.
 Fernseh Inc.
 Grass Valley Group, Inc.
 Leitch Video Ltd.
 Lenco Inc. Electronics Div.
 Link Electronics Ltd.
 Marconi Communication Systems Ltd.
 Marconi Electronics Inc. Broadcast & Communication Div.
 Philips Test & Measuring Instruments, Inc.
 Rohde & Schwarz Sales Co.
 Sencore, Inc.
 Siegel Electronics
 Sigma Electronics, Inc.
 Tektronix Inc.
 Telsudio Centre
 Telemet Div. A Geotel, Co.
 3M Co.-Professional A/V Equip.
 Magnetic Audio/Video Prod. Div.

Generators, Signal VITS

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Philips Test & Measuring 95
Tektronix Inc. 13

Asaca/Shibasoku Corp.
 Harris Corp. Broadcast Products Div.
 Link Electronics Ltd.
 Marconi Instruments Div. of Marconi Electronics Inc.
 Philips Test & Measuring Instruments, Inc.
 Rohde & Schwarz Sales Co.
 Tektronix Inc.
 Telemet Div. A Geotel, Co.

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Beaveronics, Inc. 89
Industrial Sciences, Inc. (ISI) 159

American Data Corp. Div. of Central Dynamics Corp.
 Aurora Imaging Systems
 BJA Systems, Inc.
 Beaveronics, Inc.
 Broadcast Video Systems, Ltd.
 Central Dynamics Corp.
 Colorado Video Inc.
 Convergence Corp.
 Crosspoint Latch Corp.
 Dage-MTI, Inc.
 Data Communications Corp.
 Dynair Electronics, Inc.
 Echolab Inc.
 Grass Valley Group, Inc.
 Ikegami Electronics (U.S.A.), Inc.
 Image Video Ltd.
 Industrial Sciences, Inc. (ISI)
 Interand Corp. Telestrator Div.
 International Nuclear Corp.
 MCI/Quantel
 Marconi Communication Systems Ltd.
 NAC Inc.
 NEC America, Inc. Broadcast Equip. Div.
 Panasonic Company
 Panasonic Co. Video Systems Div.
 Shintron Co. Inc.
 Viscount Industries Ltd.
 Vital Industries Inc.

Generators, Staircase

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Tektronix Inc. 13

Asaca/Shibasoku Corp.
 B & K Precision Dynascan Corp.
 Broadcast Video Systems, Ltd.
 Colorado Video Inc.
 Leader Instruments Corp.
 Leasametric, Inc.
 Leitch Video Ltd.
 Lenco Inc. Electronics Div.
 Link Electronics Ltd.
 Philips Test & Measuring Instruments, Inc.
 Rohde & Schwarz Sales Co.
 Tektronix Inc.
 Telemet Div. A Geotel, Co.

Generators, Stereo

Boonton Electronics Corp.
 Broadcast Electronics, Inc.
 CSI Electronics, Inc.
 Catel Div. United Scientific Corp.
 Circuit Research Labs, Inc.
 Continental Electronics Mfg. Co.
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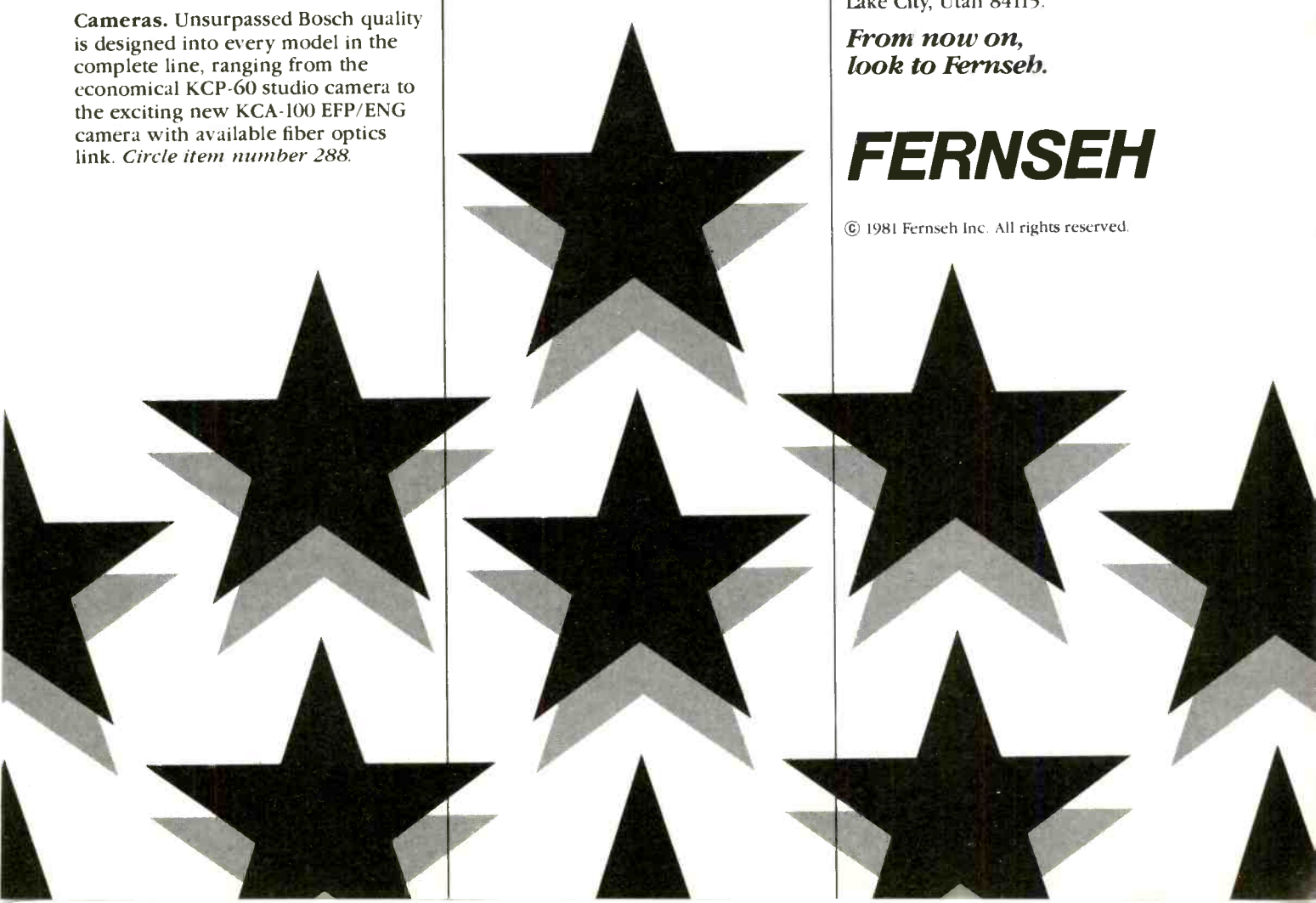
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Radiotechniques
Singer Broadcast Products, Inc.
Soll, Inc.
Utility Tower Co.
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CSP Inc.
Delta Electronics Inc. (VA)

Meters, Blanking Interval

A. F. Associates, Inc.
Broadcast Video Systems, Ltd.
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Amber Electro Design, Ltd.
Eaton Corp., L.A. Plant Elec. Instrumentation Div.
Global Specialties Corp.
Hickok Elec. Inst. Co.
ITT Components & Instruments Div. Metrix

Ivie Electronics, Inc.
Lampkin Lab. Inc.
Leader Instruments Corp.
Rohde & Schwarz Sales Co.
Rycom Instruments

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B & K Precision Dynascan Corp.
Belar Electronics Lab., Inc.
CSP Inc.
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Meters, Frequency Calibrating

Eidson Electronic Co.
Global Specialties Corp.
Lampkin Lab. Inc.
Phoenix Co.

Meters, Grid Dip

Leader Instruments Corp.

Meters, Intermodulation

Amber Electro Design, Ltd.
Marconi Instruments Div. of Marconi Electronics Inc.
Potomac Instruments, Inc.
Sound Technology

Meters, Line Voltage

B & K Precision Dynascan Corp.
Creative Electronics
Dranetz Engineering Labs., Inc.
Gralex Industries
Leasametric, Inc.
Motorola Communications and Electronics Inc.
Phoenix Co.
Sencore, Inc.
VIZ Mfg. Co.

Meters, Modulation

Belar Electronics Lab., Inc.
Boonton Electronics Corp.
Harris Corp. Broadcast Products Div.
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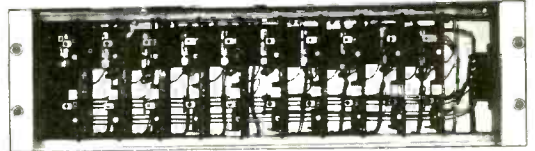
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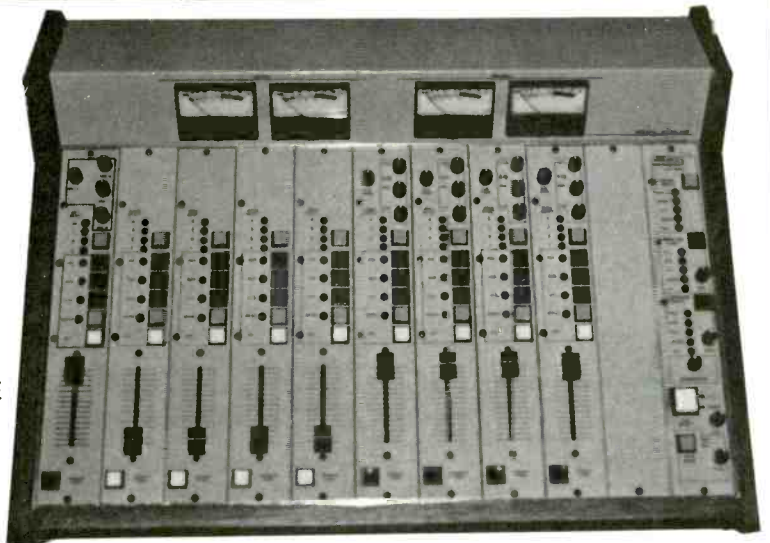
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Meters, Video Level

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Meters, Video Noise

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Lenco Inc. Electronics Div.
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Leader Instruments Corp.
Motorola Communications and Electronics Inc.
North American Soar Corp.
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VIZ Mfg. Co.

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Amber Electro Design, Ltd.
Applied Technology Corp.
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Audio Technology
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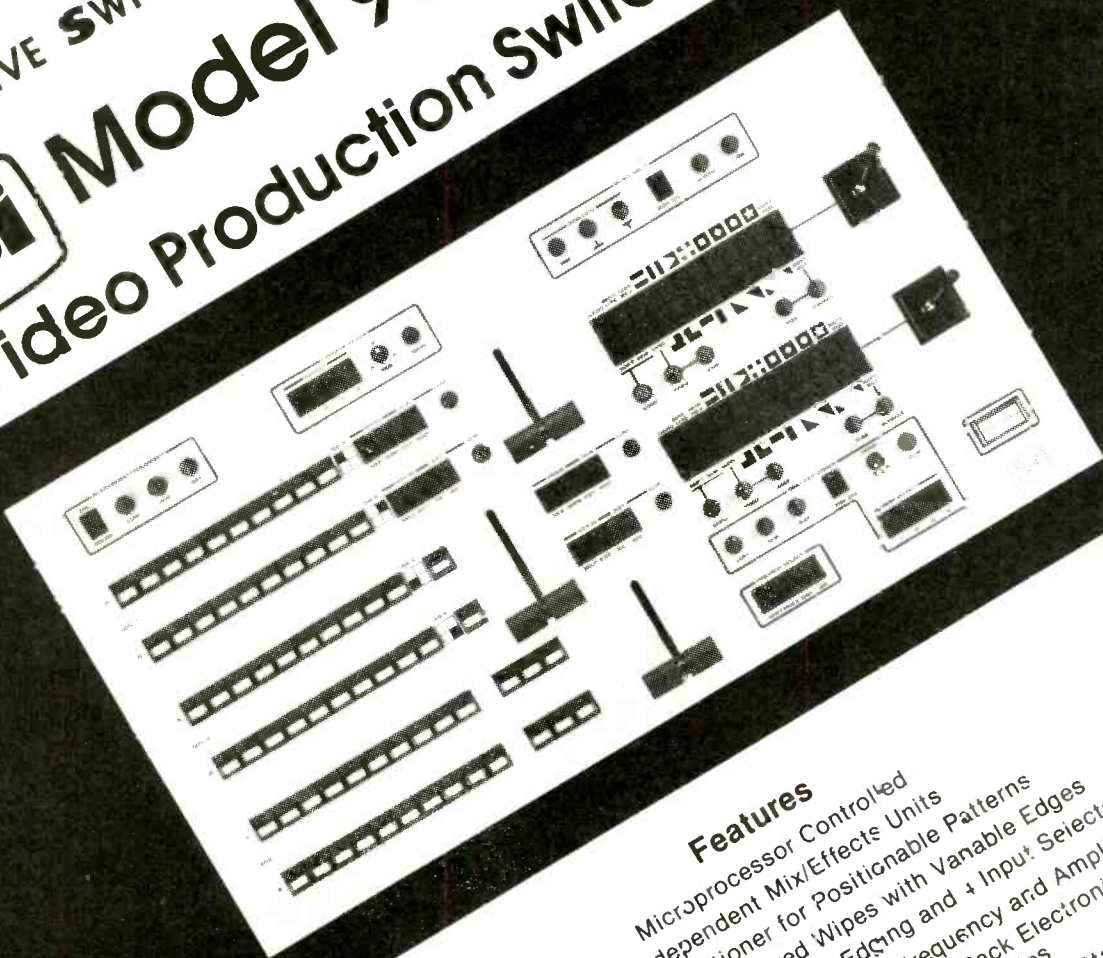
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Coastcom
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EEV, Inc.
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International Microwave Corp.
Microwave Assoc. Communications
Microwave Power Devices, Inc.
North Hills Electronics, Inc.
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UTE Microwave, Inc.

Microwave Systems, ENG

California Microwave
Compucon, Inc.
DYMA Engineering, Inc.
E-N-G Corp.
ENG Helicopter Satellites, Ltd.
Gabriel Electronics, Inc.
Harris Corp. Broadcast Products Div.
Harris Corp./Farinon Video
Hitachi Denshi America, Ltd.
Hughes Aircraft Co. Microwave
Communications Products
International Microwave Corp.
Leasametric, Inc.
Microwave Assoc. Communications
Microwave Power Devices, Inc.
Moseley Associates, Inc.
NEC America, Inc. Broadcast Equip.
Div.
Nurad, Inc.
R.F. Technology, Inc.
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Harris Corp./Farinon Video
Hughes Aircraft Co. Microwave
Communications Products
International Microwave Corp.
Leasametric, Inc.
Lora Microwave Communications
Terracom
Marti Electronics
Micro Control Associates, Inc.
Microwave Assoc. Communications

Microwave Power Devices, Inc.
Moseley Associates, Inc.
NEC America, Inc. Broadcast Equip.
Div.
Nurad, Inc.
RHG Electronics Laboratory, Inc.
Rockwell Int'l. Commercial Elec.
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Audiotronics, Inc.
AVAB America Inc.
Bogen Div. Lear Siegler, Inc.
Broadcast Audio Corp.
Broadcast Electronics, Inc.
Broadcast Technology, Inc.
Central Dynamics Corp.
Cetec Broadcast Group
Coherent Communications
Continental Electronics Mfg. Co.
Crosspoint Latch Corp.
Dage-MTI, Inc.
Delta Electronics Inc. (N.C.)
DYMA Engineering, Inc.
Edcor
Foundation Elec. Instruments Inc.
Grass Valley Group, Inc.
Hallikainen & Friends, Inc.
Hammond Industries Inc.
Harris Corp. Broadcast Products Div.
Howe Audio Productions, Inc.
LPB Inc.
LTM Corp. of America
James B. Lansing Sound, Inc.
MBI Broadcast Systems
MCI Inc.
McCurdy Radio Ind. Inc.
McMartin Industries, Inc.
Micro-Trak Corp.
Modular Audio Products Unit of
Modular Devices, Inc.
Nagra Magnetic Recorders, Inc.
Rupert Neve, Inc.
Panasonic Company
ProTech Audio Corp.
Quad-Eight Electronics
Quantum Audio Labs, Inc.
RHG Electronics Laboratory, Inc.
Ramko Research Inc.
Richmond Sound Design, Ltd.
Ross Video Ltd.
Russco Electronics Mfg. Inc.
Scully Recording Instruments
Shure Brothers Inc.
Sono-Mag Corp.
Sphere Electronics
Studer Revox America
Switchcraft Inc.
Tangent Systems, Inc.
TEAC Corp of America
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Lawhed, Ltd.
Link Electronics Ltd.
Marconi Communication Systems Ltd.
Merlin Engineering Works, Inc.
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Dynair Electronics, Inc.
Elector
Harris Corp. Broadcast Products Div.
Javelin Electronics A Subs. of Kidde, Inc.
Marconi Communication Systems Ltd.
Merrill Cable Electronics
Phasecom Corp.
Philips Test & Measuring Instruments, Inc.
QSI Systems Inc.
Rohde & Schwarz Sales Co.
Scientific-Atlanta, Inc.
Telemet Div. A Geotel, Co.
Triple Crown Electronics, Inc.
UHF Associates
Varian Associates Electron Device
Group

Monitor Controls, Remote

D'San Corp.
Fernseh Inc.
Gorman-Redlich Mfg. Co.
LeCroy Fiberoptic Systems Div.

Monitor Mounts, Wall and Ceiling

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Electrohome Ltd.
GBC Closed Circuit TV Corp.
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Continental Electronics Mfg. Co.
Delta Electronics Inc. (VA)
Gorman-Redlich Mfg. Co.
Harris Corp. Broadcast Products Div.
Lampkin Lab. Inc.
McMartin Industries, Inc.
QEI Corp.
Sono-Mag Corp.
Soundscriber Magnetic Recording Co., Inc.

TFT Inc./Formerly Time & Frequency
Technology Inc.
Telemet Div. A Geotel, Co.
Wilkinson Electronics, Inc.

Monitors, FM System

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Lampkin Lab. Inc.
McMartin Industries, Inc.
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Studer Revox America
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Emergency Alert Receiver Inc.
Harris Corp. Broadcast Products Div.
McMartin Industries, Inc.
QEI Corp.
TFT Inc./Formerly Time & Frequency
Technology Inc.

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Harris Corp. Broadcast Products Div.
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Wide Band Engineering Co., Inc.

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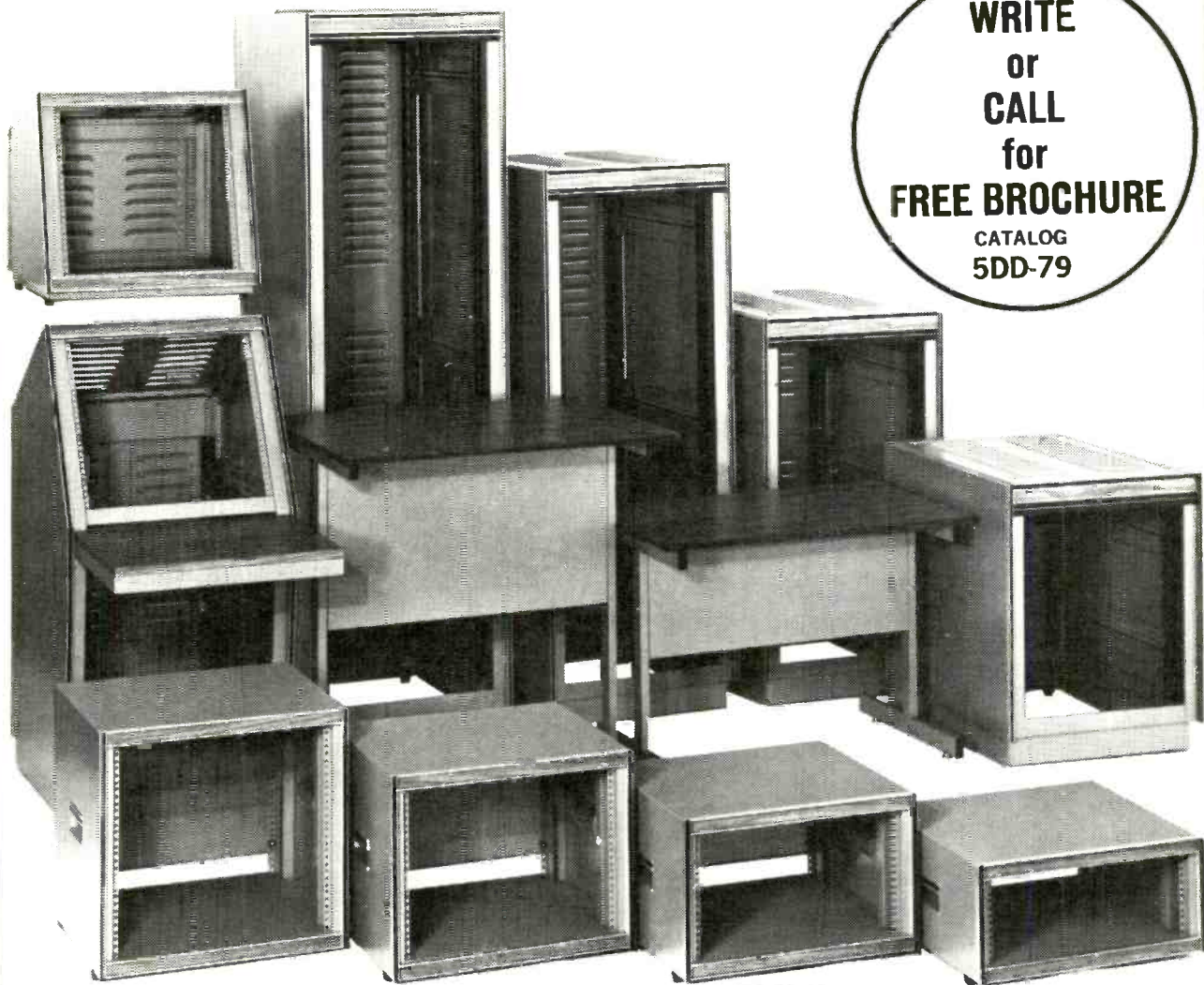
- Gorman-Redlich Mfg. Co.**250
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Continental Electronics Mfg. Co.
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Eaton Corp., L.A. Plant Elec. Instrumentation Div.
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Lampkin Lab. Inc.
McMartin Industries, Inc.
Motorola Communications and Electronics Inc.
TFT Inc./Formerly Time & Frequency Technology Inc.
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Gralex Industries
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McMartin Industries, Inc.
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Belar Electronics Lab., Inc.
Bogen Div. Lear Siegler, Inc.
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McMartin Industries, Inc.
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3D Video Corp.
Versa Count Engineering
Wilkinson Electronics, Inc.

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Hitachi Denshi America, Ltd.
JVC Professional Video
Javelin Electronics A Subs. of Kidde, Inc.
Marconi Communication Systems Ltd.
Marconi Instruments Div. of Marconi Electronics Inc.
Panasonic Company
Panasonic Co. Video Systems Div.
Sharp Electronics Corp. Professional Products
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Fernseh Inc.
GBC Closed Circuit TV Corp.
Glentronix (1977) Ltd.
Harris Corp. Broadcast Products Div.
Hitachi Denshi America, Ltd.
Ikegami Electronics (U.S.A.), Inc.
Javelin Electronics A Subs. of Kidde, Inc.
Lenco Inc. Electronics Div.
Listec TV Equipment Corp.
Motorola Communications and Electronics Inc.
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Fernseh Inc.
Glentronix (1977) Ltd.
Harris Corp. Broadcast Products Div.
Hitachi Denshi America, Ltd.
Ikegami Electronics (U.S.A.), Inc.
Image Magnification, Inc.
Image Resource Corp.
JVC Professional Video
Leasametric, Inc.
Lectrotech Inc.
Lenco Inc. Electronics Div.
Panasonic Company
Panasonic Co. Video Systems Div.
Rohde & Schwarz Sales Co.
Sharp Electronics Corp. Professional Products
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Videotek, Inc.
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Video Aids of Colorado
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Leader Instruments Corp.
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Philips Test & Measuring Instruments, Inc.
Rohde & Schwarz Sales Co.
Tektronix Inc.
Ultra Audio Pixtec
Videotek, Inc.

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Harris Corp. Broadcast Products Div.
Kalart Victor Corp.
Laird Telemedia Inc.
LeCroy Fiberoptic Systems Div.
Lora Microwave Communications
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Micro Communications, Inc.
Modulation Associates Inc.
Motorola Semiconductor Products Inc.
Mu-Del Electronics, Inc.
North Hills Electronics, Inc.
Rockwell Int'l. Commercial Elec.
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 Howell Labs, Inc.
T T E, Inc.
Times Fiber Communications, Inc. Div.
 Times Wire & Cable

Music, Production

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The CnB Studios
Century 21 Programming Inc.
Columbia Special Products
De Wolfe Music Library
Live Sound Inc.
Network Production Music Library
Peters Productions, Inc.
Soper Sound Music Library Soper
 Sound Media Music
William B. Tanner Co. Inc.
Thomas Valentino Inc.

Music, Programmed

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CaVox Stereo Productions
Century 21 Programming Inc.
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KalaMusic
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Tape-Athon Corp. Cavox Stereo
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Columbia Special Products
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T T E, Inc.
Tech Laboratories Inc.

Networks, Matching RF

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Amperelex Electronic Corp.
CSI Electronics, Inc.
CSP Inc.
Comark Communications, Inc.
Comark Industries Inc.
Continental Electronics Mfg. Co.
Dielectric Communications A Unit of
 General Signal
ESC Electronics Corp.
Multronics, Inc.
North Hills Electronics, Inc.
T T E, Inc.
Trompeter Electronics, Inc.
Wide Band Engineering Co., Inc.

Networks, Mixing

MBI Broadcast Systems
ProTech Audio Corp.
Quad-Eight Electronics
Tech Laboratories Inc.

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CSI Electronics, Inc.
CSP Inc.
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Dolby Laboratories, Inc.
Edutron, Inc.
Elector
Faroudja Labs
Fernseh Inc.
Gotham Audio Corp.
Harris Corp. Broadcast Products Div.
Harris Video Systems
Inovonics Inc.
Integrex, Inc.
Kahn Communications, Inc.
MCI/Quantel
Microtime, Inc.
Modulation Associates Inc.
NEC America, Inc. Broadcast Equip.
 Div.
Orange County Elec. Int'l., Inc.
Philips Broadcast Group Central
 Dynamics Corp.
Siegel Electronics
Valley People, Inc.
Van San Corp.

Oscillator Transformers

Nortronics Co., Inc. Recorder Care Div.
T T E, Inc.

Oscillators, AM

Delta Electronics Inc. (VA)
DYMA Engineering, Inc.
John Fluke Mfg. Co., Inc.
Frequency Devices Inc.
International Microwave Corp.
Lampkin Lab. Inc.
Marconi Instruments Div. of Marconi
 Electronics Inc.
Opamp Labs, Inc.
Potomac Instruments, Inc.
Rohde & Schwarz Sales Co.
Texscan Corp.

Oscillators, FM

John Fluke Mfg. Co., Inc.
Frequency Devices Inc.
Marconi Instruments Div. of Marconi
 Electronics Inc.
Rohde & Schwarz Sales Co.
Texscan Corp.

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Atlantic Research Corp.
Audisar
Bald Mountain Lab
Channematic, Inc.
Comex Systems
Datatronix, Inc.
Frequency Devices Inc.
Gorman-Redlich Mfg. Co.
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.
ProTech Audio Corp.
Quad-Eight Electronics
Scantex Labs Inc.
Shure Brothers Inc.
Sphere Electronics
TM Systems, Inc.
Ward-Beck Systems, Ltd.

Oscillators, TV

Asaca/Shibasoku Corp.
Leitch Video Ltd.
Rohde & Schwarz Sales Co.

Oscilloscope Cameras

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Karl Heitz, Inc.
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Lenzar Optics Corp.
Philips Test & Measuring Instruments,
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Philips Test & Measuring Instruments,
 Inc.
Sencore, Inc.
Tektronix Inc.
Ultra Audio Pixtec
Videotek, Inc.

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Gould Inc. Instruments Div.
Harris Corp. Broadcast Products Div.
Hickok Elec. Inst. Co.
Hitachi Denshi America, Ltd.
ITT Components & Instruments Div.
 Metrix
Leader Instruments Corp.
Leasametric, Inc.
Lectrotech Inc.
Motorola Communications and
 Electronics Inc.
North American Soar Corp.
Philips Test & Measuring Instruments,
 Inc.
Sencore, Inc.
Tektronix Inc.
VIZ Mfg. Co.

Oscilloscopes, Rack Type

B & K Precision Dynascan Corp.
Gould Inc. Instruments Div.
Harris Corp. Broadcast Products Div.
Hickok Elec. Inst. Co.
Leader Instruments Corp.
Leasametric, Inc.
Philips Test & Measuring Instruments,
 Inc.
Tektronix Inc.

Oscilloscopes, Triggered Sweep

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**Leader Instruments
Corp. 5**

B & K Precision Dynascan Corp.
Gould Inc. Instruments Div.
Harris Corp. Broadcast Products Div.
Hickok Elec. Inst. Co.
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 Metrix
Leader Instruments Corp.
Leasametric, Inc.
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 Electronics Inc.
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Oscilloscopes, Wideband

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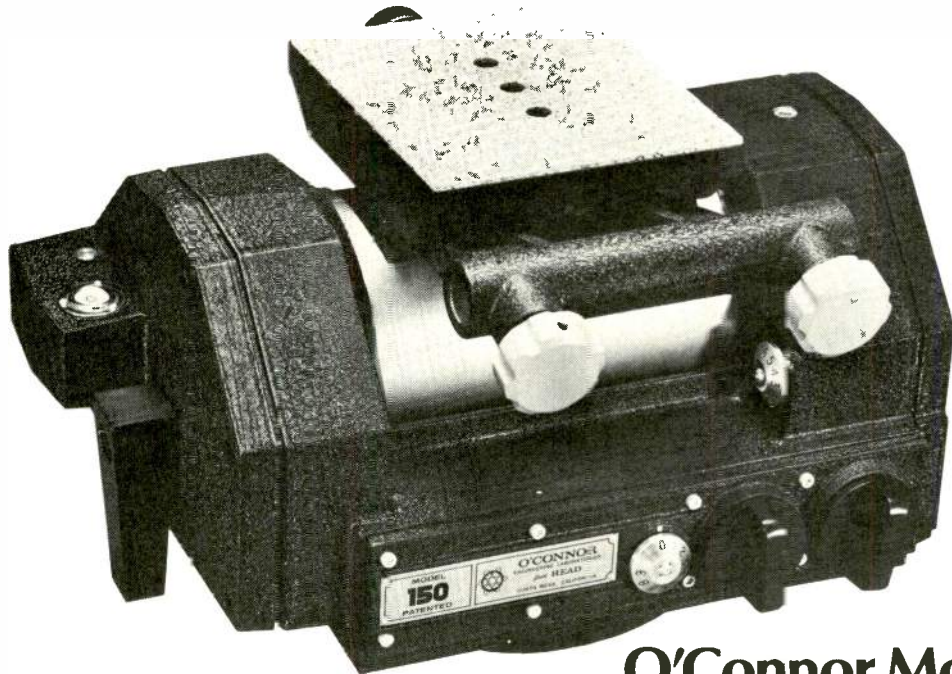
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Corp. 5**

Gould Inc. Instruments Div.
Harris Corp. Broadcast Products Div.
Hickok Elec. Inst. Co.
ITT Components & Instruments Div.
 Metrix
Leader Instruments Corp.
Leasametric, Inc.
Lectrotech Inc.
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 Inc.
Sencore, Inc.
Tektronix Inc.

**Parts and Components,
Electronic Equipment**

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CSP Inc.
EEV, Inc.
Ercona Corp.
G C Electronics Div. Wallace Murray
Global Specialties Corp.
Merlin Engineering Works, Inc.
Microtran Co., Inc.
Multronics, Inc.
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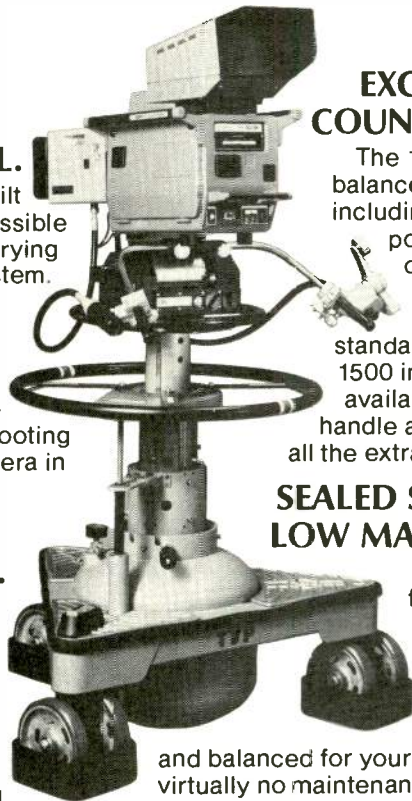
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PRECISE DRAG REPEATABILITY.

Separate pan and tilt drag dial indicators are provided to aid the cameraman when precise repeatability of a motion is needed. The dials also aid in matching the tilt and pan drag for exceptionally smooth horizontal shots.



EXCEPTIONAL COUNTERBALANCE.

The 150 is counterbalanced at all times, including extreme tilt positions, making operation much easier. A 1000 in-lb spring comes standard with an optional 1500 in-lb spring also available so the 150 can handle any TV camera with all the extras up to 150 lbs.

SEALED SYSTEM FOR LOW MAINTENANCE.

Like all O'Connor fluid heads, the Model 150 is fully sealed off from all contaminants. Once the head is properly adjusted and balanced for your camera, it requires virtually no maintenance whatsoever.

EXCEPTIONAL QUALITY THROUGHOUT.

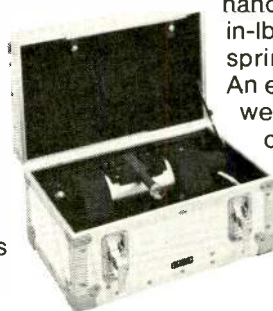
The 150 is built of lightweight aluminum and magnesium castings, weighing only 25 lbs.

The pan and tilt locks are fully independent of the pan and tilt drag adjustments.

The tilt range is $\pm 45^\circ$.

THE EXTRAS COME STANDARD.

The Model 150 comes equipped with an O'Connor adjustable and removable platform with double handles. The 1500 in-lb counterbalance spring is optional. An exceptionally well-constructed carrying case is probably the only accessory your Model 150 will need.



O'Connor

FLUID CAMERA HEADS

O'Connor Engineering Labs., Inc., 100 Kalmus Drive, Costa Mesa, CA 92626 • (714) 979-3993 • TELEX 685 641
O'Connor Engineering Ltd., 14 Av. Industrielle, 1227 Carouge, Geneva, Switzerland • Phone (022) 42 79 38 • TELEX 28 449

Varian Associates Electron Device Group
Vector Electronic Co., Inc.

Patch Panels, Jacks and Plugs

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- Berkey-Colortran Inc.243**
- Farrtronics Ltd. 94**
- Trompeter Electronics, Inc.259**

ADM Technology, Inc.
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Altec Lansing Int'l.
Atlantic Research Corp.
Audio Accessories, Inc.
Audiotechniques Inc.
Audiotronics, Inc.
AVA Electronics
Berkey-Colortran Inc.
Broadcast Electronics, Inc.
Comark Industries Inc.
Datatronic, Inc.
Dielectric Communications A Unit of General Signal
DYMA Engineering, Inc.
Dynatech Data Systems
Electronics Diversified, Inc.
Ercona Corp.
Farrtronics Ltd.
Glentronix (1977) Ltd.
Harris Corp. Broadcast Products Div.
Kliegl Bros. Lighting
Micro Communications, Inc.
Olesen
Panoak Lighting Systems
Phelps Dodge Communications Co.
Potomac Instruments, Inc.
Rex Rheostat & Co., Inc.
Strand Century, Inc.
Switchcraft Inc.
Tangent Systems, Inc.
TEAC Corp of America
Theatre Techniques Inc.
Trompeter Electronics, Inc.
Union Connector Co., Inc.
Vector Electronic Co., Inc.
Vidaire Electronics Mfg. Corp.

Phase Converters, Single to Three Phase

California Instruments Div. of Norlin Industries
Harris Corp. Broadcast Products Div.
Kay Industries, Inc.

Phase Enhancers, Stereo

EXR Corp.

Phasing Units -- See also Networks, Phasing

Alford Mfg. Co.
CSI Electronics, Inc.
CSP Inc.
Comark Industries Inc.
Continental Electronics Mfg. Co.
Eventide Clockworks, Inc.
Harris Corp. Broadcast Products Div.
Ikegami Electronics (U.S.A.), Inc.
Kahn Communications, Inc.
Multronics, Inc.
T T E, Inc.

Phono Tracking Force Gauges

Shure Brothers Inc.

Plans, Broadcast Equipment Construction

Don Britton Enterprises
CSP Inc.
Centro Corp.
DYMA Engineering, Inc.
HN Engineering Inc.
Harris Corp. Broadcast Products Div.
Radiotechniques
Ruslang Corp.
Sharepoint Systems inc.
Soll, Inc.

Pointers, Video Screen

Central Dynamics Corp.
Ednalite Corp.
Industrial Sciences, Inc. (ISI)
Interand Corp. Telestrator Div.

Power Supplies, AC

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- Modulation Associates Inc. 84**
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AKG Acoustics, Inc.
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California Instruments Div. of Norlin Industries
Delta Electronics Inc. (N.C.)
Dynamote Corp.
G C Electronics Div. Wallace Murray
GTE Products Corp. Sylvania CATV Div.
Kay Industries, Inc.
Magnavox CATV Systems, Inc.
Merrill Cable Electronics
Microwave Assoc. Communications
Modulation Associates Inc.
Motorola Communications and Electronics Inc.
Nagra Magnetic Recorders, Inc.
Nova Electric Mfg. Co.
Opamp Labs, Inc.
Quad-Eight Electronics
SGL Waber Electric
Sorensen Co. A Unit of Raytheon Co.
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- Christie Electric Corp.220**
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Altec Lansing Int'l.
Analog Devices, Inc.
B & K Precision Dynascan Corp.
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Computer Products Inc. Power Products Div.
Datel-Intersil Inc.
Frequency Devices Inc.
G C Electronics Div. Wallace Murray
Harris Corp. PRD Electronics Div.
Modular Audio Products Unit of Modular Devices, Inc.
North Hills Electronics, Inc.
Opamp Labs, Inc.
ProTech Audio Corp.
Sorensen Co. A Unit of Raytheon Co.
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Ward-Beck Systems, Ltd.

Power Supplies, Standby

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- Vanner, Inc. 90**
- Dynamote Corp.
G & M Power Products
GTE Products Corp. Sylvania CATV Div.
Kay Industries, Inc.
Microwave Assoc. Communications
Nova Electric Mfg. Co.
Tech Laboratories Inc.
Topaz, Inc.
Tweed Audio USA Inc.
Vanner, Inc.

Preamplifiers, Audio

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ADM Technology, Inc.
ATI-Audio Technologies Inc.
Altec Lansing Int'l.
American Data Corp. Div. of Central Dynamics Corp.
Arrakis Sytems inc.
Atlantic Research Corp.
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Audio Technology
Audiotronics, Inc.
Autogram Corp.
BGW Systems Inc.
Bell Audio Systems, Inc.
Bogen Div. Lear Siegler, Inc.
Broadcast Electronics, Inc.
Broadcast Technology, Inc.
Cetec Broadcast Group
Continental Electronics Mfg. Co.
Crown International, Inc.
Datatronic, Inc.
Delta Electronics Inc. (N.C.)
DYMA Engineering, Inc.
Dynair Electronics, Inc.
Edecor
Eumig USA, Inc.
Excalibur Electronics, Inc.
G C Electronics Div. Wallace Murray
Gregg Laboratories
Hammond Industries Inc.
Harris Corp. Broadcast Products Div.
ITI Electronics, Inc.
Integrated Sound Systems Inc.
International Nuclear Corp.
James B. Lansing Sound, Inc.
LeCroy Fiberoptic Systems Div.
Logitek Electronic Systems, Inc.
McCurdy Radio Ind. Inc.
McMartin Industries, Inc.
Micro-Trak Corp.
Modular Audio Products Unit of Modular Devices, Inc.
Motorola Semiconductor Products Inc.
Rupert Neve, Inc.
Opamp Labs, Inc.
Orange County Elec. Int'l., Inc.
Panasonic Company
Panasonic Co. Professional Audio Div.
ProTech Audio Corp.
QRK Broadcast Electronics
Quad-Eight Electronics
RTS Systems, Inc.
Ramko Research Inc.
Richmond Sound Design, Ltd.
Russco Electronics Mfg. Inc.
Scantex Labs Inc.
Sescom, Inc.
Sharp Electronics Corp. Professional Products
Shure Brothers Inc.
Sono-Mag Corp.
Sontec Electronics
Spectra Sonics
Sphere Electronics
Stanton Magnetics Inc.
Straight Wire Audio, Inc.
Tangent Systems, Inc.
TEAC Corp of America
Technics See also Panasonic Co.
Telex Communications, Inc.
United Recording Electronics Industries
VIF International
Wilkinson Electronics, Inc.

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Coastcom
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Gregg Laboratories
Harris Corp. Broadcast Products Div.
ITI Electronics, Inc.
Orange County Elec. Int'l., Inc.
ProTech Audio Corp.
Quad-Eight Electronics
Ramko Research Inc.
Richmond Sound Design, Ltd.
Scantex Labs Inc.
Sescom, Inc.
Shure Brothers Inc.
Sontec Electronics
Spectra Sonics
Ultra Audio Pixtec
United Recording Electronics Industries
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Preamplifiers, Microphone

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Audiotechniques Inc.
Autogram Corp.
Broadcast Electronics, Inc.
Broadcast Technology, Inc.
Bruel & Kjaer Instruments, Inc.
Datatronic, Inc.
DYMA Engineering, Inc.
Edecor
Gregg Laboratories
Harris Corp. Broadcast Products Div.
Harrison Systems Inc.
Howe Audio Productions, Inc.
ITI Electronics, Inc.
Micro-Trak Corp.
Modular Audio Products Unit of Modular Devices, Inc.
Nagra Magnetic Recorders, Inc.
Opamp Labs, Inc.
ProTech Audio Corp.
Quad-Eight Electronics
ROH Corp.
RTS Systems, Inc.
Ramko Research Inc.
Richmond Sound Design, Ltd.
Russco Electronics Mfg. Inc.
Scantex Labs Inc.
Sescom, Inc.
Shure Brothers Inc.
Sontec Electronics
Spectra Sonics
Sphere Electronics
Straight Wire Audio, Inc.
Valley People, Inc.

Preamplifiers, Microwave

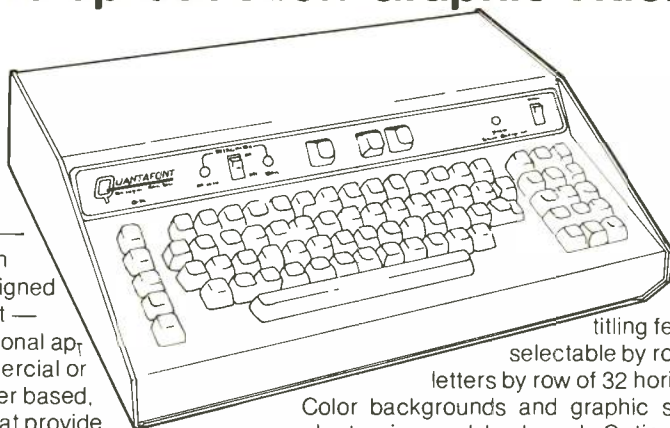
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Avantek Inc.
Microwave Power Devices, Inc.
Mu-Del Electronics, Inc.
North Hills Electronics, Inc.
RHG Electronics Laboratory, Inc.
Tayburn Electronics, Inc.

QUANTAFONT[®]

Teleproduction Graphic Titlers



QUANTAFONT television production titlers are available in a product line designed to satisfy virtually any titling requirement — from limited budget industrial or educational applications to the high demands of commercial or broadcast studios. All are microcomputer based, software intensive, compact systems that provide extensive display versatility and variety. Numerous character sizes and a wide variety of resident fonts with large resident RAM memories are standard features in all systems.

The titlers as listed indicate only the basic differences between the various models. Complete feature listings and system descriptions are available from System Concepts' offices and from dealers located worldwide.

MODEL Q-7A

Broadcast and commercial studio titling features. Proportionally spaced characters in 16 resident fonts. "Bolt" large and small caps and "Universal" upper and lower case type faces. NANOLOG* character resolution. Colorized characters and backgrounds. Full borderline and shadow edge selections, and graphic separators. Self-contained keyboard and electronics. Optional international accents.

MODEL Q-7A/R

Rack mount electronics with remote keyboard and multiple remote keyboard capability. Display features the same as Q-7A with the addition of RS-232-C input for external data interface.

MODEL QST

Automatic Subtitling System. Includes a Q-7A/R production titler with EBU/SMPTE time code interface, expanded software subtitle timing and operations package, and dual disc extended memory for mass title storage. Functional as a studio production titler or automatic subtitler utilizing Q-7A display capabilities.

MODEL Q-VII

Commercial, industrial and educational titling features. Multiple resident fonts of large and small caps and true upper and lower case characters. 20 character size selection of all fonts. NANOLOG* character resolution. Colorized characters, backgrounds and graphic separators. Full borderline and shadow edge selections. Self-contained keyboard and electronics. Optional international accents and custom logo capability.

MODEL Q-6/B

Industrial and educational titling features. 24 character sizes selectable by row. Large and small capital letters by row of 32 horizontal pixel bold face font. Color backgrounds and graphic separators. Self-contained electronics and keyboard. Optional international accents.

MODEL Q-6/A

All of the standard features of Q-6/B in monochrome only.

MODEL Q-6/M

Automated mass memory information display system. Programmable control over digital cassette memory. Over 3,000 rows — 400 pages typical. All display qualities and standard features of Q-6/B available for automatic recall.

MODEL Q-V

Industrial and educational titling features. 12 character sizes selectable by row. Large and small capital letters by row of 32 horizontal pixel bold face font. Monochrome only. Self-contained electronics and keyboard. Optional international accents. Optional on-board mini-cassette extended memory.

EXTENDED MEMORY SYSTEMS

FLEXIBLE DISC MEMORY Single or dual mini-disc storage systems. 100, 16-row pages per disc. Random or sequential page access of less than .5 second. Total data block of resident memory storage per disc. Memory console can accommodate 6-inch monitor. Available for use with models: Q-7A/R, Q-7A, Q-VII, Q-6/B and Q-6/A.

DIGITAL CASSETTE MEMORY High speed computer grade cassette tape systems. Block load storage of entire resident memory. Self-standing or top-mounting console. Top-mounting console can accommodate a 6-inch monitor.

NightWatch[™]

Automatic all-night character generator display for broadcast sign-off to sign-on void. Displays 7 or 8-row formatted newswire service, local weather from sensors and one-row keyboard entry 2,720 character crawl. Color backgrounds and teleproduction quality character font. Rack mount electronics and remote keyboard.

SYSTEM CONCEPTS

To Be Letter Perfect

System Concepts, Inc. Corporate headquarters, 2440 South Progress Drive, Salt Lake City, Utah 84119, (801) 974-0992, TWX 910-925-5684 / Cleveland, (206) 692-3410 / Tulsa, (918) 627-4151

*20 nanosecond effective average start-point resolution with patent-pending NANOLOG[™] circuit.

Circle (152) on Reply Card

Preamplifiers, Stereo

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ATI-Audio Technologies Inc.
Arrakis Sytems Inc.
Audio Technology
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Cetec Broadcast Group
DYMA Engineering, Inc.
Eumig USA, Inc.
Excalibur Electronics, Inc.
The Finney Co.
Harris Corp. Broadcast Products Div.
Integrated Sound Systems Inc.
Logitek Electronic Systems, Inc.
Micro-Trak Corp.
Panasonic Company
ProTech Audio Corp.
QRK Broadcast Electronics
RTS Systems, Inc.
Ramko Research Inc.
Richmond Sound Design, Ltd.
Russco Electronics Mfg. Inc.
Scantex Labs Inc.
Sharp Electronics Corp. Professional Products
Shure Brothers Inc.
Sontec Electronics
Sound Technology
Spectra Sonics
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TEAC Corp of America

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Audio Technology
Audionics, Inc.
Audiotechniques Inc.
Broadcast Audio Corp.
Broadcast Electronics, Inc.
Cetec Broadcast Group
Continental Electronics Mfg. Co.
D-B Electronics, Inc.
Datatronix, Inc.
DYMA Engineering, Inc.
EAR Systems, Inc.
EMT-FRANZ GMBH
Excalibur Electronics, Inc.
Gregg Laboratories
Hammond Industries Inc.
Harris Corp. Broadcast Products Div.
Howe Audio Productions, Inc.
LPB Inc.
Logitek Electronic Systems, Inc.
McCurdy Radio Ind. Inc.
McMartin Industries, Inc.
Micro-Trak Corp.
Modular Audio Products Unit of Modular Devices, Inc.
Rupert Neve, Inc.
Opamp Labs, Inc.
Pinzone Communications Products Inc.
ProTech Audio Corp.
QRK Broadcast Electronics
RTS Systems, Inc.
Radio Systems Inc.
Ramko Research Inc.
Russco Electronics Mfg. Inc.
Scantex Labs Inc.
Sontec Electronics
Sound Technology
Spectra Sonics
Stanton Magnetics Inc.

Straight Wire Audio, Inc.
United Recording Electronics Industries
Westrex
Wilkinson Electronics, Inc.

Preamplifiers, Video

Blonder-Tongue Lab., Inc.
The Finney Co.
International Nuclear Corp.
LeCroy Fiberoptic Systems Div.
Magnavox CATV Systems, Inc.

Pressurization Equipment, Transmission Line

Andrew Corp.
Cablewave Systems Inc.
Dielectric Communications A Unit of General Signal
General Cable Corp.
Harris Corp. Broadcast Products Div.
Shively Laboratories, Inc. Div. of Howell Labs, Inc.

Probes, Oscilloscope

B & K Precision Dynascan Corp.
Hickok Elec. Inst. Co.
ITT Components & Instruments Div. Metrix
Leasametric, Inc.
Lectrotech Inc.
North American Soar Corp.
Philips Test & Measuring Instruments, Inc.
Tektronix Inc.
VIZ Mfg. Co.

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Applied Technology Corp.
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Circuit Research Labs, Inc.
dbx, Inc.
Datatronix, Inc.
Delta Electronics Inc. (VA)
Dolby Laboratories, Inc.
EXR Corp.
Elcom-Bauer
Eventide Clockworks, Inc.
Gregg Laboratories
Harris Corp. Broadcast Products Div.
Inovonics Inc.
Kahn Communications, Inc.
Modulation Associates Inc.
Orange County Elec. Int'l., Inc.
Orban Assoc. Inc.
Phasecom Corp.
ProTech Audio Corp.
Quintek Inc.
Richmond Sound Design, Ltd.
Scantex Labs Inc.
Sescom, Inc.
Shure Brothers Inc.
Tangent Systems, Inc.
United Recording Electronics Industries
Valley People, Inc.

Processing Equipment, Video

Automation Techniques, Inc.
Robert Bosch GmbH
Composite Video
Faroudja Labs
Fernseh Inc.
Grass Valley Group, Inc.
Harris Corp. Broadcast Products Div.
Image Resource Corp.
Industrial Sciences, Inc. (ISI)
Kreonite, Inc.
Leitch Video Ltd.
Lenco Inc. Electronics Div.
MCI/Quantel
Marconi Electronics Inc. Broadcast & Communication Div.
Microtime, Inc.
Siegel Electronics
3M Co.-Professional A/V Equip.
Magnetic Audio/Video Prod. Div.
Versa Count Engineering

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Eastman Kodak Co.

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- Osram Sales Corp.
- Packaged Lighting Systems
- Plastic Reel Corp. of America
- Schuessler Case Co., Inc.
- Thorn Lighting, Inc.
- Varian Associates Electron Device Group

Projectors, Film

Bell & Howell Audio Visual Div.
Dukane Corp. Audio-Visual Div.
Eastman Kodak Co.
Alan Gordon Enterprises Inc.
Harris Corp. Broadcast Products Div.
Kalart Victor Corp.
L-W International
Laird Telemedia Inc.
Multi-Track Magnetics, Inc.
Optical Radiation Corp.
Pioneer Marketing Corp.
Radmar, Inc.
Rangertone Research Inc.

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- General Electric Co. Vicoe Display Equip. Op.
- Pioneer Marketing Corp.
- Radmar, Inc.
- Research Technology Int'l.

Projectors, Slide

Buhl Optical Co.
Eastman Kodak Co.
The Great American Market
Hammond Industries Inc.
Harris Corp. Broadcast Products Div.
Kliegl Bros. Lighting
Laird Telemedia Inc.
Mast Development Co. A-V Systems Div.
Optical Radiation Corp.
Radmar, Inc.
Rangertone Research Inc.
Spindler & Sauppe, Inc.

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Electro
Electrohome Ltd.
General Electric Co. Video Display Equip. Op.
Image Magnification, Inc.
Kalart Victor Corp.
Panasonic Company
Panasonic Co. Video Systems Div.
Schudel, Inc.
Sony Corp. of America

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B.E.I. (Beston Electronics Inc.)
Cinema Products Corp.
D'San Corp.
Harris Corp. Broadcast Products Div.
Listec TV Equipment Corp.
Q-TV
Telescript, Inc.

Proof Workbook (For FCC Test Requirements)

Intertec Publishing Corp.

Pulse Assignment Systems

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Audico, Inc.
Broadcast Video Systems, Ltd.
Central Dynamics Corp.
Grass Valley Group, Inc.
Leitch Video Ltd.
Xedit Corp.

Purchasing Services, Broadcast Equipment

CSP Inc.
Jim Cason Electronics
Centro Corp.
DYMA Engineering, Inc.
Industrial Marketing Advisory Services, Inc.
Old Dominion Broadcast Eng. Service

Quadraphonic Systems

Audionics, Inc.
Belar Electronics Lab., Inc.
Catel Div. United Scientific Corp.
Rupert Neve, Inc.
Spectra Sonics
Tangent Systems, Inc.

Beyer. We make the best broadcast mics, too.

In recording studios, concert halls and theatres worldwide, Beyer is the premier name in microphones. Loved by performers and respected by engineers.

Now that same Beyer quality is available in a full line of innovative broadcast microphones, to meet every need and solve every problem.

The Beyer MCE 5 is the world's smallest electret condenser and provides true broadcast-quality audio from a 7 x 23 mm. cylinder weighing just 6.5 grams. It has wide frequency response, but is immune to most body noises. And you can hide it almost anywhere and connect it to a cable or a wireless transmitter.

If you can't get the mic near the sound source, try our Beyer MC 717 shotgun. It has a directional gain of at least 20 dB and a 40-20K frequency response.

The MC 717 is part of a modular condenser mic system consisting of six different transducer capsules plus amplifiers and phantom power supplies that can be perfectly tailored for a wide range of broadcast situations. They're all ruggedly built to handle ENG as well as studio work and can accept temperatures up to 160° and 99% humidity.

Other mics include: the M 55 — an omni-directional dynamic mic that is especially suited for reporters and field interviews; the M 69 — a uni-directional hypercardioid dynamic mic that is perfect for announcers on TV and a studio mic in radio stations; the M 88 — a uni-directional cardioid dynamic mic with warm and full bass response that is ideal for booth or radio announce. This is easily one of the best mics in the business — with a special suspension that eliminates transmitted noise if hand held. Our M 201 is another microphone with excellent vocal characteristics that is favored by singers and reporters alike.

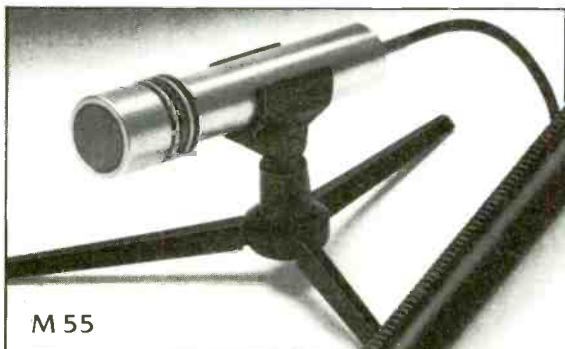
There are many more mics in the Beyer line, plus stands, booms, headsets and accessories. Visit your local Beyer distributor for more information and specs.



MCE 5



MC 717



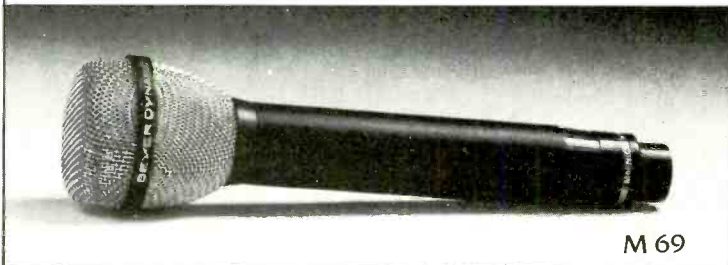
M 55



M 201



M 88



M 69

Beyer
Dynamic

BEYER DYNAMIC, INC.

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Circle (144) on Reply Card

Radar, Weather

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Arvin/Echo Science Corp.
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Oktel Corp.
Sperry Marine Systems Sperry Corp.
Sperry Weather Systems
Technology Service Corp.
Development Labs Div.
Varian Associates Electron Device Group
Video Data Systems
Weathercaster, Inc.
Weathermat, Inc.
Weather Services Corp.

Radomes

Andrew Corp.
Cetec Broadcast Group
Gabriel Electronics, Inc.
Harris Corp. Broadcast Products Div.
Micro Communications, Inc.
Nurad, Inc.
Shively Laboratories, Inc. Div. of Howell Labs, Inc.
Tayburn Electronics, Inc.

Receivers, AM

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TFT Inc./Formerly Time & Frequency Technology Inc.201

Bell Audio Systems, Inc.
Bogen Div. Lear Siegler, Inc.
Communitronics Ltd.
Delta Electronics Inc. (VA)
Eaton Corp., L.A. Plant Elec. Instrumentation Div.
Eumig USA, Inc.
International Microwave Corp.
Kahn Communications, Inc.
McKay Dymek Co.
McMartin Industries, Inc.
Panasonic Company
Potomac Instruments, Inc.
Sharp Electronics Corp. Professional Products
TFT Inc./Formerly Time & Frequency Technology Inc.

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Electrohome Ltd.
International Microwave Corp.
Johnson Electronics Inc.
LeCroy Fiberoptic Systems Div.
McMartin Industries, Inc.
Microwave Assoc. Communications
TFT Inc./Formerly Time & Frequency Technology Inc.
Telesound Communication Services
Vaitec A Phillips-M/A-Com. Venture

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Emergency Alert Receiver Inc.
Gorman-Redlich Mfg. Co.
Harris Corp. Broadcast Products Div.
Johnson Electronics Inc.
McMartin Industries, Inc.
Microwave Assoc. Communications

TFT Inc./Formerly Time & Frequency Technology Inc.

Receivers, Earth Station

Avantek Inc.
California Microwave
Electrohome Ltd.
Gardiner Communications Corp.
Harris Corp. Broadcast Products Div.
Microdyne Corp.
Microwave Assoc. Communications
Modulation Associates Inc.
NEC America, Inc. Broadcast Equip. Div.
Pinzone Communications Products Inc.
Rockwell Int'l. Commercial Elec. Operations
Western Tele-Communications, Inc.

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Altec Lansing Int'l.
Bang & Olufsen of America
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Bogen Div. Lear Siegler, Inc.
Catel Div. United Scientific Corp.
Communitronics Ltd.
Eaton Corp., L.A. Plant Elec. Instrumentation Div.
Electrohome Ltd.
Emergency Alert Receiver Inc.
International Microwave Corp.
Johnson Electronics Inc.
LNR Communications, Inc.
Marti Electronics
McMartin Industries, Inc.
Panasonic Company
Pyramid Loudspeaker Corp.
RHG Electronics Laboratory, Inc.
Rohde & Schwarz Sales Co.
The Ken Schaffer Group, Inc.
Scientific Radio Systems, Inc.
Sonar Radio Corp.
Studer Revox America
TFT Inc./Formerly Time & Frequency Technology Inc.
Times Fiber Communications, Inc. Div. Times Wire & Cable
Wilkinson Electronics, Inc.

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Communitronics Ltd.
Eaton Corp., L.A. Plant Elec. Instrumentation Div.
Kahn Communications, Inc.
Marconi Electronics Inc. Broadcast & Communication Div.
Marconi Instruments Div. of Marconi Electronics Inc.
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Nagra Magnetic Recorders, Inc.
Rohde & Schwarz Sales Co.
Scientific Radio Systems, Inc.

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Marti Electronics
Microdyne Corp.
Microwave Assoc. Communications
Moseley Associates, Inc.
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Modulation Associates Inc.
Moseley Associates, Inc.
Pyramid Loudspeaker Corp.

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Panasonic Company
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Rohde & Schwarz Sales Co.
Sharp Electronics Corp. Professional Products
Sony Corp. of America

Receivers, TV Monochrome

Electrohome Ltd.
Panasonic Company
Panasonic Co. Video Systems Div.
Sharp Electronics Corp. Professional Products
Sony Corp. of America

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Catel Div. United Scientific Corp.
Communitronics Ltd.
Gorman-Redlich Mfg. Co.
Motorola Communications and Electronics Inc.
Nagra Magnetic Recorders, Inc.
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Taber Mfg. & Eng. Co.

Telectro Systems Corp.
Telex Communications, Inc.
United Research Lab Corp.
VIF International

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Allsop, Inc.
Comprehensive Video Supply Corp.
KAPCO Communications
Marathon Products Corp.
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Gruber Products Co.
Impact Case Sales Ltd.
Javelin Electronics A Subs. of Kidde, Inc.
Lee-Ray Industries, Inc.
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Recorder Drive Motor Power Supply Units

Datatronix, Inc.
Merlin Engineering Works, Inc.

Recorder Modifications, Reel Servo

Inovonics Inc.
Merlin Engineering Works, Inc.
Mineroff Electronics, Inc. Uher Products
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Merlin Engineering Works, Inc.
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Sontec Electronics
Studer Revox America
Taber Mfg. & Eng. Co.
United Research Lab Corp.
VIF International

Recorder Replacement Motors

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Merlin Engineering Works, Inc.
UMC Electronics Co. Broadcast Products Div.
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Deltronics Inc.
EMT-FRANZ GMBH
Harris Corp. Broadcast Products Div.
IGM Communications
International Electro-Magnetics
International Tapetronics Corp.
McCurdy Radio Ind. Inc.
Micro-Trak Corp.
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Micro-Trak Corp.
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Ramko Research Inc.
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Panasonic Company
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Marconi Communication Systems Ltd.
Marconi Electronics Inc. Broadcast & Communication Div.
Merlin Engineering Works, Inc.
NEC America, Inc. Broadcast Equip. Div.
Philips Broadcast Group Central Dynamics Corp.
RCA Broadcast Systems
Sony Corp. of America
TEAC Corp of America
3M Co.-Professional A/V Equip.
Magnetic Audio/Video Prod. Div.
Video Rentals, Inc.

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A. F. Associates, Inc.
Ampex Corp.
Merlin Engineering Works, Inc.
RCA Broadcast Systems
Video Rentals, Inc.

Recording Services, Audiotape

Audio Magnetics Corp.
Command Productions Radio Broadcasting Services
Media Concepts, Inc.
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Peters Productions, Inc.
Tape-Athon Corp. Cavox Stereo Productions
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Mineroff Electronics, Inc. Uher
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Plastic Reel Corp. of America
Polyline Corp.
Schuessler Case Co., Inc.
Soundscriber Magnetic Recording Co.,
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Storeel Corp.
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3M Co.-Professional A/V Equip.
Magnetic Audio/Video Prod. Div.

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Fuji Photo Film USA, Inc. Magnetic
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Plastic Reel Corp. of America
Polyline Corp.
Schuessler Case Co., Inc.
Sony Corp. of America
Storeel Corp.
3M Co.-Professional A/V Equip.
Magnetic Audio/Video Prod. Div.

Reflectors, Passive

Fort Worth Tower Co.
Microflect Co., Inc.
UNR-Rohn, UNR, Inc.

Regulators, Voltage

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Broadcast Technology, Inc.
California Instruments Div. of Norlin
Industries
Continental Electronics Mfg. Co.
Harris Corp. Broadcast Products Div.
Kay Industries, Inc.
Lightning Elimination Assoc., Inc.
Motorola Semiconductor Products Inc.
Straight Wire Audio, Inc.
The Superior Electric Co.
Topaz, Inc.

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Remote Broadcast Cue Systems

Cetec Vega
Channematic, Inc.
Comrex Corp.
DYMA Engineering, Inc.
Harris Corp. Broadcast Products Div.
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Moseley Associates, Inc.
Motorola Communications and
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ProTech Audio Corp.
Telfax Communications

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Continental Electronics Mfg. Co.
Control Video Corp.
Delta Electronics Inc. (VA)
DYMA Engineering, Inc.
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JVC Professional Video
Kaitronics Corp.
Marconi Communication Systems Ltd.
Marconi Instruments Div. of Marconi
Electronics Inc.
Marti Electronics
Micro Control Associates, Inc.
Microwave Assoc. Communications
Modulation Associates Inc.
Monroe Electronics, Inc.
Moseley Associates, Inc.
Nurad, Inc.
Power-Optics, Inc.
ProTech Audio Corp.
Quick-Set Inc.
Richmond Sound Design, Ltd.
Sharepoint Systems Inc.
Soll, Inc.
Sono-Mag Corp.
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Moseley Associates, Inc.
Motorola Communications and
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Belden Communications, Inc.
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ENG Helicopter Satellites, Ltd.
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Leasametric, Inc.
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L. Matthew Miller Assoc. Ltd.
Old Dominion Broadcast Eng. Service
One Pass Video
Plastic Reel Corp. of America
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Eventide Clockworks, Inc.
Gotham Audio Corp.
Harris Corp. Broadcast Products Div.
Lexicon Inc.
MICMIX Audio Products, Inc.
Opamp Labs, Inc.
Orban Assoc. Inc.
ProTech Audio Corp.
Quad-Eight Electronics
The Ken Schaffer Group, Inc.
URSA MAJOR, Inc.
VIF International

Rewinders, Film

K B Systems
Kaiart Victor Corp.
Magnasync/Moviola Corp.
Neumade Industries, Inc.
Plastic Reel Corp. of America
Research Technology Int'l.
Unidek Film Editing Systems

Rewinders, Tape

Audico, Inc.
Broadcast Electronics, Inc.
K B Systems
Magnesonic Mfg. & Sales Co.
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HN Engineering Inc.
Harris Corp. Broadcast Products Div.
McMartin Industries, Inc.
Microwave Assoc. Communications
Misar Industries
Mitsubishi Elec. America
Modulation Associates Inc.
Oak Communications Inc.
Pinzone Communications Products Inc.
Third Wave Communications Corp.
Western Tele-Communications, Inc.
Western Union Broadcast Services
Wold Communications

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RCA American Communications
Western Tele-Communications, Inc.
Western Union Broadcast Services

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TFT Inc./Formerly
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Technology Inc.201

American Quotation System, Inc.
Subsidiary of AmNET
Edcor

IF WE SAID YOU COULD MAINTAIN HIGH PRODUCTION STANDARDS FOR LESS THAN \$2000, YOU'D SAY WE'RE UNBALANCED.

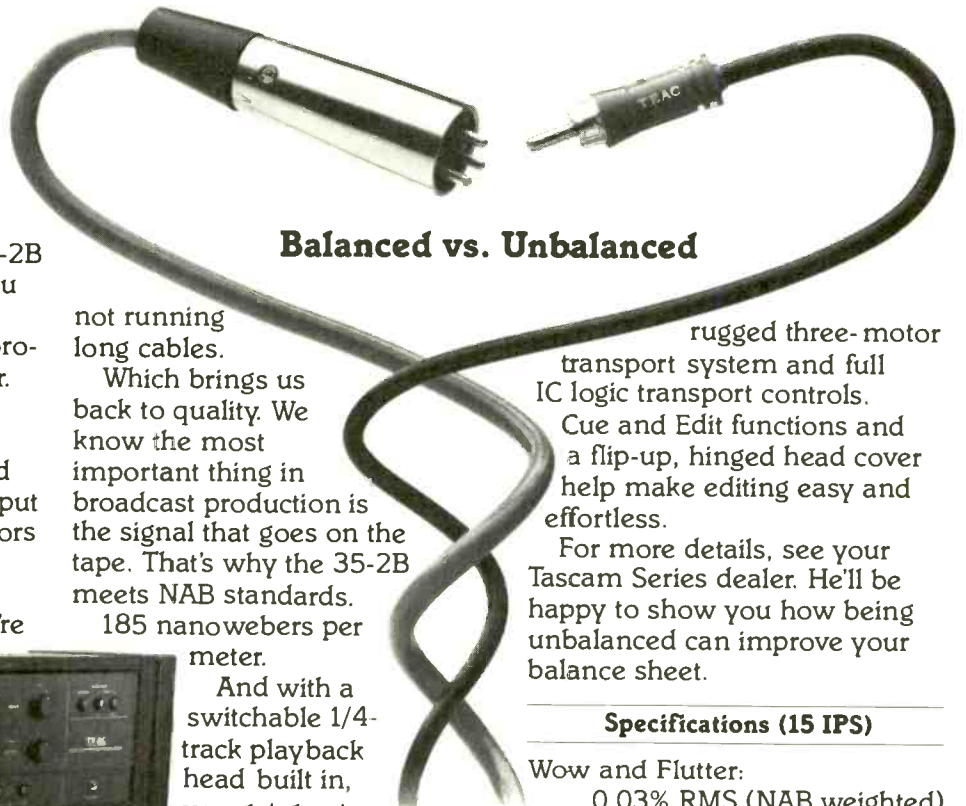
By using a -10 unbalanced system, instead of +4 balanced, we eliminated hundreds of dollars of line amplifiers, transformers and balanced audio cables.

And that's how the Tascam 35-2B recorder/reproducer can save you money.

Without compromising your professional quality one nanoweber.

Unless you're running cable hundreds of feet long, there's no real difference between balanced and unbalanced. Since input/output levels and impedance aren't factors in recording quality.

So it pays to use the Tascam 35-2B in production, where you're



Balanced vs. Unbalanced

not running long cables.

Which brings us back to quality. We know the most important thing in broadcast production is the signal that goes on the tape. That's why the 35-2B meets NAB standards.

185 nanowebers per meter.

And with a switchable 1/4-track playback head built in, you get greater flexibility at no extra cost.

What's more, the 35-2B features a

rugged three-motor transport system and full IC logic transport controls.

Cue and Edit functions and a flip-up, hinged head cover help make editing easy and effortless.

For more details, see your Tascam Series dealer. He'll be happy to show you how being unbalanced can improve your balance sheet.

Specifications (15 IPS)

Wow and Flutter:

0.03% RMS (NAB weighted)
±0.05% peak
(DIN/IEC/ANSI weighted)

Frequency Response:

40 Hz-22 kHz, ±3dB at 0 VU

Signal to Noise Ratio:

Reference 1 kHz at 10 dB above
0 VU (650 nW/m) 65 dB A
weighted (NAB) 92 dB A
weighted with integral dbx*

*dbx is a trademark of dbx Incorporated.

TASCAM

Teac Production Products Group



The 32-2B and the compact 22-2 recorder/reproducers can save you even more money.

©1981 TEAC Corporation of America, 7733 Telegraph Road, Montebello, CA 90640.

CS-600 Console optional.

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Johnson Electronics Inc.
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TFT Inc./Formerly Time & Frequency
Technology Inc.

Screens, Projection

D.O. Industries, Inc.
Da-Lite Screen Co., Inc.
Eastman Kodak Co.
Electrohome Ltd.
General Electric Co. Video Display
Equip. Op.
Raven Screen Corp.
Schudel, Inc.
The Screen Works, Ltd. Wilcox-Lange
Inc.

Semiconductors, ICs

Analog Devices, Inc.
Avantek Inc.
Cherry Electrical Products
Cherry Semiconductor Corp.
Datel-Intersil Inc.
EEV Canada Ltd.
Fairchild Camera & Instrument Corp.
CCD Imaging Div.
G C Electronics Div. Wallace Murray
Harris Corp. Broadcast Products Div.
Mallory Distributor Prod. Co. Mallory
Components Group
Motorola Semiconductor Products Inc.
Opamp Labs, Inc.
Panasonic Company
RCA Distributor & Special Products
Div.
Valley People, Inc.

**Semiconductors,
Microprocessor/LSI (Solid
State)**

Amperex Electronic Corp.
Analog Devices, Inc.
G C Electronics Div. Wallace Murray
Harris Corp. Broadcast Products Div.
Motorola Semiconductor Products Inc.
Panasonic Company
RCA Distributor & Special Products
Div.
Westinghouse Elec. Corp.
Semiconductor Div.

**Semiconductors, Rectifier
General**

Amperex Electronic Corp.
EEV Canada Ltd.
Electronic Devices, Inc.
Mallory Distributor Prod. Co. Mallory
Components Group
Motorola Semiconductor Products Inc.
RCA Distributor & Special Products
Div.
Varian Associates Electron Device
Group
Westinghouse Elec. Corp.
Semiconductor Div.

**Semiconductors, Rectifier High
Voltage Stack**

Amperex Electronic Corp.
EEV Canada Ltd.
Electronic Devices, Inc.
Mallory Distributor Prod. Co. Mallory
Components Group
Motorola Semiconductor Products Inc.
RCA Distributor & Special Products
Div.
Westinghouse Elec. Corp.
Semiconductor Div.
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Amperex Electronic Corp.
EEV Canada Ltd.
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Mallory Distributor Prod. Co. Mallory
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Motorola Semiconductor Products Inc.

RCA Distributor & Special Products
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Westinghouse Elec. Corp.
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Amperex Electronic Corp.
EEV Canada Ltd.
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R. F. Gain, Ltd.
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The Narda Microwave Corp.
North Hills Electronics, Inc.

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Arvin/Echo Science Corp.
Colorado Video Inc.
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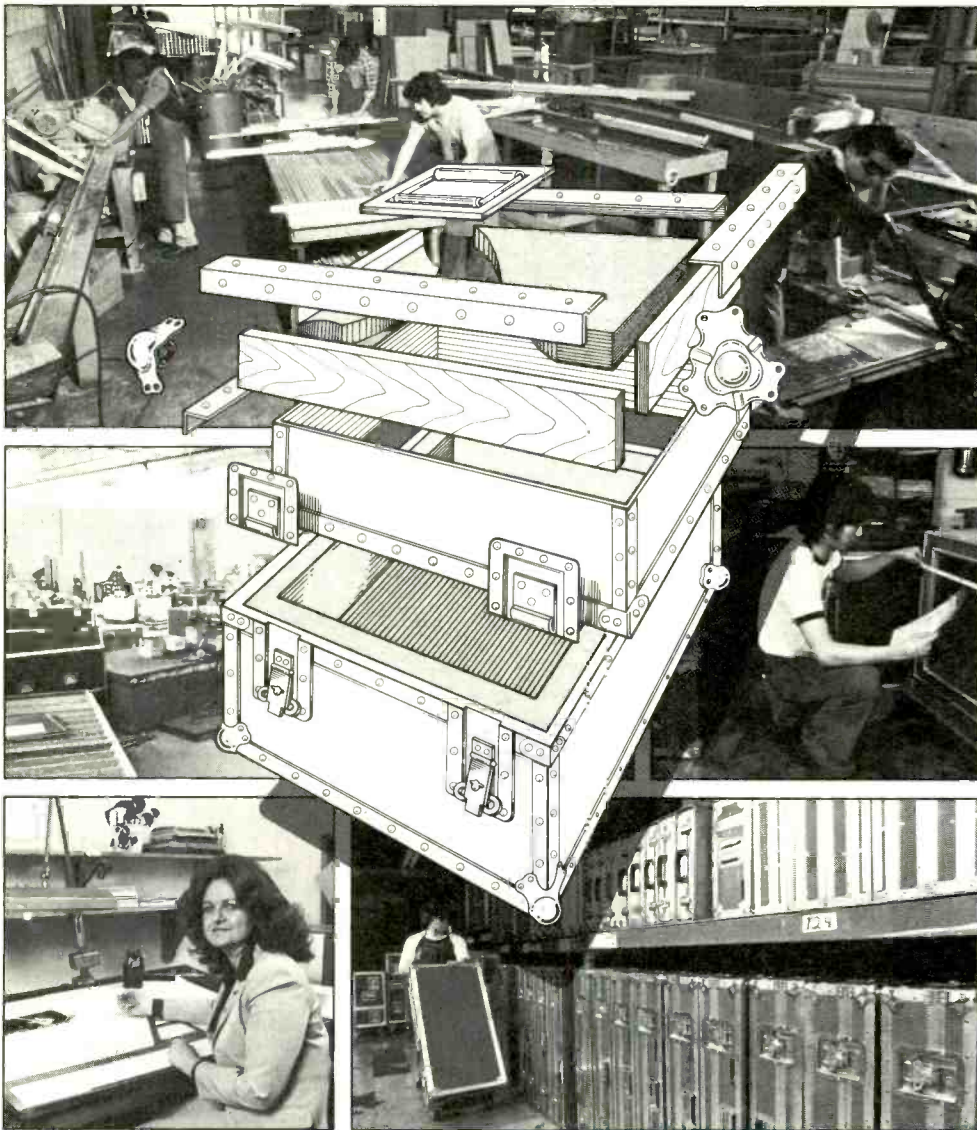
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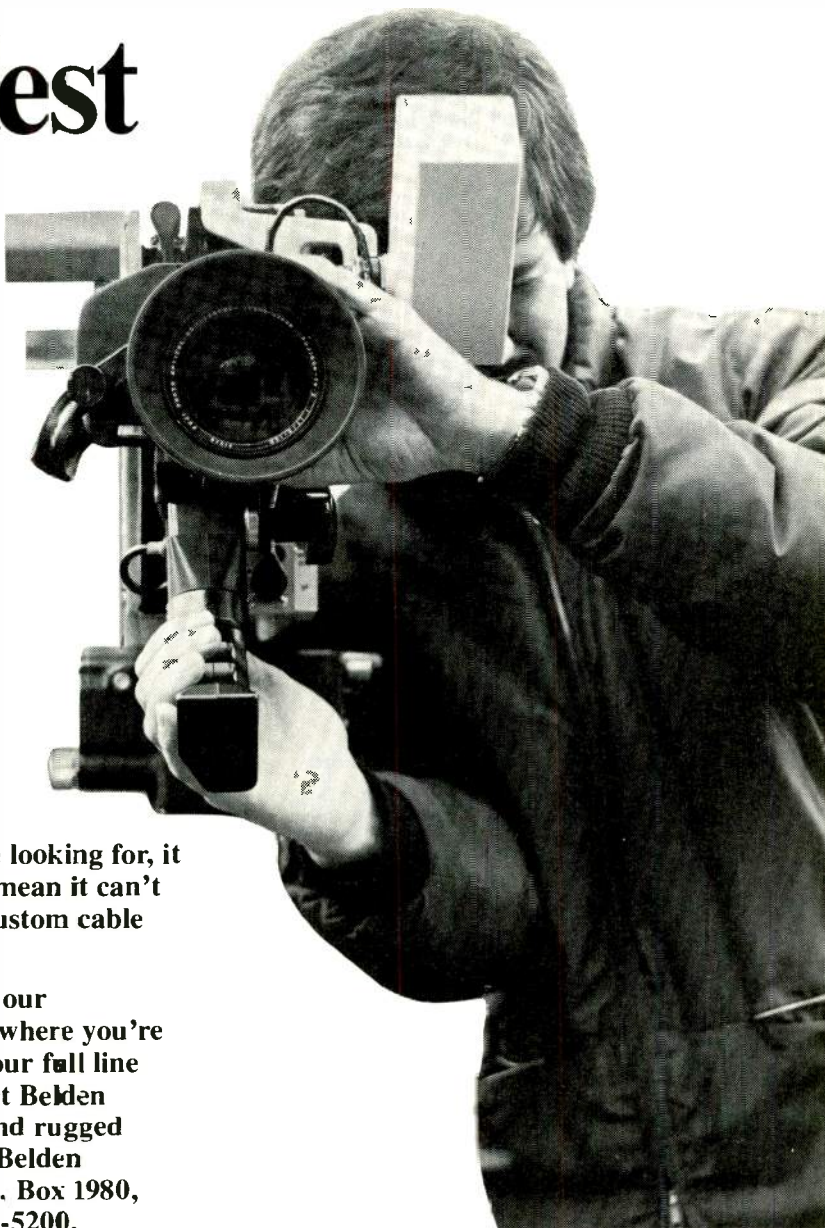
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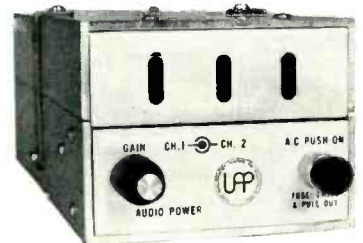
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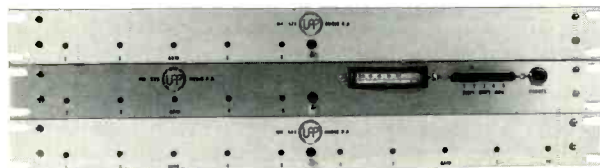
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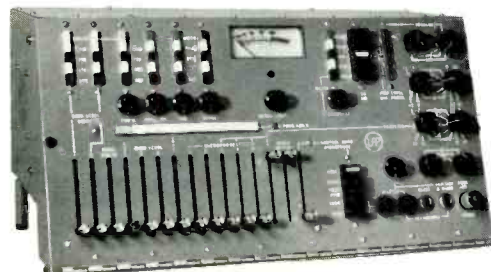
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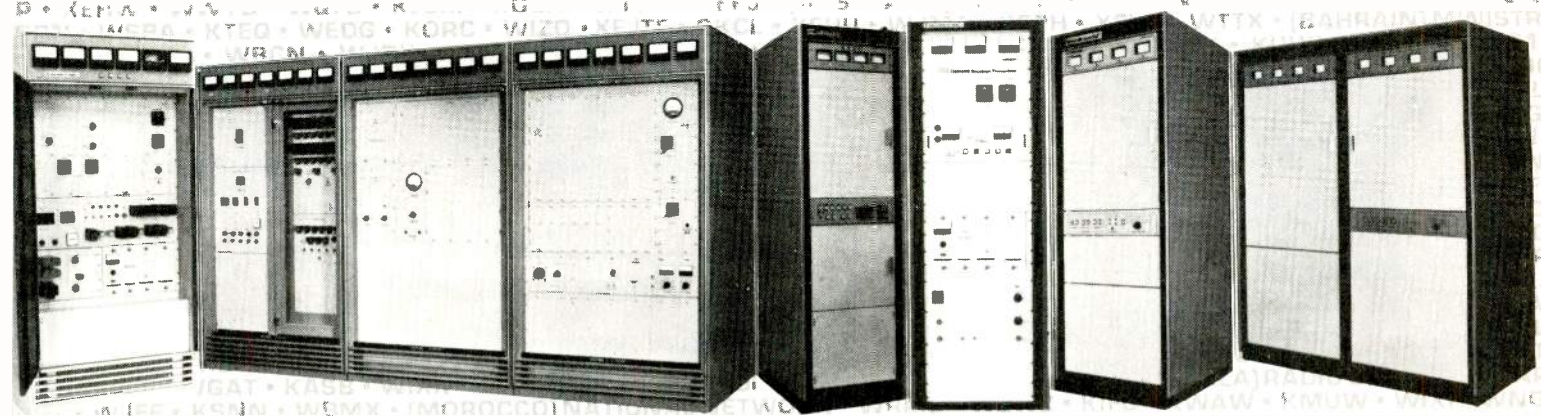
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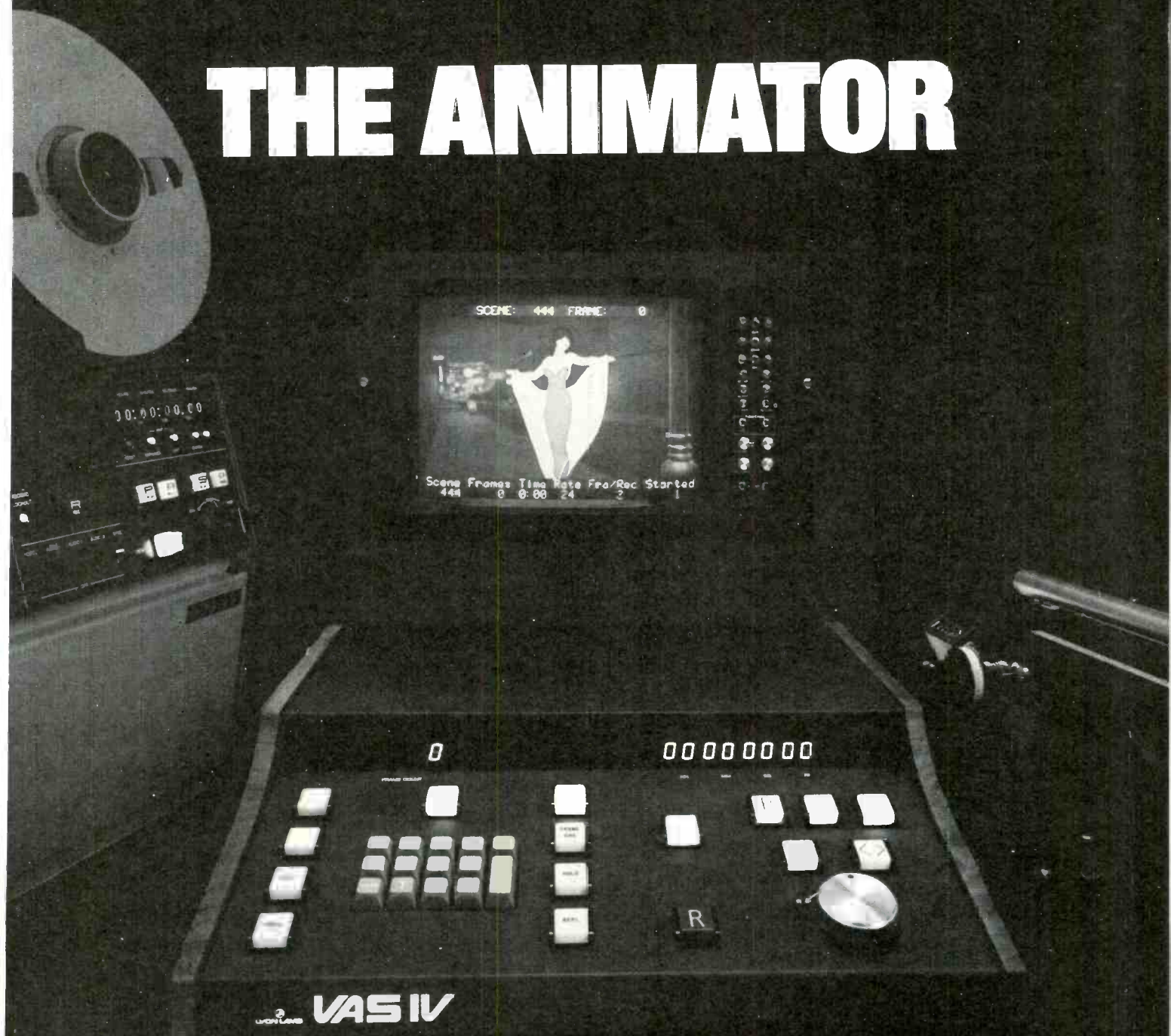
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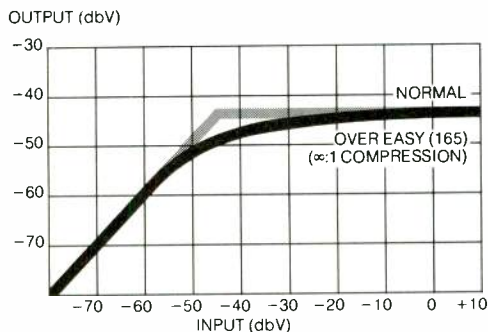
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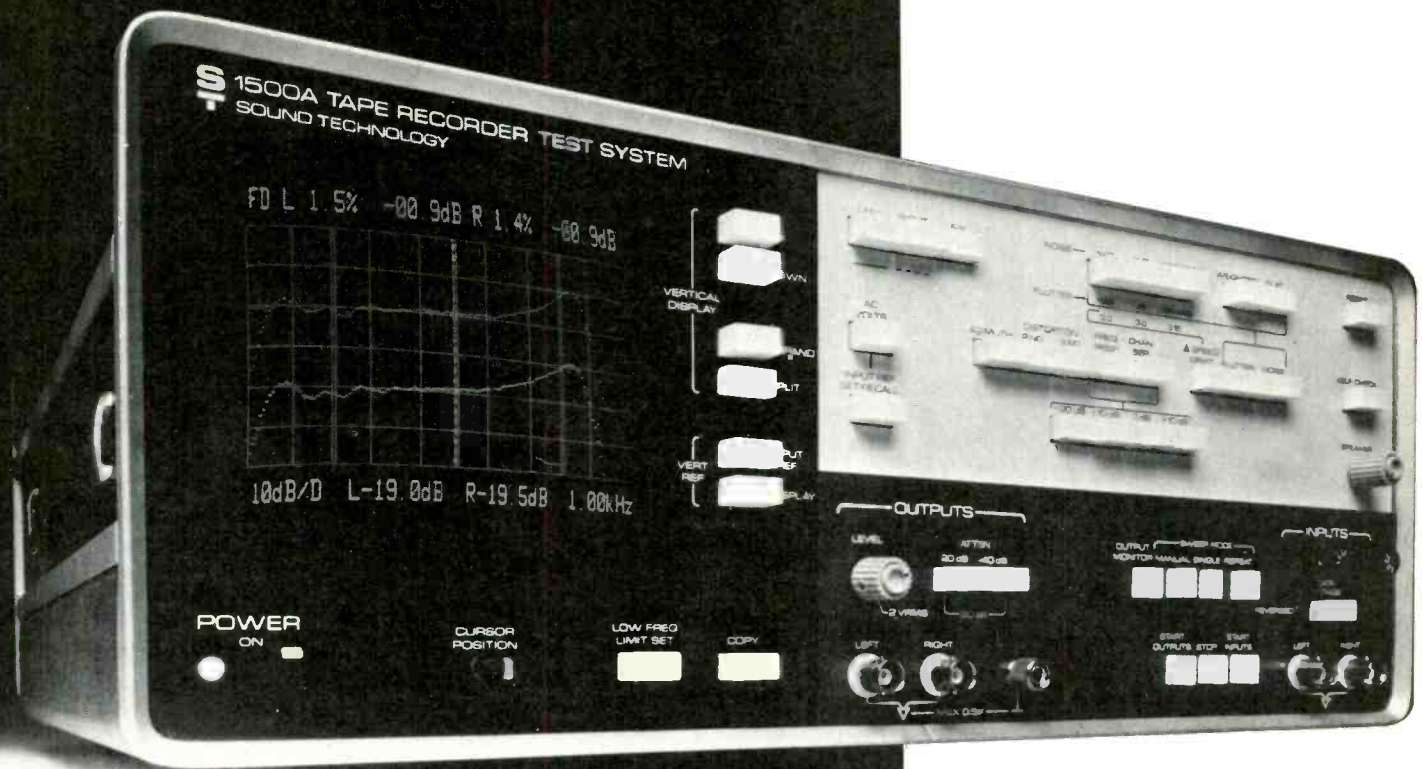
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 R. M. Associates, Ltd., 11503 West 75th St., Shawnee Mission, KS 66214 (913) 631-7606 Mike Eakins
 Robert Milk Co., 22420 Telegraph Rd., Southfield, MI 48034 (313) 354-3310 Chuck Milk
 A. C. Simmonds and Sons, 975 Dillingham Rd., Pickering, Ont., Canada L1W 3B2 (416) 839-8041 Bud Campion

Cezar International, Ltd., 1026 W. Maude Ave., Sunnyvale, CA 94086

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Cherry Electrical Products, 3600 Sunset Ave., Waukegan, IL 60085

Cherry Semiconductor Corp., 2000 S. County Trail, East Greenwich, RI 02818

Christie Electric Corp., 20665 Manhattan Pl., Torrance, CA 90501

Chyron Corp., Telesystems, 265 Bethpage/Spagnoli Rd., Melville, NY 11747

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Cine 60, Inc., 630 9th Ave., New York, N.Y. 10036

Cinema Products Corp., 2037 Granville Ave., Los Angeles, CA 90025
 Don Dunbar, V.P. National Mktg. (213) 478-0711

Circuit Research Labs, Inc., 3204 S. Fair Lane, Tempe, AZ 85282

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Ciro Equipment Corp., 6820 Romaine St., Hollywood, CA 90038

Clear-Com Intercom Systems, 759 Harrison St., San Francisco, CA 94107

Edward Fitzgerald (415) 989-1130

Cletronic Inc., 1684 Medina Rd. (Rt. 18), Medina, OH 44256

Cleveland Institute of Elec., Inc., 1776 East 17th St., Cleveland, OH 44114

Coastcom, 2312 Stanwell Dr., Concord, CA 94520

Coherent Communications, 13733 Glenoaks Blvd., Sylmar, CA 91342

Cohu, Inc., Electronics Div., Box 623, San Diego, CA 92112

Colorado Video Inc., Box 928, Boulder, CO 80306

Colorgraphics Weather Systems, Inc., 5727 Tokay Blvd., Madison, WI 53719

Columbia Special Products, 51 West 52nd St., Room 861, New York, NY 10019

Columbine Systems, Inc., Box 740, Golden, CO 80401

Comark Communications, Inc., Box 267, Southwick, MA 01077

Comark Industries Inc., Box 229, Southwick, MA 01077

Comex Systems, 2 Columbia Dr., Amherst, NH 03031

Command Productions, Radio Broadcasting Services, Box 26348, San Francisco, CA 94126

Commerce Airborne Corp., 16425 Hart St., Suite 104, Van Nuys, CA 91406

Commercial Electronics, Inc., 880 Maude Ave., Mountain View, CA 94043

Commercial Radio Monitoring Co., Inc., 103 S. Market, Lee's Summit, MO 64063

Comm/Scope Co., Rt. 1, Box 199A, Catawba, N.C. 28609

Communitronics Ltd., 160 Wilbur Place, Bohemia, NY 11716

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COMPAC, 279 Skidmore Rd., Deer Park, NY 11729

Compact Video Sales, Inc., 1104 W. Chestnut St., Burbank, CA 91506

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 Compact Video Systems, Washington Executive Plaza, 522 Washington, Naperville, IL 60540 (312) 369-0714 Dick Smith
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 Compact Video Systems, 13773 N. Central Expressway, Suite 1230, Keystone Park, Dallas, TX 75243

Composite Video, 1218 N. Blackwelder, Oklahoma City, OK 73106

Comprehensive Video Supply Corp., 148 Veterans Dr., Northvale, NJ 07647

Compucon, Inc., Box 401229, Dallas, TX 75240

Computer Business Systems, Inc., 167 Moore Rd., East Weymouth, MA 02189

Computer Concepts Corp., 8001 West 63rd, Shawnee Mission, KS 66202

Greg Dean (913) 677-4000

Computer Labs, Div. of Analog Devices, Inc., 505 Edwardia Dr., Greensboro, N.C. 27409

Computer Management Systems, Inc., 6610 N. Shadeland Ave., Indianapolis, IN 46220

Computer Products Inc., Power Products Div., 2801 Gateway Dr., Pompano Beach, FL 33060

Computer Video Systems, Inc., 3678 W. 2150 So., Unit #2, Salt Lake City, UT 84120

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 Computer Video Systems, Inc., Eastern Regional Office, 2131 Kingston Court, Suite 116, Marietta, GA 30067 (404) 952-3177 Kent Lewis
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 Cable TV Service, 412 First Security Bank Bldg., Garland, TX 75042 (214) 235-6589 Al Laughlin
 Cable Market Specialists, Inc., 1201 Market St., Kirkland, WA 98033 (206) 822-0278 Don Thomsen

Comrex Corp., 60 Union Ave., Sudbury, MA 01776

Comsearch, Inc., 7633 Leesburg Pike, Falls Church, VA 22043

Conrac Div., Conrac Corp., 600 North Rimsdale Ave., Covina, CA 91722

Consolidated Electronic Industries, 1925 N. Lynn St., Arlington, VA 22209

Contel Mfg., 1620 W. 32nd Place, Hialeah, FL 33012

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Convergence Corp., 1641 McGaw, Irvine, CA 92714

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Cool Light Co., Inc., 5723 Auckland Ave., No. Hollywood, CA 91601

Cortland Cable Co., Box 352, Cortland, NY 13045

Creative Electronics, 1417 N. Selfridge, Clawson, MI 48017

Crosspoint Latch Corp., 95 Progress St., Union, NJ 07083

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Crown International, Inc., 1718 W. Mishawaka Rd., Elkhart, IN 46517

Cumming Corp., 8720 Woodley Ave. #207, Sepulveda, CA 91343

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 John B. Anthony Co., 992 High Ridge Rd., Stamford, CT 06805
 Crescendo Associates, 9766 Deer Run Dr., Ponte Vedra Beach, FL 32082
 Audio Resources, 825 N. Cass Ave., Suite 205, Westmont, IL 60559
 Professional Audio Associates, 104 Drake Rd., Burlington, MA 01803
 CM Sales, 221 Lakeshire, W. Bloomfield, MI 48033
 Fruen & Associates, 2800 West Rd., Wayzata, MN 55391
 Centurian Marketing Associates, 124 Manchester St., Ballwin, MO 63011
 Audio Source Marketing, 4701 Orlentangy River Rd., Columbus, OH 43214
 Wilson Audio Sales, Rt. 3, Barrel Springs Hollow Rd., Franklin, TN 37064
 Rep Tech Inc., Rt. 4, Box 197, Terrell, TX 75060
 Sphere Associates, 11250-7 Roger Bacon Dr., Reston, VA 22091
 Roger Ponto Associates, 8611 Northeast 26th Pl., Bellevue, WA 98004

DHV, Inc., Box 520, Mineral Wells, TX 76067

D.O. Industries, Inc., 317 E. Chestnut St., East Rochester, NY 14445

D and S Corley Ltd., 80 Galaxay Blvd., Rexdale, Ont., Canada M9W 4Y8

DSI Instruments, Inc., 9550 Chesapeake Dr., San Diego, CA 92123

Dage-MTI, Inc., 208 Wabash St., Michigan City, IN 46360

Peter W. Dahl Co., Inc., 4007 Fort Blvd., El Paso, TX 79930

Peter W. Dahl (915) 566-5365

Da-Lite Screen Co., Inc., 3100 State Rd. 15 N., Warsaw, IN 46580

Data Communications Corp., 3000 Directors Row, Suite 508, Memphis, TN 38131

Data Industrial Corp., Commerce Park Rd., Pocasset, MA 02559

Datametrics Inc., 340 Fordham Road, Wilmington, MA 01887

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 Roscor Corp., 6160 W. Oakton St., Morton Grove, IL 60053 (312) 539-7700 Paul Roston
 Wiltronix, Inc., 5504 Waterway, Rockville, MD 20853 (301) 460-1454 Dwight Wilcox
 Sedillo Co., 125 E. Sunnyside Ave., Campbell, CA 95008 (408) 374-5220 Ramon Sedillo

Datatek Corp., 1121 Bristol Rd., Mountainside, NJ 07092
Datatron, Inc., Box 11427, Santa Ana, CA 92711
Frank Logan (714) 544-9970

Datatronix, Inc., 2100 Reston Ave., Reston, VA 22091

Datel-Intersil Inc., 11 Cabot Blvd., Mansfield, MA 02048

Decca Austin Insulators, 71 Selby Road, Brampton Ont., Canada L6W 1K5

Delcom Corp., 6019 South 66th East Ave., Tulsa, OK 74145

Delta Electronics Inc. (N.C.), 145 Fayette St., Winston Salem, N.C. 27101

Delta Electronics Inc. (VA), 5730 Gen. Washington Dr., Alexandria, VA 22312

Delta Lightning Arrestors, Box 1084, Big Spring, TX 79720

Deltronics Inc., Interstate Industrial Park, Riviera Beach, FL 33404

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Devlin Productions, Inc., 150 West 55th St., New York, NY 10019

De Wolfe Music Library, 25 West 45th St., New York, NY 10036

Dictaphone Corp., 120 Old Post Rd., Rye, NY 10580

Dielectric Communications, A Unit of General Signal, Route 121, Raymond, ME 04071

Digital Video Systems Inc., 716 Gordon Baker Rd., Willowdale, Ont., Canada M2H 3B4

Ditch Witch, The Charles Machine Works, Inc., Box 66, Perry, OK 73077

Di-Tech Inc., 48 Jefry Blvd., Deer Park, NY 11729

Dolby Laboratories, Inc., 731 Sansome St., San Francisco, CA 94111
Tim Prouty (415) 392-0300

DowKey Div., Of Kilovac Corp., Box 4422, Santa Barbara, CA 93103

Dranetz Engineering Labs, Inc., 1000 New Durham Rd., Edison, NJ 08817

D'San Corp., 25-30 163rd St., Flushing, NY 11358

Dukane Corp., Audio-Visual Div., 2900 Dukane Dr., St. Charles, IL 60174

Duncan Electronics, Inc., 2865 Fairview Road, Costa Mesa, CA 92626

E. I. du Pont de Nemours & Co., Inc., Product Information, 1007 Market St., Wilmington, DE 19898

The Durafilm Co., 137 N. LaBrea Ave., Hollywood, CA 90036

DYMA Engineering, Inc., Box 1697, Taos, NM 87571

Dynair Electronics, Inc., 5275 Market St., San Diego, CA 92114

Robert A. Jacobs (714) 263-7711

Dynamote Corp., 1200 W. Nickerson, Seattle, WA 98119

Dynatech Data Systems, 7644 Dynatech Ct., Springfield, VA 22153

Dynatech/U-Z, Inc., 9522 W. Jefferson Blvd., Culver City, CA 90230

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EAR Systems, Inc., 1807 Old Shay Court, Columbus, OH 43229

ECCO Inc., 1601 E. Chestnut Ave., Santa Ana, CA 92701

EEG Enterprises, Inc., 1 Rome St., Farmingdale, NY 11735

EEV, Inc., 7 Westchester Plaza, Elmsford, N.Y. 10523

Tom Soldano, RF Products and Dick Betts, Imaging Devices (914) 592-6050

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EEV, Inc., 15 Dunwoody Park, Suite 100E, Atlanta, GA 30338 (404) 394-9201 Harry Kozicki

English Electric Valve Co. Ltd., Waterhouse Lane, Chelmsford England CM1 2QU (0245) 61777 Mark Knight

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EMCEE Broadcast Products, Box 68, White Haven, PA 18661

Peter A. Rosa (717) 443-9575

EMT-FRANZ GMBH, Postfach 1520, D-7630 Lahr, West Germany

E-N-G Corp., 1009 C. Shary Circle, Concord, CA 94518

ENG Helicopter Satellites, Ltd., 9919 Carter Rd., Bethesda, MD 20817

Alex Carey, President (301) 469-8109

ESC Electronics Corp., 534 Bergen Blvd., Palisades Park, N. J. 07650

ESE, 142 Sierra St., El Segundo, CA 90245

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Broadcast Supply West, 7012 27th St. W., Tacoma, WA 98466 (206) 565-2301 Irv Law

David Green Broadcast Consultant, 21 N. Wirt St., Leesburg, Va. 22075 (703) 777-8660 David Green

Martin Audio, 423 West 55th St., New York, N.Y. 10019 (212) 541-5900

Allied Broadcast Equipment, 635 South E St., Richmond, Ind. 47374 (317) 962-8596 Jim Jones

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Eastman Kodak Co., 343 State St., Rochester, N.Y. 14650

Eaton Corp., L.A. Plant, Elec. Instrumentation Div., 5340 Alla Rd., Los Angeles, CA 90066

Echolab Inc., 175 Bedford Rd., Burlington, MA 01803

Econco Broadcast Service Inc., 1302 Commerce Ave., Woodland, CA 95695

Eddcor, 16782 Hale Ave., Irvine, CA 92714

Editall Corp., Box 17435, Washington, DC 20041

Ednalite Corp., 200 N. Water St., Peekskill, NY 10566

Edutron, Inc., 6649-A Peachtree Ind&I. Blvd., Norcross, GA 30092

Eidson Electronic Co., Box 3751, Temple, TX 76501

Eigen Video, Box 1027, Grass Valley, CA 95945

EIMAC, Div. of Varian, 301 Industrial Way, San Carlos, CA 94070

Bob Hoffman (415) 592-1221

Elcom-Bauer, 6199 Warehouse Way, Sacramento, CA 95826

Elector, 5128 Calle del Sol, Santa Clara, CA 95050

Electro-Acoustic Designs, Inc., 5131 W. Chester Pike, Edgemont, PA 19028

Electro Controls, 2975 S. 300 W., Salt Lake City, UT 84115

Electro Impulse, Inc., Box 870, Red Bank, N.J. 07701

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Electro-Voice Inc., 600 Cecil St., Buchanan, MI 49107

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Electronic Devices, Inc., 21 Gray Oaks Ave., Yonkers, N.Y. 10710

Electronic Industries Assn., 2001 Eye St., N.W., Washington, DC 20006

Electronic Instrument & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180

Electronics Diversified, Inc., 1675 N.W. 216th, Hillsboro, OR 97123

Elektroimpex, Box 296, H-1392 Budapest, Hungary

Emcor Products, GF Business Equipment, Inc., 1600 4th Ave. N.W., Rochester, MN 55901

Emergency Alert Receiver Inc., 1 West 30th St., New York, NY 10001

Enclosure Corp., 4529 Adams Circle, Cornwell Heights, PA 19020

English Electric Valve Co. Ltd., Waterhouse Lane, Chelmsford, Essex England CM1 2QU

Environmental Container Systems, Inc., Box 188, Grants Pass, OR 97526

Equipto Electronics Corp., 447 Woodlawn Ave., Aurora, IL 60507

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Ercona Corp., 2492 Merrick Rd., Bellmore, NY 11710

Eumig USA, Inc., 225 Community Dr., Lake Success Business Park, Great Neck, N.Y. 10020

Eventide Clockworks, Inc., 265 West 54th St., New York, N. Y. 10019

Exact Electronics, Inc., Box 347, Tillamook, OR 97141

Excalibur Electronics, Inc., 5645 Mt. Burnside Way, Burke, VA 22015

Excalibur Industries, 12419 Foothill Blvd., Lake View Terrace, CA 91342

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Fisher Berkeley Corp., 5800 Christie Ave., Emeryville, CA 94608

Flash Technology Corp. of America, 55 Lake St., Nashua, N. H. 03060

John Fluke Mfg. Co., Inc., Box C9090, Everett, WA 98206

For-A Corp. of America, 1680 N. Vine St., Suite 201, Los Angeles, CA 90028

Forox Corp., 393 West Ave., Stamford, CT 06902

Fort Worth Tower Co., Box 8597, Ft. Worth, TX 76112

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GKM Mfg. Corp., 47 Bridgewater St., Brooklyn, NY 11222

G & M Power Products, 6500 Santa Monica Blvd., Los Angeles, CA 90038

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Global Specialties Corp., 70 Fulton Terr., New Haven, CT 06509

Alan Gordon Enterprises Inc., 1430 N. Cahuenga Blvd., Hollywood, CA 90028

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Gould Inc., Instruments Div., 3631 Perkins Ave., Cleveland, Ohio 44114

Gralex Industries, 155 Marine St., Farmingdale, N. Y. 11735

The Graphic Express, 7969 Engineer Rd., Suite 201, San Diego, CA 92111

Grass Valley Group, Inc., 13024 Bitney Springs Rd., Grass Valley, CA 95945

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Groton Computer Inc., 19 Fort Hill Rd., Groton, CT 06340

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HSC, Inc., Box 155, River Grove, IL 60171

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Clifford B. Hannay & Son, Inc., 402 Main St., Westerlo, N.Y. 12193

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Harris Corp., PRD Electronics Div., 1200 Prospect Ave., Westbury, NY 11590

Harris Video Systems, 1255 E. Arques Ave., Sunnyvale, CA 94086

Harrison Systems Inc., Box 22964, Nashville, TN 37211

Harrison Systems Ltd., 6117 63rd Ave., Riverdale, MD 20840

Hartley Products Corp., 620 Island Rd., Ramsey, N.J. 07446

Karl Heitz, Inc., 979 Third Ave., New York, NY 10022

Hickok Elec. Inst. Co., 10514 Dupont Ave., Cleveland, Ohio 44108

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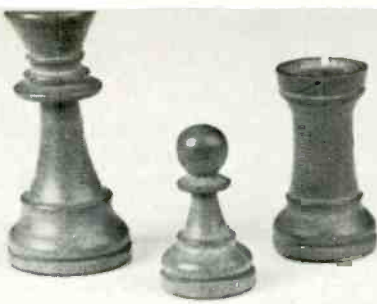
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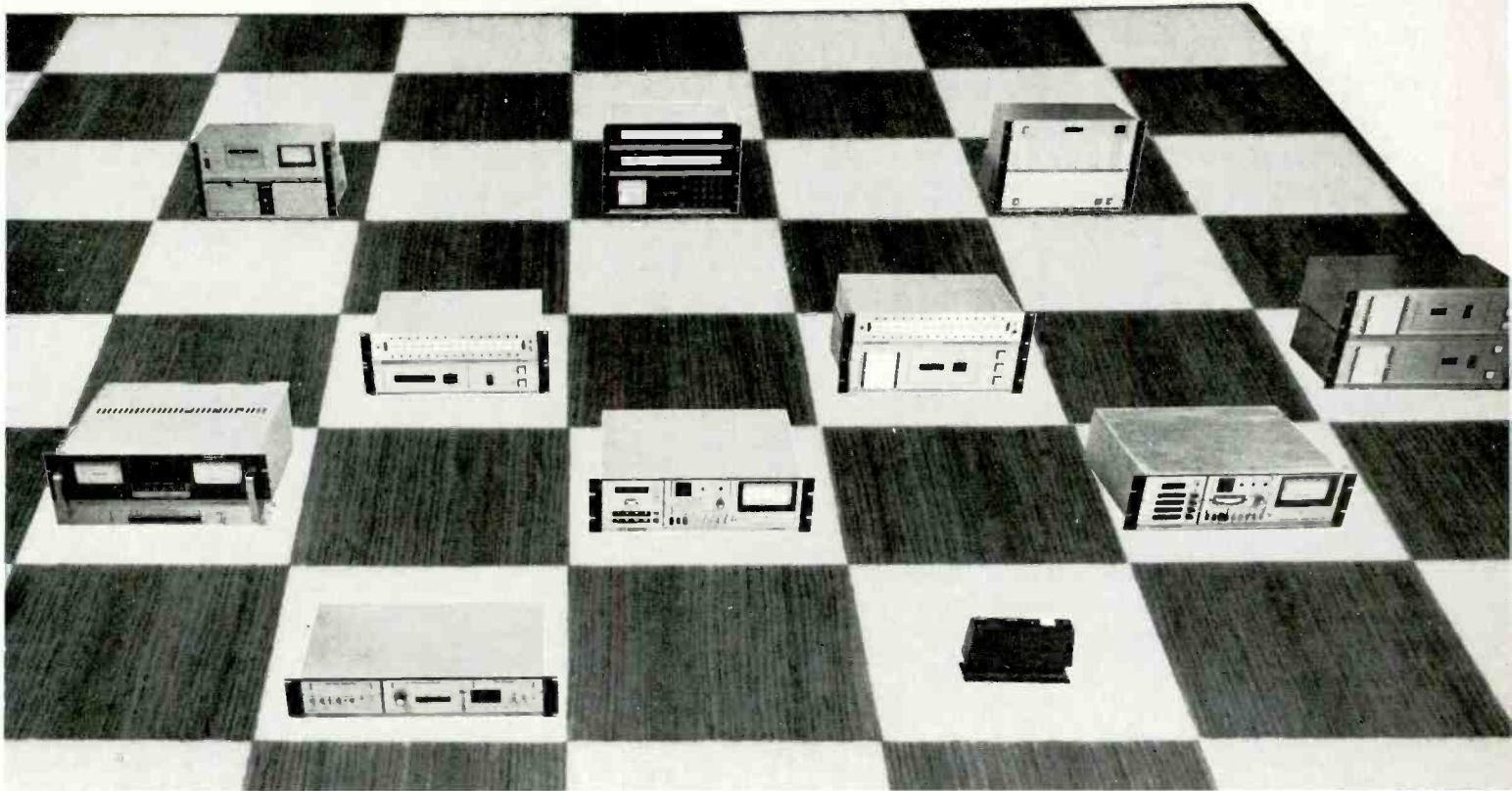
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Allen Osborne Associates, 5195 N. Douglas Fir Rd., Calabasas, CA 91302

Lois Osborne, Sales Mgr. (213) 888-2772

Osram Sales Corp., Box 7062, Newburgh, NY 12550

Otari Corp., 2 Davis Dr., Belmont, CA 94002

Michael Bernard (415) 592-8311

REGIONAL SALES CONTACTS:

Sonics Associates, 237 Oxmore Rd. Suite 101, Birmingham, AL 35209 (205) 942-9631
 Autograph, Inc., 601 E. Blackledge Dr., Tucson, AZ 85705 (602) 882-9016
 E.A.R. Sound Consultants, 947 S. 48th St., Suite 127, Tempe, AZ 85281 (602) 968-8675
 Accurate Sound Corp., 114 5th Ave., Redwood City, CA 94063 (415) 365-2843
 ACI/Filmways, 7138 Santa Monica Blvd., Hollywood, CA 90046 (213) 851-7172
 A-1 Audio, 6322 De Longpre Ave., Hollywood, CA 90028 (213) 465-1101
 American Video Products, 1875 S. Santa Cruz St., Anaheim, CA 92805 (714) 978-9002
 B & L Sales & Marketing, 10640 Magnolia Blvd., No. Hollywood, CA 91601 (213) 985-1792
 Bananas At Large, 812 4th St., San Rafael, CA 94901 (415) 457-7600
 Broadcast Comm. Devices, 2990 E. La Jolla St., Anaheim, CA 92806 (213) 628-9590 (714) 630-8150
 Castle Music, 5796 Calle Real, Goleta, CA 93017 (805) 964-9827
 Century Music, 620 Bascom Ave., San Jose, CA 95128 (408) 998-7474
 2nd Address, 23239 Hesparian Blvd., Hayward, CA 94543 (415) 887-8700
 Cetec Broadcast Group, 1110 Mark Ave., Carpinteria, CA 93013 (805) 684-7686
 Coast Recording, 6114 Santa Monica Blvd., Hollywood, CA 90036 (213) 462-6058
 Everything Audio, 16055 Ventura Blvd. Suite 1001, Encino, CA 91436 (213) 994-4175
 Express Sound, 1833 Newport Blvd., Costa Mesa, CA 92627 (714) 645-8501
 Media Generalists, 500 Second St., San Francisco, CA 94107 (415) 957-9191
 RPS/Sound Foyer, 6230 Descanso Ave., Buena Park, CA 90620 (714) 521-5230, (213) 744-0355
 Sound Genesis, 2001 Bryant St., San Francisco, CA 94110 (415) 585-8900
 Sound Investments, 31121 Via Colinas Suite 1003, Westlake Village, CA 91361 (213) 991-3400
 Westlake Audio, 6311 Wilshire Blvd., Los Angeles, CA 90048 (213) 655-0303
 Barath Acoustics, 7800 E. Iliff Suite F, Denver, CO 80231 (303) 750-6474
 Boulder Sound Gallery, 1200 Pearl, Boulder, CO 80302 (303) 444-2626
 Listen-Up Audio Systems, 685 S. Pearl St., Denver, CO 80209 (303) 778-0780
 United Tapes Of America, 362 27 1/2 Rd., Grand Junction, CO 81501 (303) 242-0405
 Audiotechniques, 652 Glenbrook Rd., Stamford, CT 06906 (203) 359-2312
 La Salle Music Shop, 22 La Salle Rd., West Hartford, CT 06107 (203) 233-7980
 Audio Visual Services, 5484 Jetport Industrial Blvd., Tampa, FL 33614 (813) 884-1461
 Continental Electronics, 1620 W. 32nd Place, Hialeah, FL 33012 (305) 822-1421
 DMC Sound Controls, 456 N. Orange Ave., Orlando, FL 32801 (305) 843-2025
 Harris Audio Systems, 1962 N.E. 1-9th St., North Miami, FL 33181 (305) 944-4448
 Midwest Telecom, 3331 NW 82nd Ave., Miami, FL 33122 (305) 592-5355
 Pro Audio General Store, 1378 N.W. 100 Ave., Coral Springs, FL 33065 (305) 752-0330
 Southeast Electronics, 1125 Roselle St., Jacksonville, FL 32216 (904) 356-3007
 Thoroughbred Music, 12311 Nebraska Ave., Tampa, FL 33612 (813) 971-5822

Roscom, 385 Monivea Lane, Roswell, GA 30075 (404) 992-2700
 Broadcast Services, Pacific Trade Center, Suite 2495, Honolulu, HI 96813 (808) 521-6311
 Bridgewater Custom Sound, 15957 S. Halstead, Harvey, IL 60426 (312) 596-0309
 Gill Custom House, 8813 W. 95th St., Palos Hills, IL 60465 (312) 598-2400
 Milam Audio, 1504 N. 8th St., Pekin, IL 61544 (309) 346-3161
 Microprobe Electronics, 875 S. Michigan Ave., Suite 1532A, Chicago, IL 60611 (312) 440-3111
 Pyramid Audio, 16240 Prince Dr., South Holland, IL 60473 (312) 339-8014
 Roscor Corporation, 6160 W. Oakton, Morton Grove, IL 60053 (312) 539-7700
 Allied Broadcast, 635 S. E. St., Richmond, IN 47374 (317) 962-8596
 Pro Studio Distributors, 1059 Porter, Wichita, KS 67203 (316) 267-1573
 Audiomedia Associates, 4657 Michoud Blvd. #5, New Orleans, LA 70189 (504) 242-8014
 Broadcast Controls, 9155 Brookville Rd., Silver Springs, MD 20910 (301) 587-3505
 CMG Sound, 11011 Schuylkill Dr., Rockville, MD 20852 (301) 984-9150
 Midwest Corporation, 4700 G. Boston Way, Lanham, MD 20801 (301) 355-4903
 Recording Consultants (RCI), 8550 Second Ave., Silver Springs, MD 29010 (301) 587-1800
 Venemans Music Co., 15555L Fredrick Rd., Rockville, MD 20854 (301) 424-2346
 Lake Systems, 55 Chapel St., Newton, MA 02160 (617) 244-6881
 PRRS, Inc., 1616 Soldier Field Rd., Boston, MA 02135 (617) 254-2110
 Al Nalli Music, 312 S. Ashley, Ann Arbor, MI 48108 (313) 665-7008
 Arnold Williams Music, 5701 Canton Center Rd., Canton, MI 48187 (313) 453-6586
 Audio Distributors, 2342 S. Division Ave., Grand Rapids, MI 49507 (616) 452-1596
 Hy James Enterprises, 2839 Boardwalk, Ann Arbor, MI 48104 (313) 994-0934
 AVC Systems, 1517 E. Lake St., Minneapolis, MN 55407 (612) 729-8305
 Guarantee Radio Supply, 1314 Iturbide St., Laredo, TX 78040 (512) 723-6913, 722-3233
 Hardin Electronics, 5635 E. Rosedale, Fort Worth, TX 76112 (817) 429-9761
 Midwest Telecom, 15046 Beltway Dr., Dallas, TX 75240 (214) 387-2755
 Pran, Inc., 1001 Broadway, New Braunfels, TX 78130 (512) 625-2376
 L-D Systems, 467 W. 33th St., Houston, TX 77018 (713) 695-9400
 Linrose Electronics, 12132 Colwick, San Antonio, TX 78216 (512) 342-8847
 Video Systems, 2123 W. Governors Circle, Houston, TX 77092 (713) 686-9651
 Westbrook Audio, 1836 Judd Court, Suite 336, Dallas, TX 75243 (214) 699-1203
 Performance Audio, 2358 S. Main St., Salt Lake City, UT 84115 (801) 355-8890
 Alpha Recording Corp., 2049 W. Broad St., Richmond, VA 23220 (804) 358-3852
 David Green Broadcast Consult., 131 E. Market St., Leesburg, VA 22075 (703) 777-8660
 Midwest Telecom, 1395 Air Rail Ave., Virginia Beach, VA 23455 (804) 464-6256
 Bob Dix, Inc., Highway 16 S., Marion, VA 24354 (703) 783-2001
 Robert Slye Electronics, 3415 N. Washington Blvd., Arlington, VA 22201 (703) 525-7272
 Broadcast Supply West, 7012 27th St. S.W., Tacoma, WA 98466 (206) 565-2301
 Capitol Communications, 310 S. Bay Bldg, J. Olympia, WA 98506 (206) 943-5378

P

Pace Int'l. Corp., 3727 S. Robertson Blvd., Culver City, CA 90230
 Pacific Recorders & Eng. Corp., 11100 Roselle St., San Diego, CA 92121
 Packaged Lighting Systems, Box 285 - Grant St., Walden, N.Y. 12586
 Paladin Corp., 31332 Via Colinas #106, Westlake Village, CA 91361
 Panasonic Company, One Panasonic Way, Secaucus, N.J. 07094

Panasonic Co., Professional Audio Div., One Panasonic Way, Secaucus, NJ 07094
 Panasonic Co., Video Systems Div., One Panasonic Way, Secaucus, N.J. 07094

I. Izuka, Gen. Mgr. (201) 348-7685

REGIONAL SALES CONTACTS:

Panasonic Co., Video Systems Div., North-east Area, 50 Meadowlands Pkwy., Secaucus, N.J. 07094 (201) 348-7620 Michael Dollacker, Regional Sls. Mgr.
 Panasonic Co., Video Systems Div., South-east Area, #3 Meca Way, Norcross, GA 30093 (404) 923-9700 Leroy Wright, Regional Sls. Mgr.
 Panasonic Co., Video Systems Div., Mid-west Area, 425 E. Algonquin Rd., Arlington Hgts., IL 60005 (312) 364-7936 Richard Grams, Regional Mgr.
 Panasonic Co., Video Systems Div., South-east Area, 1825 Walnut Hill Lane, Irving, TX 75062 (214) 258-6400 Terry Conner, Regional Sls. Mgr.
 Panasonic West, Inc., 8383 Wilshire Blvd., Beverly Hills, CA 90211 (213) 655-1111 Bob Karadzian, Regional Sls. Mgr.

Panoak Lighting Systems, 6809 East 40th St., Tulsa, OK 74145

Parker Voltage Suppressor Corp., 356 Bacon St., Box 460, Lake City, MI 49651

Parsons Mfg. Corp., 1055 O'Brien Dr., Menlo Park, CA 94025

Patrick Computer Systems, Inc., 11 Plymouth St., Winnipeg, Man., Canada R2X 2V5

Pentagon Industries, Inc., 4751 N. Olcott Ave., Chicago, Ill. 60656

Permafilm Int'l. Corp., 305 East 46th St., New York, NY 10017

Perma Power Electronics, Inc., 5615 Howard Ave., Chicago, IL 60648

Perrott Eng. Labs, Inc., 1020 N. Fillmore, Arlington, VA 22201
 William D. Mallon (703) 528-5861

Peters Productions, Inc., 9590 Chesapeake Dr., San Diego, CA 92123

Petersen Mfg. Co., Inc., Box 337, deWitt, NE 68341

Phasecom Corp., 6365 Arizona Circle, Los Angeles, CA 90045

Phelps Dodge Communications Co., Rt. 79, Marlboro, N.J. 07746

Philadelphia Resins Corp., 20 Commerce Dr., Montgomeryville, PA 18936

Philips Broadcast Group, Central Dynamics Corp., Box 618, Mahwah, N. J. 07430

Philips Test & Measuring Instruments, Inc., 85 McKee Dr., Mahwah, N. J. 07430

Phoenix Co., Rt. 2, Colchester, IL 62326

Photo Research, Div. of Kollmorgen Corp., 3000 N. Hollywood Way, Burbank, CA 91505

Piclear, Inc., 180 E. Prospect Ave., Mamaroneck, NY 10543

Pinzone Communications Products Inc., 10142 Fairmount Rd., Newbury, Ohio 44065
 B. Pinzone Jr., President (304) 296-4493

Pioneer Marketing Corp., 7702-4 Balboa Blvd., Van Nuys, CA 91406

Plastic Reel Corp. of America, 475 Boulevard, Elmwood Park, NJ 07407

Polarad Electronics, Inc., 5 Delaware Dr., Lake Success, NY 11042
PoleStar Products, Box 18, Belmont, MA 02178
Polyline Corp., 1233 Rand Rd., Des Plaines, IL 60016

Ray Kaiser, President (312) 298-5300

Porta-Pattern Telecommunications Industries Ltd., 6822 Santa Monica Blvd., Los Angeles, CA 90038

Portable Energy Products, Inc., 1875 S. Pearl St., Denver, CO 80210

Portac Inc., 108 Aero Camino, Goleta, CA 93117

Potomac Instruments, Inc., 932 Philadelphia Ave., Silver Spring, MD 20910

David G. Harry, V.P. (301) 589-2662

Power-Optics, Inc., Box 266, Fairview Village, PA 19409

Procart, 7012 27th St. West, Tacoma, WA 98466

Prodelin Inc., Box 131, Hightstown, N.J. 08520

ProTech Audio Corp., Flowerfield, Bldg. #1, St. James, NY 11780

Pulse Techniques Inc., 1411 Palisade Ave., Teaneck, N.J. 07666

Pyramid Loudspeaker Corp., 131-15 Fowler Ave., Flushing, NY 11355

Q

QEI Corp., Rt. 73, Kresson, N. J. 08053

QRK Broadcast Electronics, Box 3606, Quincy, IL 62305

QSC Audio Products Inc., 1926 Placentia Ave., Costa Mesa, CA 92627

QSI Systems Inc., 12 Linscott Rd., Woburn, MA 01888

Q-TV, 33 West 60th St., New York, N.Y. 10023

Quad-Eight Electronics, 11929 Vose St., No. Hollywood, CA 91605

Ned Padwa (213) 764-1516

Quam-Nichols Co., 234 E. Marquette Rd., Chicago, IL 60637

Quantum Audio Labs, Inc., 1905 Riverside Dr., Glendale, CA 91201

Andrew C. Thompson (213) 841-0970

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B.C.D., 2990 E. LaJolla St., Anaheim, CA 92806 (714) 630-8150 Doug Dessero G.E.S.I., 1440 San Pablo Ave., Berkeley, CA 94702 (415) 527-7700 Dick Lindheim

Trankle & Associates, 3782 E. Austin Way, Fresno, CA 93726 (209) 288-0652 Bob Martin

Trankle & Associates, 820 Black Mtn. Rd., Hillsborough, CA 94010 (415) 344-1133 Brian Trankle

Coast Recording, 6114 Santa Monica Blvd., Hollywood, CA 90038 (213) 462-6058 Jerry Cabbage

Accurate Sound Corp., 3515 Edison Way, Menlo Park, CA 94025 (415) 365-2843 Don O'Bella

Sunwest Marketing, 18411 Chatsworth St., Northridge, CA 91326 (213) 368-1938 Shelly Brown

Centro Corp., 9516 Chesapeake Dr., San Diego, CA 92123 (714) 560-1578 Darrell Wenhardt

Video Equipment corp., 7377 Corvay Ct., San Diego, CA 92111 (714) 278-4400 Mike Bennett

New World Recording, 8521 Neva Ave., San Diego, CA 92123 (714) 569-1944 Jim Scott

Sunwest Marketing, 94694A Carlton Oaks Dr., Santee, CA 92071 (714) 562-0607 Eunice Adams

Marcom, 59 Mt. Herman Rd., Scotts Valley, CA 95066 (408) 438-4273 Marty Jackson

Pro Audio General Store, 1378 Northwest 100th Ave., Coral Springs, FL 33065 (305) 752-0330 Bill Shute

Control Technology, 991 Southwest 27th Ave., Fort Lauderdale, FL 33312 (305) 587-2716 Jim Woodworth

Sutido Design Labs, 1940 Poinsetta Lane, Maitland, FL 32751 (305) 331-5435 Alan Smith

Onyx Systems, Inc., 2615 N. Orange Ave., Orlando, FL 32804 (305) 894-7034 Phil Hale

Sound & Signal Systems, 1811 Deleon St., Tampa, FL 33606 (813) 253-0923 Mr. Puglio

Technical Systems Reps, Inc., 2065 Peachtree Ind. Ct., Suite 215, Chamblee, GA 30341 (404) 457-0426 Norm Schneider

Schwendman's, Inc., 910 Lincoln Rd., Idaho Falls, ID 83401 (208) 433-6611 Ron Alrich

AVC Systems, Inc., 7116 W. Higgins, Chicago, IL 60656 (312) 763-6010 Jon Borman

Bridgewater Sound, 15957 S. Halsted, Harvey, IL 60426 (312) 596-0323 Mr. Brown

Milam Audio Corp., 1504 North 8th, Peekin, IL 61554 (309) 346-3161 Jerry Milam

Allied Broadcast Equipment, 635 South 'E' St., Richmond, IN 47374 (317) 962-8596 David Burns

Audiomedia Associates, 4657 Michoud Blvd., Suite 5, New Orleans, LA 70189 (504) 242-8014 Corey Meyer

Collmus Sound Inc., 627 N. Bend Rd., Baltimore, MD 21229 (301) 747-6339 Bob Collmus

Associated Sales Reps., Inc., 403 Fieldstone Ct., Fallston, MD 21047 (301) 877-7300 Phil Walter

Cramer Electronics, 120 Hampton Ave., Needham, MA 02194 (617) 449-2100 Bill Lewis

HY James Enterprises, 2839 Boardwalk, Ann Arbor, MI 48104 (313) 994-0934 Henry Root

AVC Systems, Inc., 1517 E. Lake Street, Minneapolis, MN 55407 (612) 729-8305 Jon Borman

Optimedia Systems, Inc., 1080 Rt. 46th W., Clifton, NJ 07013 (201) 777-7600 George Hoffman

Tele-Measurements, Inc., 145 Main Ave., Clifton, NJ 07014 (201) 473-8822 Alan Bjornsen

Professional Audio Video, 384 Grand Street, Paterson, NJ 07655 (201) 523-3333 Paul DiSivine

Dyma Engineering, 213 Pueblo Del Sur, Taos, NM 87571 (505) 758-2686 Michael Ziomko

Eastern Audio Reps, 41 Keefer Ave., Merrick, NY 11566 (516) 546-5374 Bill Watkins

Harvey Pro Audio Video, 25 West 45th Street, New York, NY 10036 (212) 921-5920 Gene Perry

Studio Works, 1018 Central Ave., Charlotte, NC 28204 (704) 375-1053 Cal Walker

Kavco, Inc., 3931 Image Drive, Dayton, OH 45414 (513) 898-2003 Russ Johnson

Audio Associates, Inc., 2419 Classen, Oklahoma City, OK 73106 (405) 524-3232 Greg Robertson

Electro Media, 2555 South 1935 West, Salt Lake City, UT 84119 (801) 973-4206 Kjell Anderson

Alpha Audio, 2049 W Broad Street, Richmond, VA 23220 (804) 358-3852 Nick Collieran

Gemini Electronics Mktg. Co., 1110 N. 17th, Seattle, WA 98133 (206) 542-1116 Dean Nordquist

Broadcast Supply West, 7012 27th St. W., Tacoma, WA 98466 (206) 565-2301 Irving Law

Quick-Set Inc., 3650 Woodhead Drive, Northbrook, Ill. 60062

Quintek Inc., 4721 Laurel Canyon Blvd., No. Hollywood, CA 91607

R

R-Columbia Products Co., Inc., 2008 St. Johns Ave., Highland Park, IL 60035

RCA American Communications, 400 College Rd. E., Princeton, NJ 08540

RCA Broadcast Systems, Front & Cooper Sts. Bldg. 2-2, Camden, N.J. 08102

RCA Distributor & Special Products Div., 2000 Clements Bridge Rd., Deptford, N.J. 08096

RCA Electro Optics and Devices, New Holland Ave., Lancaster, PA 17604

Re: DB Co., A Div. of Pierce Industries Inc., 3120 E. Pico, Los Angeles, CA 90023

M.P. 'Mickey' Epstein, Mktg. Mgr. (213) 264-7855

R.F. Technology, Inc., 145 Woodward Ave., So. Norwalk, CT 06845

RHG Electronics Laboratory, Inc., 161 E. Industry Court, Deer Park, NY 11729

RKO Tape Corp., 3 Fairfield Crescent, W. Caldwell, NJ 07006

ROH Corp., 3603 Clearview Pl., N.E., Atlanta, GA 30340

Jerry Levy (404) 455-7940

RTS Systems, Inc., 1100 W. Chestnut St., Burbank, CA 91506

Jules Racine & Co., Inc., 85 Executive Blvd., Elmsford, NY 10523

Rack Techniques Corp., Box 473, Batavia, IL 60510

Radio Programming/Management, 25140 Lahser #232, Southfield, MI 48075

Radio Systems Inc., 5131 W. Chester Pike, Edgemont, PA 19028

Radiotechniques, 402 Tenth Ave., Haddon Hgts., NJ 08035

Radmar, Inc., 1282 Old Skokie Rd., Highland Park, IL 60035

Ramko Research Inc., 11355 'A' Folsom Blvd., Rancho Cordova, CA 95670

Jack M. Ducart (916) 635-3600

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Comex Corp., Dulles Int'l Airport, P.O. Box 17011, Washington, DC 20041 (703) 471-421E Jack Rickel

Electrex Co., 18680 N.E. 2nd Ave., Miami, FL 33179 (305) 945-6483 Ben Ostrovsky

Repelect, 8406 North Blvd., Tampa, FL 33604 (813) 227-5051 John Govreau

Pacific Coast Mktg., 20 S. Santa Cruz Ave., Suite 309, Los Gatos, CA 95303 (408) 395-7021 Larry Maguire

Hall Electronics, 2302 Kootenai, Boise, ID 83705 (208) 336-5894 Larry Hall

Guarantee Radio Supply, 1314 Iturbide St., Laredo, TX 78040 (512) 723-6913 Richard Reyes

Caldwell A-V Equipment Co., Ltd., 1080 Bellamy Rd. N., Scarborough, Ont., Canada M1H 1H2 (416) 438-6230 Jim Smith

Wiltronix, Inc., 16850 Oakmont Ave., Washington Grove, MD 20880 (301) 258-7676 Dwight Wilcox

Doug Cook & Associates, 6300 Carmel Rd., Charlotte, NC 28211 (704) 542-6510 Doug Cook

Enterprises, Inc., 3006 North 124th St., Milwaukee, WI 53222 (414) 257-4668 John Road

Jim Walters Co., 5017 Kalaniana'ole Hwy., Honolulu, HI 96821 (808) 373-2701 Jim Walters

PARCOM, 2460 Raintree, Southlake, TX 76092 (817) 481-7221 Darryl Parker

Chamberlain & Murray Inc., 336 Baker Ave., Concord, MA 01742 (800) 343-5519 James Murray

Don Bennett & Associates, 2645 Naranja, Mesa, AZ 85202 (602) 897-2151 Don Bennett

Shea Sales, 552 Prospect St., Maplewood, NJ 07040 (201) 762-2382 Tom Shea

J. N. S. Electronic Industries, P.O. Box 85, Rosanna Victoria 3084 Australia 439-1430 John Stannard

Lee Engineering Ltd., Napier House, Bridge St., Walton-On-Thames Surrey, England KT12 1AP 2998 T. A. Lee

Roscom, Inc., P.O. Box 1208, Roswell, GA 30077 (404) 992-2700 Bob Stewart

Southern Coastal Marketing Svc., Inc., 6300 Carmel Rd., Charlotte, NC 28211 (704) 542-6543 Bob Cauthen

Rangertone Research Inc., 509 Madison Ave., New York, NY 10022

Rank Hi Fi, Inc., 260 North Rt. 303, West Nyack, NY 10994

Raven Screen Corp., 124 East 124th St., New York, N.Y. 10035

Rectortec, Inc., 475 Ellis St., Mountain View, CA 94043

Rees Associates, Inc., 722 N. Broadway, Suite 500, Oklahoma City, OK, 73102

Regency Electronics, Inc., 7707 Records St., Indianapolis, IN 46226

Reliance Plastics & Packaging Div., 225 Belleville Ave., Bloomfield, NJ 07003

Re-Play Video Cartridge Service, 328 Merritt Ave., Pittsburgh, PA 15227

Research Technology Int'l., 4700 Chase, Lincolnwood, IL 60046

Rex Rheostat & Co., Inc., 149 Babylon Turnpike, Roosevelt, N. Y. 11575

Reynolds/Leteron Co., 6704 Valjean Ave., Van Nuys, CA 91406

Richmond Sound Design, Ltd., 1234 West 6th Ave., Vancouver, B.C., Canada V6H 1A5

Robins Industries Corp., 75 Austin Blvd., Commack, NY 11725

Rockwell Int'l., Commercial Elec. Operations, 1200 N. Alma Rd., Richardson, TX 75081

Rohde & Schwarz Sales Co., 14 Gloria Lane, Fairfield, N.J. 07006

Roll-A-Reel Co. Inc., 7881 Reading Rd., Cincinnati, Ohio 45237

Ross Video Ltd., 9 Iroquois Plaza, Iroquois, Ont., Canada K0E 1K0

Ruslang Corp., 247 Ash St., Bridgeport, CT 06605

Russco Electronics Mfg. Inc., 5690 E. Shields, Fresno, CA 93727

Rycom Instruments, 9351 E. 59th St., Raytown, MO 64133

S

SGL Waber Electric, 300 Harvard Ave., Westville, N. J. 08093

SSAC Inc., Box 395, Liverpool, N.Y. 13088

David Lawrie (315) 622-1000

REGIONAL SALES CONTACTS:

Antenna & Tower Specialist, 4310 S. Barns, Oklahoma City, OK 73119 (405) 685-2314 Mark Wagstoff
Broadcast Equip. & Supply, P.O. Box 3141, Bristol, TN 37620 (615) 878-2531 Cliff Droke
Communications Facilities, P.O. Box 98, Lexington Park, MN 20653 (301) 862-1777 Samuel Leach
Lauderdale Electric Labs, 16 S.W. 13th St., Ft. Lauderdale, FL 33315 (305) 764-7755 Irene Linne
U.S. Tower Service, 677 S. Lawn Lane, Rockville, MD 20850 Norm Jeweler

SWR Inc., Box 215, Goffstown, N.H. 03045

Sachtler GmbH, Dieselstrasse 16, D-8046 Garching, West Germany

Saki Magnetics, Inc., 8650 Hayden Place, Culver City, CA 90230

Howard W. Sams & Co., Inc., 4300 West 62nd St., Indianapolis, Ind. 46268

Scala Electronic Corp., Box 4580, Medford, OR 97501

Scantex Labs Inc., 1 Westmount Sqr., Suite 1200, Montreal, Que., Canada H3Z 2Z7

Val Muscalu, President (514) 626-8943

The Ken Schaffer Group, Inc., 10 East 49th St., New York, N.Y. 10017

Schneider Corp. of America, 185 Willis Ave., Mineola, N. Y. 11501

Ios. Schneider Optische Werke, Aktiengesellschaft, Ringstrasse 132, D-6550 Bad Kreuznach, West Germany

Schudel, Inc., 6973 Consolidated Way, San Diego, CA 92121

Schuessler Case Co., Inc., Box 39066, Chicago, IL 60639

Scientific-Atlanta, Inc., Box 105600, Atlanta, GA 30348

Scientific Radio Systems, Inc., 367 Orchard St., Rochester, N.Y. 14606

Scientific Systems, Inc., 92 Westwood Dr., Toms River, NJ 08753

The Screen Works, Ltd., Wilcox-Lange Inc., 3925 N. Pulaski Rd., Chicago, IL 60641

Scully Recording Instruments, 2693 Philmont Ave., Huntingdon Valley, PA 19006

See Hear Industries, Div. of RJA Inc., 717 E. Artesia Blvd., Carson, CA 90746

Selco Products Co., 7580 Stage Rd., Buena Park, CA 90621

Sencore, Inc., 3200 Sencore Drive, Sioux Falls, S. D. 57107

Sennheiser Electronic Corp., 10 West 37th St., New York, N. Y. 10018

Sescom, Inc., 1111 Las Vegas Blvd. N., Las Vegas, NV 89101

Franklin J. Miller, President (702) 384-0993

Setcom Corp., 1400 Stierlin Rd., Mountain View, CA 94043

Sfena Corp., 2617 Aviation Parkway, Grand Prairie, TX 75051

Shallo, Inc., Box 1089, Smithfield, N.C. 27577

Mike Sutton (919) 934-3135

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Bell Industries, 306 E. Alondra Blvd., Gardena, CA 90248 (213) 321-5802 Lester Fenberg
Westec Distributing Co., 14125 Inglewood Ave., Hawthorne, CA 90250 (213) 772-4479 W. C. Vanbeber

Westec/Collins, Pier 32, San Francisco, CA 94105 (415) 957-1357 Tom Collins
Southeast Electronics, 1125 Roselle St., Jacksonville, FL 32203 (904) 356-3007 H. Clark Overton
Graham Electronics, 133 Pennsylvania St., Indianapolis, IN 46204 (317) 634-8486
Audio Distributors, Inc., 2342 Division Ave. So., Grand Rapids, MI 49507 (616) 452-1596

Peerless Radio Corp., 19 Wilbur St., Lynbrook, NY 11563 (516) 593-2121
United Radio, Inc., Summit Rd. & Reinhold Dr., Cincinnati, OH 45237 (513) 761-4030 Ed Moore

Philadelphia Electronics, 112 North 12th St., Philadelphia, PA 19107 (215) 568-7400 David C. Shaw
Broadcast Equipment & Supply Co., P.O. Box 3141, Bristol, TN 37620 (615) 878-2531 Clifton Droke

Wholesale Electronics, 2809 Ross Ave., Dallas, TX 75201 (214) 824-3001 Debbie McClure

Electronics Industries Inc., 19 E. Irving Ave., Oshkosh, WI 54901 (414) 235-8930

L.A. Varah Ltd., 2077 Alberta St., Vancouver, BC, Canada V5Y 1C4 (604) 404-3211 John Dickinson
Braydon Electro Ltd., 2925 De Miniac St., Laurent, Montreal, Que., Canada H4S 1L8 (514) 332-5650 Don MacKenzie

Sharepoint Systems Inc., 402 Tenth Ave., Haddon Heights, NJ 08035

Sharp Electronics Corp., Professional Products, 10 Keystone Place, Paramus, N.J. 07652

Shintron Co. Inc., 144 Rogers St., Cambridge, MA 02142

Shively Laboratories, Inc., Div. of Howell Labs, Inc., 36 Harrison Rd., Bridgton, ME 04009

Shure Brothers Inc., 222 Hartrey Ave., Evanston, Ill. 60204

Siegel Electronics, Box 33421, San Diego, CA 92103

Sigma Electronics, Inc., 1830 State St., East Petersburg, PA 17520

Singer Broadcast Products, Inc., Box 5500, Cherry Hill, NJ 08034

Sintron Corp., See Singer Broadcast Products, Lionville, PA 19353

Skirpan Lighting Systems, Inc., 1100 W. Chestnut St., Burbank, CA 91506

Skotel Corp., 1445 Provencher, Brosard, Que. Canada J4W 1Z3

Stephen Scott (514) 676-1813

Smith-Victor Corp., 301 N. Colfax St., Griffith, IN 46319

Warren R. Smith Co., 110 E. Point Pleasant Ave., Ocean Gate, NJ 08740

Solid Electronics Labs, 49 Fairfield Rd., Havertown, PA 19083

Soll, Inc., 401 East 74th St., New York, NY 10021

Sonar Radio Corp., 3000 Stirling Rd., Hollywood, FL 33021

Sono-Mag Corp., 1833 W. Hovey Ave., Normal, IL 61761

Sontec Electronics, Audio Dr., Goldbond, VA 24094

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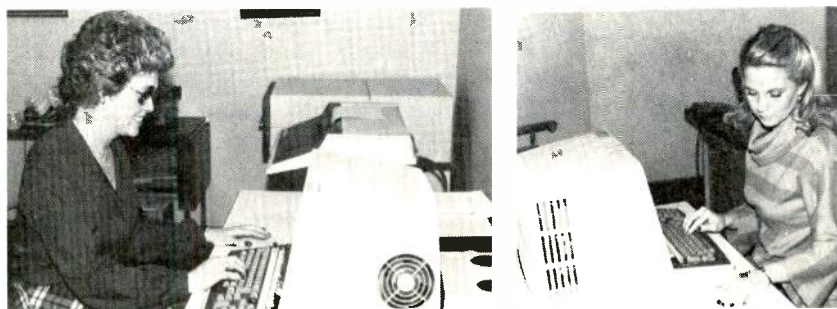
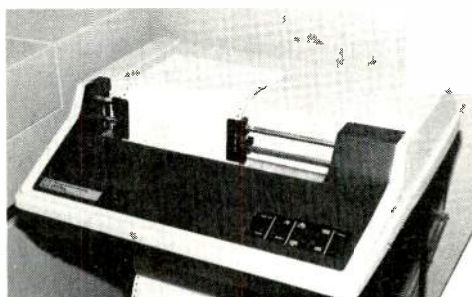
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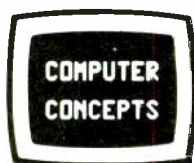


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Broadcast product dealer/distributors

For your added convenience, **Broadcast Engineering** has designed this Broadcast Product Dealer/Distributors section to provide close-to-home purchasing assistance. Use it, in conjunction with other sections in the 1981 Buyers' Guide, to plan new facilities, and equipment expansion or upgrading. For broadcast product dealer/distributors, this directory identifies: address and telephone, products handled and territory served.

Listings are arranged alphabetically by state. Firms listed do not include all dealer/distributors serving an area, but only those who returned **BE's** listing form.

Both a typical dealer/distributor listing, and the geographical area and product classification code keys are included on this page to assist you. We think you will find this section, in addition to the updated Product Directory and Broadcast Product Manufacturers' Addresses section, makes this issue the most useful and comprehensive purchasing aid for the broadcast industry.

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) geographical area served and products handled (see code keys)

This firm covers Iowa, Kansas, Missouri and Oklahoma, and sells audio equipment, video equipment, tape, film equipment, and service and repair.

Key to geographical area code

AK Alaska	KS Kansas	NV Nevada	WI Wisconsin
AL Alabama	KY Kentucky	NY New York	WV West Virginia
AR Arkansas	LA Louisiana	OH Ohio	WY Wyoming
AZ Arizona	MA Massachusetts	OK Oklahoma	
CA California	MD Maryland	OR Oregon	(Abbreviations for Canadian provinces)
CO Colorado	ME Maine	PA Pennsylvania	ALTA Alberta
CT Connecticut	MI Michigan	PR Puerto Rico	BC British Columbia
DC District of Columbia	MN Minnesota	RI Rhode Island	MAN Manitoba
DE Delaware	MO Missouri	SC South Carolina	NB New Brunswick
FL Florida	MS Mississippi	SD South Dakota	NF Newfoundland
GA Georgia	MT Montana	TN Tennessee	NS Nova Scotia
GU Guam	NC North Carolina	TX Texas	ONT Ontario
HI Hawaii	ND North Dakota	UT Utah	PEI Prince Edward Island
IA Iowa	NE Nebraska	VA Virginia	QUE Quebec
ID Idaho	NH New Hampshire	VI Virgin Islands	SASK Saskatchewan
IL Illinois	NJ New Jersey	VT Vermont	YUK Yukon Territory
IN Indiana	NM New Mexico	WA Washington	

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.)

ALABAMA

- Gray Communications**, 209 Oxmoor Circle, Suite 708, Birmingham, AL 35209 (205-942-2824) AL, MS 2, 5, 8, 9, 10
- Leeco Mid-South, Inc./Lee Associates Mid-South, Inc.**, 817 Wheeler Ave., Huntsville, AL 35801 (205-533-5896) AL, FL, GA, LA, MS, TN 3
- Gray Communications**, 4367 Downtowner Loop N, Mobile, AL 36609 (205-343-0662) AL, West-FL, MS 2, 5, 8, 9, 10

ALASKA

- Alaska Electronics Supply, Inc.**, 5401 Fairbanks St., Suite 1&2, Anchorage, AK 99502 (907-272-9416) AK 1, 3, 5, 6
- Harry J. Lang & Associates**, 1371 Hillcrest Dr. #303, Anchorage, AK 99503 (907-279-5741) AK 1, 3, 4, 5
- NVS Systems, Inc.**, 4609 Business Park Blvd., Anchorage, AK 99503 (907-279-5571) AK 1, 2, 3, 4, 5, 7, 9, 10

ARIZONA

- Fisher-Burke Professional Audio**, Box 2468, Phoenix, AZ 85003 (602-257-0225) U.S.A. 1, 3, 5, 10
- Spencer Broadcast, Inc.**, 316 E. El Camino Dr., Phoenix, AZ 85020 (602-242-2211) AZ, CA, NV, NM, UT 1, 4, 5, 9, 10
- Telesource Communication Services, Inc.**, 730 E. Highland Ave., Box 7132, Phoenix, AZ 85011 (602/265-1232) U.S.A. 2
See advertisement on this page
- Jensen Tools Inc.**, 1230 S. Priest Dr., Tempe, AZ 85281 (602-968-6241) U.S.A. 9
See advertisement on page 110
- ROH'S Inc.**, 4553 E. Broadway, Tucson, AZ 85711 (602-795-8573) AZ, NM 1, 2, 5, 9, 10

ARKANSAS

- Custom Products**, 107 E. Calhoun, Magnolia, AR 71753 (501-234-7399) AR, LA, MS, OK, TN, TX 1, 3

CALIFORNIA

- Broadcast Communications Devices, Inc.**, 2990 E. LaJolla St., Anaheim, CA 92806 (714-630-8150); (213-628-9590) AZ, CA, NV, NM, OR, WA 1, 2, 3, 4, 5, 10
- Martel Electronics, Inc.**, 970 E. Orangethorpe #A, Anaheim, CA 92801 (714-871-7102) U.S.A. 1, 9
- Optek**, 1390 N. McCan, Anaheim, CA 92806 (714-630-8280) AK, AZ, CA, CO, HI, NV, OR, WA 2, 4
- Kenneth R. Meades**, Box 3831, Beverly Hills, CA 90212 (213-464-8164) CA 9, 10, 11

- Christy's Editorial Film Supply Inc.**, 135 N. Victory Blvd., Burbank, CA 91502 7, 9, 11 Worldwide 7, 9, 11
- Tri Tronics Inc.**, 2921 W. Alameda Ave., Burbank, CA 91505 (213-843-2170 or 800-232-2141) AZ, CA, NV, NM 1, 2, 3, 5, 6, 8, 11

- Meyer, Ross & Fleming, Inc.**, 1485 Rollins Rd., Burlingame, CA 94010 (415-348-6800) CA, HI, NV CA, HI, NV 1, 2, 3, 5

- Richard W. Burden Associates**, 20944 Sherman Way, Canoga Park, CA 91303 (213-340-4590) AZ, CA, ID, NV, OR, UT, WA 1, 3, 4, 9, 10

- Marshall Electronics, Mogami Products Div.**, Box 2027, Culver City, CA 90230 (213/836-4288) U.S.A.
See advertisement on this page

- System Associates**, 5801 Uplander Way, Culver City, CA 90230 (213-641-2042) #5 & 11-North America; #2-AZ, CA, NY 2, 5, 11

- Western Broadcast Systems**, 10707 Amulet Place, Cupertino, CA 95014 (408-749-0900) CA, NV, OR, WA 1, 2, 3, 4, 5

- SAECO International**, 1122 E. Chevy Chase Dr., Glendale, CA 91205 (213-245-7708) Worldwide 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

- ACI**, 7138 Santa Monica Blvd., Hollywood, CA 90046 (213-851-7172) AZ, CA, CO, GU, HI, ID, MO, NV, NM, OR, WY, Canada-BC 1, 2, 3, 5, 10, 11

- Birns & Sawyer, Inc.**, 1026 N. Highland Ave., Hollywood, CA 90038 (213-466-8211) U.S.A., Canada, Int'l. 1, 7, 11

- Broadcast Video Systems, Inc.**, 1438 N. Gower St., Hollywood, CA 90028 (213-460-2949) AK, AZ, CA, HI, NV, OR, WA 2, 3

- Olesen**, 1535 Ivar Ave., Hollywood, CA 90028 (213-461-4631) Worldwide 2, 10

- Shoreline, Ltd.**, 3611 Cahuenga Boulevard West, Hollywood, California 90068 (213/851-1236) CA 1, 2, 3, 4, 6

- Studio Film & Tape Inc.**, 6670 Santa Monica Blvd., Hollywood, CA 90038 (213-466-8101) U.S.A. and Canada 3, 5

- Videotape Products, Inc.**, 7165 Sunset Blvd., Hollywood, CA 90046 (213-874-7711) Worldwide 5
See advertisement on page 78

- Broadcast Cartridge Service**, 15131 Triton Lane, Suite 108, Huntington Beach, CA 92649 (714-898-7224) U.S.A. 5, 9

- JSH Electronics, Inc., A member Co. of VSI Electronics**, 15682 Producer Lane, Huntington Beach, CA 92649 (714-899-2298) U.S.A. 6
See advertisement on page 232

- A-Vidd Electronics Co.**, 2210 Bellflower Blvd., Long Beach, CA 90815 (213-598-0444 or 714-821-0870) Southern CA 2, 5

- Kallman Associates, Inc.**, 2525 Hyperion Ave., Los Angeles, CA 90027 (213-660-4900) AZ, CA, NV 2, 10

- ECD Industries, Inc.**, 2034 Armacost Ave., Los Angeles, CA 90025 (213/820-3009) U.S.A. and Canada 6
See advertisement on page 102

- Westlake Audio**, 7265 Santa Monica Blvd., Los Angeles, CA 90046 (213-655-0303) Worldwide 1, 3, 5, 10

- Pacific Coast Marketing**, 20 S. Santa Cruz Ave., Suite 309, Los Gatos, CA 95030 (408-395-7021) CA, NV 1, 3, 4

- Audio Services Corp.**, 4210 Lanker-shim Blvd., No. Hollywood, CA 91602 (213-980-9891) AK, AZ, CA, CO, HI, MN, MT, MO, NE, NV, NM, ND, OK, OR, SD, TX, UT, WA, WY 1, 5, 9, 11

- Communications Company, Inc.**, 3940 Noell St., San Diego, CA 92110 (714-297-3261) CA 1, 3

- Network Recording Products**, 4429 Morena Blvd., San Diego, CA 92117 (714-272-2011) U.S.A. 1, 5

- 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

- Broadcast Marketing Associates, (Formerly United Media)**, 2211 C Fortune Dr., San Jose, CA 95131 (408/946-2236) AK, CA, HI, ID, NV, OR, WA 1, 2, 3, 5, 7, 8, 10

- Sound Dynamics, Inc.**, Box 32055, San Jose, CA 95152 (408-926-3588) (SF 415-668-3588) (OR-503-226-3588) CA, OR, WA 1, 9
See advertisement on page 72

- Broadcast Communications Devices, Inc.**, 3350 Scott Blvd., Bldg. #48, Santa Clara, CA 95051 (408-496-6525) AZ, CA, NV, NM, OR, WA 1, 2, 3, 4, 5, 9, 10

- MARCOM**, Box 66507, Scotts Valley, CA 95066 (408-438-4273) AK, AZ, CA, HI, NV, OR, WA 1, 2, 3, 4, 6, 10, 11
See advertisement on this page

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213-703-0381

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206-622-7390

(See page 210 for key to listings)

Davis Electronics Co., Box 128, Sierra Madre, CA 91024 (213-355-6909) CA, HI 4, 9, 10
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
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

COLORADO

Colorado Magnetics, Box 713, Colorado Springs, CO 80901 (303-596-0684) AZ, CA, CO, FL, ID, KS, MO, MT, NE, NV, NM, ND, OH, OK, OR, SD, TX, UT, WA, WY 1, 3, 5
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
Film/Video Equipment Service Co., 1875 S. Pearl St., Denver, CO 80210 (303-778-8616) AZ, CO, KS, MT, NE, NV, NM, ND, SD, UT, WY 1, 2, 7, 9, 11
See advertisement on page 32
Western Tele-Communications, Inc., Box 22595, Wellshire Station, Denver, CO 80222 (303-771-8200) AZ, CA, CO, ID, KS, MT, NE, NV, NM, ND, OR, SD, UT, WA, WY 4, 8, 10, 11

Didier/Denver, Inc., Box 1599, Evergreen, CO 80439 (303-674-6000) CO, ID, KS, MT, NE, NM, ND, SD, UT, WY 1, 2, 3, 4, 10
H P Marketing Co., 2530 W. Church Ave., Littleton, CO 80120 (303-794-8367 or 800-525-8620) AZ, CO, ID, MT, NM, El Paso TX, UT, WY 1, 2, 3

CONNECTICUT

National Video Services, 3 Pembroke Rd., Danbury, CT 06810 (203-792-3862) CT, DC, ME, MA, NH, NJ, NY, PA, RI, VT 2, 9, 10
Denson Electronic Corp., Box 85, Rockville, CT 06066 (203-875-5198) U.S.A. and Canada 2
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

DELAWARE

Brenner Cine-Sound, 5215 Wisconsin Ave., N.W., Washington, DC 20015 (202-244-3800) DC, MD, OH, PA, VA, WV 1, 2, 5, 7, 9, 10, 11
Comex Corp., Box 17011, Dulles Int'l. Airport, Washington, DC 20041 (703-471-4215) South America 1, 2, 3, 4, 5, 6, 7, 8
See advertisement on page 92

FLORIDA

Doug Holland Associates, 9035 S.W. 9th St., Boca Raton, FL 33433 (305-428-7120) FL, GA, IL, IN, IA, KY, LA, MD, MI, NE, NJ, NY, NC, OH, PA, SC, TN, TX, VT, VI, VA, WV, WI 1, 4, 5, 9, 10, 11
Pro Audio General Store, Inc., 1378 NW 100th Ave., Coral Springs, FL 33065 (305-752-0330) AL, FL, GA, LA, MS, NC, SC 1, 5
Broadcast International, Inc., 1229 N.E. 37th St., Ft. Lauderdale, FL 33334 (305-564-4422) Worldwide 1, 3, 4, 5, 6, 10, 11
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
See advertisement on this page
Gray Communications, 718 Northwest 10th Ave., Gainesville, FL 32601 (904-376-2435) FL 2, 5, 8, 9, 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
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
Image Devices Inc., Box 610606; 1825 N.E. 149th St., Miami, FL 33181 (305-945-1111) AL, AR, FL, GA, KY, LA, MS, NC, OK, PR, SC, TN, VA, ONT, QUE 1, 2, 3, 5, 7, 8, 9, 10, 11
Lita Broadcasting Distributors, 7154 N.W. 72nd Avenue, Miami, FL

33166 (305-887-1223) FL, Central & South America, Caribbean 1, 4, 5, 6
See advertisement on this page
Midwest Telecommunications, 3331 Northwest 82nd Ave., Miami, FL 33122 (305-592-5355) AL, FL, GA 1, 2, 3, 4, 5, 9, 10
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
Crescendo Associates, 3597 Southwest 69th Terr., Miramar, FL 33023 (305-961-0886) AL, FL, GA, MS, NC, SC, TN 1, 10
Bencsik Associates, 1627 E. Silver Springs Blvd., Suite F, Ocala, FL 32670 (904-732-9775) FL, PR 1, 2, 3
Global Video Communications Corp., 744 W. Church St., Orlando, FL 32805 (305-843-8982 or 423-8299) Southeast U.S.A. and Latin America 2
Gray Communications, 1605 S. Bumby Ave., Orlando, FL 32806 (305-896-7414) FL 2, 5, 8, 9, 10
Crescenodo Associates, 9766 Deer Run Dr., Ponte Verde Beach, FL 32082 (904-372-0881) AL, FL, GA, MS, NC, SC, TN 1, 10
Audio Visual Services, Inc., 5484 Jet Port Industrial Blvd., Tampa, FL 33614 (813-884-1461) U.S.A 1, 5, 7, 9, 10, 11
See advertisement on this page
Design Line, Inc., Box 260007, Tampa, FL 33685 (813-886-5073) AL, FL, GA 1, 2, 10
Gray Communications, 5401 Southern Comfort Blvd., Tampa, FL 33614 (813-885-1411) FL, PR 1, 2, 4, 5, 8, 9, 10, 11

GEORGIA

Image Devices Inc., 1651 Phoenix Blvd., Box 490250, Atlanta, GA 30349 (404-996-0000) AL, AR, FL, GA, KY, LA, MS, NC, OK, PR, SC, TN, VA, ONT, QUE 1, 2, 3, 5, 7, 8, 9, 10, 11
Siboney Audio Visual Products, Inc., 1760 Tully Circle, N.E., Atlanta, GA 30329 (404-329-9200) AL, GA, TN, TX 1, 2, 5, 7, 9, 10, 11
Technical Industries Inc. of Georgia, 6000 Peachtree Rd., N.E., Atlanta, GA 30341 (404-455-7610) GA, SC 1, 2, 3, 10
Quality Media Corp., Box 7008, Columbus, GA 31908 (800-241-7878; in GA 404-324-1271) U.S.A. and Canada 1, 2, 3, 4, 5, 6, 7, 8, 10, 11
Gray Communications, 3684 Clearview Ave., Doraville, GA 30340 (404-455-3121) GA 1, 2, 5, 7, 8, 9, 10

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Dynacom Electronics Ltd., 590 Commerce Park Dr., Suite 125, Marietta, GA 30060 (404-428-3100) U.S.A., Canada, Mexico 4, 10

C. Harrison Associates, Inc., 6290 McDonough Dr., Suite E, Norcross, GA 30093 (404-449-7696) AL, FL, GA, MS, NC, SC, TN 2, 4

Broadcast Communication Associates, Box 2606, Peachtree City, GA 30269 (404-487-9559) U.S.A. and Canada 1, 3, 4, 5, 10, 11

HAWAII

Broadcast Services Inc., 2877 Kala-kaua Ave., Honolulu, HI 96815 (808-521-6311) HI 1, 4, 6, 9, 10, 11

Hawaii Broadcast Associates, Box 1344, Honolulu, HI 96807 (808-538-3749) HI 4

Omega Pacific, 570 Auahi St., #204, Honolulu, HI 96813 (808-533-7655) HI 2, 3, 4, 5

IDAHO

Hall Electronics, 2302 Kootenai, Boise, ID 83705 (208-336-5894) ID, MT, OR, UT, WA, WY 1, 3, 4, 6, 10, 11

ILLINOIS

AVC Systems, Inc., 7116 W. Higgins Ave., Chicago, IL 60656 (312/763-6010) IL, IN, IA, MI, MN, NE, ND, SD, WI 1, 3, 5, 9, 10, 11

Center Video Center, Inc., 5800 W. Fullerton Ave., Chicago, IL 60639 (312-637-1600) IL, IN, WI 1, 2, 3, 5, 9, 10, 11

Ottawa Equipment Co., 6838 N. Ottawa Ave., Chicago, IL 60631 (312-774-5115) IL, IN, WI, Export 1, 4, 6, 10

Theodore Pappas Associates Inc., 5218 W. Diversey Ave., Chicago, IL 60639 (312-685-2338) IL, IN, KY, MN WI 1, 3

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

WIDL Video, 5245 W. Diversey, Chicago, IL 60639 (312-622-9606) Worldwide 1, 3, 5, 8

Swiderski Electronics, Inc., 1200 Greenleaf Ave., Elk Grove Village, IL 60007 (312-364-1900) IL, IN, IA, MI, WI 1, 2, 3, 5, 6, 7, 8, 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

GO Video Sales, 1195 S. Wilson Dr., Lake Forest, IL 60045 (312-295-6726) North IL, Northwest IN, Davenport IA, East WI 2

Tech Theatre Inc., 4724 Main St., Lisle, IL 60532 (312-971-0855) Worldwide 2, 10

Roscor Corp., 6160 Oakton, Morton Grove, IL 60053 (312-966-3010 or 539-7700) IL, IA, KY, MI, OH, WI 1, 2, 3, 5, 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, 7

William M. Linz Assoc., Inc., 821 Skokie Blvd., Northbrook, IL 60062 (312-498-9600) IL, WI 1

Milam Audio, 1504 North 8th St., Pekin, IL 61554 (309-346-3161) CO, IL, IN, IA, KS, MI, MO, OH, OK, TX, WI 1, 5, 9, 10, 11

INDIANA

Indianapolis Video, Inc., 8720 Robbins Rd., Indianapolis, IN 46268 (317-875-5313) IL, IN 1, 2, 3, 5, 9, 10, 11

Allied Broadcast Equipment, #One, 635 South E St., Richmond, IN 47374 (317-962-8596) Worldwide 1, 3, 4, 5, 6, 9, 10

IOWA

Kimian Sales, Inc., Box 503; 1804 Sycamore St., Atlantic, IA 50022 (712-243-1626) IL, IA, KS, MO 1, 2

Triangle Audio Visual, 2740 30th St., Des Moines, IA 50310 (515-279-3672) IA, MN, NE, ND, SD 1, 2, 3, 5, 6, 7, 9, 10, 11

Sitler's Supplies, Inc., 702 E. Washington, Washington, IA 52353 (319-653-2123) U.S.A. 7
See advertisement on page 238

Telfax Communications, Box 31, Webster City, IA 50595 (515-832-1263) U.S.A. 1, 4

See advertisement on page 234

KANSAS

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

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, 5, 9, 10, 12

Radio Supply Co., Inc., 131 Laura; Box 1220, Wichita, KS 67201 (316-267-5213) KS, OK 1, 2, 3, 5, 6, 9

KENTUCKY

Bruce L. Dawson & Associates, Box 115, Prospect, KY 40059 (502-228-4898) IN, KY, Southern OH 2, 4

LOUISIANA

Gray Communications, 910 N. Bon Marche, Suite 'E', Baton Rouge, LA 70806 (504-924-2298) LA 1, 2, 3, 4, 5, 7, 8, 9, 10, 11

Wm. B. Allen Supply Co., Inc., 1601 Basin St., New Orleans, LA 70116 (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 1, 3, 4, 5, 9, 10

See advertisement on this page

Gray Communications, 5441 Pepsi St., New Orleans, LA 70173 (504-733-7265) AR, LA 1, 2, 3, 4, 5, 7, 8, 9, 10, 11

MAINE

MG Associates, Box 4245 Station A, Portland, ME 04101 (207-774-5290) ME, NH 2, 3

MARYLAND

David H. Brothers Co., Inc., 19 Old Court Rd., Baltimore, MD 21208 (301-764-7189) DC, MD, VA 1, 5, 6

Music Sound Distributors, 6730 Santa Barbara Court, Baltimore, MD 21227 (301-796-3984) U.S.A. and Canada 1, 2, 5

Theatre Service & Supply Corp., 1792 Union Ave., Baltimore, MD 21211 (301-467-1225) U.S.A. 1, 2, 7, 9, 10, 11

Peirce-Phelps, Inc., 10215 Fernwood Dr., Bethesda, MD 20034 (301-530-9580) U.S.A., GU, PR, VI 1, 2, 3, 5, 7, 8, 9, 10, 11

Professional Products Inc., 4964 Fairmont Ave., Bethesda, MD 20014 (301-657-2141) DC, MD, VA 1, 2, 3, 4, 5, 6, 7, 9, 10, 11

Associated Sales Reps, Inc., 403 Fieldstone Ct., Fallston, MD 21047 (301-877-7300) DE, DC, MD, NJ, PA, VA 1, 3

Midwest Corp., Communications Systems Div., 4700-G Boston Way (Washington D.C.), Lanham, MD 20801 (301-577-4903) North America 1, 2, 4, 5, 8, 9, 10

Broadcast Controls, 9155 Brookville Rd., Silver Spring, MD 20910 (301-587-3505) Worldwide 1, 10

Wiltronix, Inc., 16850 Oakmont Ave., Washington Grove, MD 20880 (301-258-7676) DE, DC, KY, MD, PA, VA, WV 1, 2, 3, 10

MASSACHUSETTS

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

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

M. P. Video, Inc., 45 Kenneth St., Newton, MA 02161 (617-965-5405) CT, ME, MA, NH, RI 1, 2, 3, 5, 9, 10, 11

Landy Associates, Inc., 39 Union Ave., Sudbury, MA 01776 (617-443-5708) CT, DE, DC, ME, MD, MA, NH, NJ, NY, PA, RI, VT 1, 2, 3, 5, 7, 10, 11

QSI Systems, Inc., 12 Linscott Rd., Woburn, MA 0188 (617-938-1403) U.S.A. 2, 3, 5

MICHIGAN

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

Sound Solutions Inc., 5701 Canton Center Rd., Canton, MI 48187 (313-453-6586) IL, IN, MI, OH 1, 2, 3, 4, 5, 10

H. M. Dyer Electronics, Inc., 31185 Ten Mile Rd., Farmington Hills, MI 48024 (313/478-2157) IL, IN, IA, MI, MN, MO, OH, WI 1, 2, 3, 10, 11

See advertisement on page 217

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New Orleans
LA 70189

(See page 210 for key to listings)

Audio Distributors, Inc., 2342 S. Division Ave., Grand Rapids, MI 49507 (616-452-1596) U.S.A. 1, 3, 4, 5, 10, 11

Victor Duncan, Inc., 32380 Howard St., Madison Hgts., MI 48071 U.S.A. and Canada 1, 2, 3, 5, 6, 7, 9, 10, 11

V F Sales Inc., 41940 Joy Rd., Plymouth, MI 48170 (313-453-8720) MI 1, 3

MINNESOTA

Emmons Associates, Inc., 1121 Riverwood Dr., Burnsville, MN 55337 (612-890-8920) IA, MN, ND, SD, WI 1, 2, 4, 9, 11

Todd Communications Inc., 7360 Ohms Lane, Minneapolis, MN 55435 (612-835-3080) IA, MN, NE, ND, SD, WI 1, 2, 3, 4, 5, 7, 9, 10, 11

Video Midwest, Inc., 434 Stinson Blvd., Minneapolis, MN 55413 (612-379-3300) IA, MN 1, 2, 3, 5, 7, 9, 10, 11

Clark R. Gibb Co., 11100 Bren Rd. W., Minnetonka, MN 55343 (612-938-5434) MN, ND, SD, WI 1, 3, 5

T. R. Pitts Co., 458 W. Sanborn St.; Box 57, Winona, MN 55987 (507-452-2629) All - MD, MN, SD, WI; Parts of - IL, IN, IA, KY, MI, MT, OH 1, 2, 3, 4, 5, 8, 9, 10

MISSISSIPPI

Central School Supply, 310 Airport Rd., Jackson, MS 39208 (601-932-1901) AL, LA, MS, TN 1, 2, 4, 5, 6, 7, 9, 10, 11

Transvolt, Inc., 4672 Nisqually Rd., Jackson, MS 39206 (610/362-2697) AL, AR, DC, FL, GA, KY, LA, MD, MS, MO, NC, OK, SC, TN, TX, VA, WV 9, 10, 11

MISSOURI

Television Engineering Corp., 580 Goddard Ave., Chesterfield, MO 63017 (314-532-4700) IL, IA, KS, MI, MN, MS, MO, NE, OH, TN 1, 2, 5, 7, 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

Delcom Corp. of St. Louis, 2349 Grisom, St. Louis, MO 63141 (314-432-1164) AR, South-IL, KS, MO, OK 2, 3, 5, 7, 8, 9, 10

Lines Video Systems, 219 S. Jefferson, Springfield, MO 65806 (417-862-5533 out of state 800-641-4674) AR, IL, KS, KY, MO, OK, TN 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

MONTANA

Holm-James Distributors Inc., 4th Ave. S. at 6th St., Box 2487, Great

Falls, MT 59403 (406/761-2420) MT, Northern-WY 1, 2, 3, 5, 6, 9, 10

NEVADA

Cinema Services, 3050 Sheridan St., Las Vegas, NV 89102 (702-876-4667) AZ, NV, NM, UT 2, 7, 11

NEW HAMPSHIRE

New England Wholesale Supply, dba Video Lab, 250 Derry Rd., Hudson, NH 03051 (603-880-1896) ME, MA, NH, VT 1, 2, 5, 9, 10, 11

Associated Systems, Box 333, Londonderry, NH 03053 (603-434-0731 or 4533) CT, ME, MA, NH, NY, RI, VT 1, 2, 3

NEW JERSEY

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 1, 2, 3, 5, 7, 9, 10, 11

Calvert Electronics Inc., 1 Branca Rd., East Rutherford, NJ 07073 (Out of NJ-800-526-6362; In NJ-201-460-8800) Worldwide 2, 6
See advertisement on page 101

Thor Electronics Corp., 321 Pennsylvania Ave., Linden, NJ 07036 (201-486-3300) Worldwide 6

Cinecraft Int'l., Inc. Export Agents, 11 Caesar Place, Moonachie, NJ

07074 (201-939-0875) Worldwide 1, 7, 9, 11

Stylist Systems, Inc., 39 Industrial Ave., Teterboro, NJ 07608 (201/288-6130) USA, Egypt, Nigeria, Saudi Arabia 1, 2, 3, 4, 5, 6, 7, 9, 10

See advertisement on this page

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, 7, 8, 10

See advertisement on this page

NEW MEXICO

Magnetic Media Corp., 1213 N. Lea, Roswell, NM 88201 (505-622-6393) Southern NM 2, 3, 5, 9, 10

DYMA Engineering, Inc., Box 1697, Taos, NM 87571 (505-758-8686 or 2686) AZ, CA, CO, KS, NV, NM, OK, TX, UT 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

NEW YORK

Ceco Communications Inc., 2115 Avenue X, Brooklyn, NY 11235 (212-646-6300) Worldwide 6
See advertisement on page 244

Audio-Video Corp., 55 Delaware Ave., Delmar, NY 12054 (518-439-7611) CT, MA, NY, North-PA, VT 1, 2, 3, 5, 9, 10, 11

H.M. HOLZBERG ASSOCIATES, INC.

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Temtron Electronics Ltd., 15 Main St., East Rockaway, NY 11518 (516-599-6400; 800-645-2300) U.S.A. 5, 6

London Electric, 27-16 Fortyfirst Ave., Long Island City, NY 11101 (212-786-1800) U.S.A. 1, 2, 3, 5, 8, 9, 10

Team Electronics, Inc., 24-16 Queens Plaza South, Long Island City, NY 11101 (212-937-9200) U.S.A. and Canada 1, 2, 5, 6, 7

Boynon Studio Inc., Melody Pines Farm, Morris, NY 13808 (607-263-5695) U.S.A.; in Canada-BC, MAN, NB, NS, ONT, PEI, QUE, SASK 1, 3, 4, 5, 10, 11

Richard W. Burden Associates, 342 Lexington Ave., Mount Kisco, NY 10549 (914-666-3730) U.S.A. 10

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

Adcom Communications Inc., 555 West 57th St., New York, NY 10019 (212-265-1760) NY 2, 3, 5, 9, 10

Adwar Video Corp., 100 Fifth Ave., New York, NY 10011 (212-691-0976) Worldwide 1, 2, 3, 5, 6, 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

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

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

See advertisement on pages 230, 231

Levit Electronics, Inc., 200 Park Ave. S., New York, NY 10003 (212-777-5517) Worldwide 6

Martin Audio/Video Corp., 423 West 55th St., New York, NY 10019 (212-541-5900) CT, DE, DC, ME,

MD, MA, NH, NJ, NY, PA, VT 1, 2, 3, 5, 9, 10

The Ken Schaffer Group, Inc., 10 East 49th St., New York, NY 10017 (212-371-2335) Worldwide 1, 3

Sonocraft Corp., 360 West 31st St., New York, NY 10001 (212-760-9300) NJ, NY 1, 2, 5, 7, 9, 10

Studio Film & Tape Inc., 630 9th Ave., New York, NY 10036 (212-977-9330) U.S.A. and Canada 3, 5

Tape City, Inc., 404 Park Ave. S., New York, NY 10016 (212-679-1606) CT, NJ, NY, Mail Order in U.S.A. 1, 2, 5, 9, 11

United Research Lab Corp., 16 East 52nd St., New York, NY 10022 (212-751-4663) Worldwide 1, 3, 5, 9

See advertisement on page 250

Videotape Services Inc., 855 Avenue of the Americas, New York, NY 10001 (212-695-6606) Worldwide 5, 7, 11

R F Gain, Ltd., 100 Merrick Rd., Rockville Centre, NY 11570 (516-536-8868; 800-645-2322) Worldwide 6

See advertisement on page 252

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

Motion Picture Enterprises, Inc., Box 276, Tarrytown, NY 10591 (212-245-0969) Worldwide 2, 5, 7

Singer Products Co., Inc., 875 Merrick Ave., Westbury, NY 11590 (516-333-2000) Worldwide except U.S.A. and Canada 1, 3, 4

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

NORTH CAROLINA

Doug Cook & Associates, 6300 Carmel Rd., Charlotte, NC 28211 (800/438-6040) AL, FL, GA, KY, OH, W.-PA, TN, WV 1, 2, 3, 4, 10

Southern Coastal Marketing Services, Inc., 6300 Carmel Rd., Charlotte,

NC 28211 (704-542-6543) NC, SC, VA 1, 2, 3, 4, 5, 9

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

Technical Video Systems, Inc., 215 N. Broad St., Winston-Salem, NC 27101 (919-748-0916) GA, NC, SC, TN, VA, WV 1, 2, 3, 4, 5, 7, 8, 9, 10, 11

See advertisement on this page

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

Cercone Vincent Associates, Inc., 5020 Richmond Rd., Bedford Heights, OH 44146 (216)/292-2550 IN, OH, PA, WV 2, 7, 10, 11

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

Midwest Corp., 1021 West 8th St., Cincinnati, OH 45203 (513-651-1904) U.S.A., GU, PR, VI 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

See advertisement on pages 141, 214

KAVCO, Inc., 3931 Image Dr., Dayton, OH 45414 (513-236-5500) IN, KY, MI, OH, WV 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

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Hill Radio Equipment Co., Route 6, Box 622, Claremore, OK 74017 (918/341-5240) AR, KS, MO, OK 1, 3, 4, 5

Walter S. Brewer Co., Inc., 2216 East 56th Place, Tulsa, OK 74105 (918-749-9894) Worldwide 2, 10

See advertisement on page 248

Doug Brown Enterprises, Inc., 1703 East Skelly Drive, Tulsa, OK 74105 (918/747-3618) Worldwide 1, 3, 5, 9, 10, 11

See advertisement on page 242

Delcom Corp., 6019 S. 66th E. Ave., Tulsa, OK 74145 (918-494-9500) AR, KS, South IL, MO, OK 2, 3, 5, 7, 8, 9, 10

OREGON

United Radio Supply Inc., Box 14040, Portland, OR 97214 OR, WA 3, 6

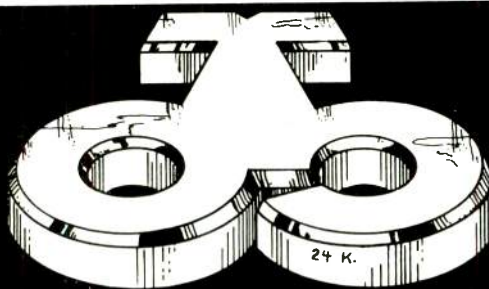
VideoSonics Inc., 821 Southeast 14th Ave., Portland, OR 97214 (503-232-4632) ID, MT, OR, WA 1, 2, 3, 5, 7, 8, 9, 10, 11

PENNSYLVANIA

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

Dimension Five Sound Co., 139 Montgomery Ave., Bala Cynwyd, PA 19004 (215-668-8260) DE, DC, NJ, NY, OH, PA, VA 1, 3, 5, 9, 10

See advertisement on this page



DIMENSION FIVE SOUND COMPANY (215) 589-2546, in PA 1-800-422-8582
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(See page 210 for key to listings)

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

See advertisement on page 33

Electro-Acoustic Designs, Inc., 5131 W. Chester Pike, Edgemont, PA 09028 (215-356-4700) United States 9, 10

LPB Inc., 28 Bacton Hill Rd., Frazer, PA 19355 (215-644-1123) CA, CT, DE, DC, GA, ME, MD, MA, NJ, NY, NC, OH, PA, RI, SC, VA, WV 1, 3, 4, 10

Gallagher Equipment Co., Box 582, Honey Brook, PA 19344 (215-942-4111) PA 8

Richard S. Pass Associates, Inc., 27 Oxford Dr., Langhorne, PA 19047 (215-757-6100) DE, DC, MD, Southern-NJ, Eastern-PA, VA 1, 2, 3

Richard S. Hajdu, 2000 North 59th St., Philadelphia, PA 19131 (215-879-7171) DE, NJ, PA 1, 2, 3, 5, 8, 10

Lerro Electrical Corp., 3125 N. Broad St., Philadelphia, PA 19132 (215-223-8200) DE, DC, MD, NJ, PA 1, 2, 5, 8, 10

See advertisement on page 131

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

See advertisement on page 33

Steinberg Electronics Inc., 2520-22 N. Broad St., Philadelphia, PA 19132 (215-223-9400) (800-523-0894) Worldwide 1, 2, 3, 5, 6

Cercone Vincent Associates, Inc., 2741 Noblestown Road, Pittsburgh, PA 15205 (412/341-6610) IN, OH, PA, WV 2, 7, 10, 11

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

Val-Tronics, Inc., Penn Park Bldg., Pittston, PA 18640 (717-655-5937) U.S.A. 1, 3, 4, 5, 6

Dimension Five Sound Co., 24 N. 3rd St., Womelsdorf, PA 19567 (215-589-2546) DE, DC, NJ, NY, OH, PA, VA 1, 3, 5, 9, 10

See advertisement on page 215

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

TENNESSEE

Broadcast Equipment & Supply Co., Inc., Box 3141, Bristol, TN 37620 (615-878-2531) U.S.A. 1, 4, 5

Gray Communications, 6339 E. Brainerd Rd., Chattanooga, TN 37421 (615-894-6860) TN 2, 5, 8, 9, 10

Centel Systems, Inc., 3610 Democrat Rd., Memphis, TN 38118 (901-365-1361) AR, MS, TN 1, 2, 5, 9, 10

Phase Audio, Inc., 151 N. Angelus, Memphis, TN 38104 (901-726-1900) U.S.A. 1, 3, 9, 10

Audicon, Inc., 1200 Beechwood Ave., Nashville, TN 37212 (615-256-6900) AL, AZ, AR, CA, CO, CT, DE, DC, FL, GA, ID, IL, IN, IA, KS, KY, LA, ME, MD, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, SC, TN, TX, VA, WA, WV 1, 3, 9, 10, 11

Gray Communications, 225 Spence Lane, Nashville, TN 37210 (615-883-9175) TN 2, 5, 8, 9, 10

TEXAS

Midcom, Inc., 2231 E. Division, Arlington, TX 76011 AZ, KS, LA, NM, OK, TX 1, 4, 5, 9, 10, 11

Broadcast Systems Inc., 8222 Jamestown Dr., Austin, TX 78758 (800-531-5232) U.S.A. 1, 2, 3, 4, 7, 8, 9, 10

See advertisement on this page

Sound Investment Enterprises, Box 14825, Austin, TX 78761 (512-837-4646) AL, AZ, AR, CA,



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| LENCO | TELEMET |
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| 3M | QUICKSET |
| MICROTIME | O'CONNOR |
| STANTRON | MYAT |
| DYNATECH | MICRODYNE |
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| AMP | ESE |
| IKEGAMI | HME |
| RTS SYSTEMS | ELECTROHOME |
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Gene Sudduth Co., Inc., 5675 Roadrunner Lane, Beaumont, TX 77708 (713/899-1341) AR, LA, OK, TX 1, 2, 3

Jenel Corp., Consulting & Engineering, 9550 Forest Lane, Suite 400, Dallas, TX 75243 (214-343-1229) U.S.A. 8, 10

MZB&Assoc., 4203 Beltway, Dallas, TX 75234 (214-233-5535) AR, LA, NM, OK, TX 1, 2, 3, 4, 5, 7, 9, 10, 11
See advertisement on page 216

E. Smalling III, Consulting Engineer, 10307 Bernardin, Dallas, TX 75243 (214-234-5894) U.S.A. 10

Victor Duncan, Inc., 2659 Fondren Dr., Dallas, TX 75206 (214-369-1165) U.S.A. and Canada 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

Professional Audio Services, Box 1953, Ft. Worth, TX 76101 (817-536-6254) AL, AZ, AR, CO, FL, GA, HI, IL, KY, LA, ME, MI, MN, MS, MO, NE, NV, NM, OH, OK, PA, TN, TX, UT, VI, WA, WY 1, 3, 5, 9
See advertisement on page 216

Tenicki & Associates, 5719 Kirby, Suite 17, Houston, TX 77005 (713-528-2005) AR, LA, OK, TX 1

Fitzco Sound, Inc., 204 N. Midkiff, Midland, TX 79701 (915/684-0861) U.S.A. 1, 2, 10
See advertisement on page 239

The Gene Sudduth Co., Inc., 845 39th S.E., Paris, TX 75460 (214-785-5764) AR, LA, OK, TX 1, 2, 3
See advertisement on page 216

Abadon/Sun., Inc., Box 6520, San Antonio, TX 78209 (512-824-8781) U.S.A., Mexico 1, 2, 3, 5, 9, 10, 11

CFA-Media Specialties, Inc., 8232/34 Vicar, San Antonio, TX 78218 San Antonio-512-657-5997; Dallas-214-327-4525; Houston-713-528-6012 LA, NM, OK, TX 1, 2, 9, 10, 11

Linrose Electronics Corp., 12132 Colwick, San Antonio, TX 78216 (512/342-8849) Worldwide 1, 2, 3, 4, 5, 6, 7

UTAH

RIA, Inc., 50 E. Malvern, Salt Lake City, UT 84115 (801-486-8822 or 484-1701) AZ, CO, ID, LA, MS, MO, MT, NV, OK, TX, UT, WY 1, 2, 3, 4, 5, 7, 9, 10, 11

VIRGINIA

Broadcast Equipment Exchange, Box 1238, Arlington, VA 22210 (703-525-0400) U.S.A. and Int'l. 11

David Green Broadcast Consultants Corp., Box 590, Leesburg, VA 22075 (703-777-8660) North America 1, 3, 4, 5, 6, 9, 10, 11
See advertisement on page 237

Alpha Audio, 2049 W. Broad Street, Richmond, VA 23220 (804/358-3852) DC, MD, NC, VA, WV 1, 5

Old Dominion Broadcast Eng. Service, 1101 Front St., Richmond, VA 23222 (804-321-4506) Worldwide 1, 3, 4, 5, 6, 9, 10, 11

Hoppman Corp., Box 1463, Springfield, VA 22151 (703-321-8800) U.S.A. 1, 2, 7, 10

Midwest Corp., Communications Systems Div., 1395 Airrail Ave., Virginia Beach, VA 23455 (804-464-6256) North America 1, 2, 4, 5, 8, 9, 10

WASHINGTON

Custom Video Systems, Inc., 17521 15th Ave. N.E., Seattle, WA 98155 (206-365-5400) AK, OR, WA 1, 2, 3, 5, 8, 9, 10, 11

MARCOM, 216 Westlake Ave. N., Seattle, WA 98109 (206-622-7390) AK, AZ, CA, HI, NV, OR, WA 1, 2, 3, 4, 6, 10, 11

WEST VIRGINIA

Midwest Communications Systems, 300 First Ave., Nitro, WV 25143 (304-722-2921) KY, OH, PA, WV 1, 2, 3, 4, 5, 6, 9, 10, 11

WISCONSIN

Full Compass Systems, Ltd., 6729 Seybold Rd., Madison, WI 53719 (608/271-1100; 800/356-5811) U.S.A. 1, 3, 5, 10, 11
See advertisement on page 76

Electronic Industries Inc., 19 E. Irving Ave., Oshkosh, WI 54901 (414-235-8930) U.S.A. 1, 3, 4, 5, 6, 9, 11

Video Images, 12200 W. Adler Lane, West Allis, WI 53214 (414-475-0111) WI 1, 2, 5, 7, 9, 10, 11

CANADA

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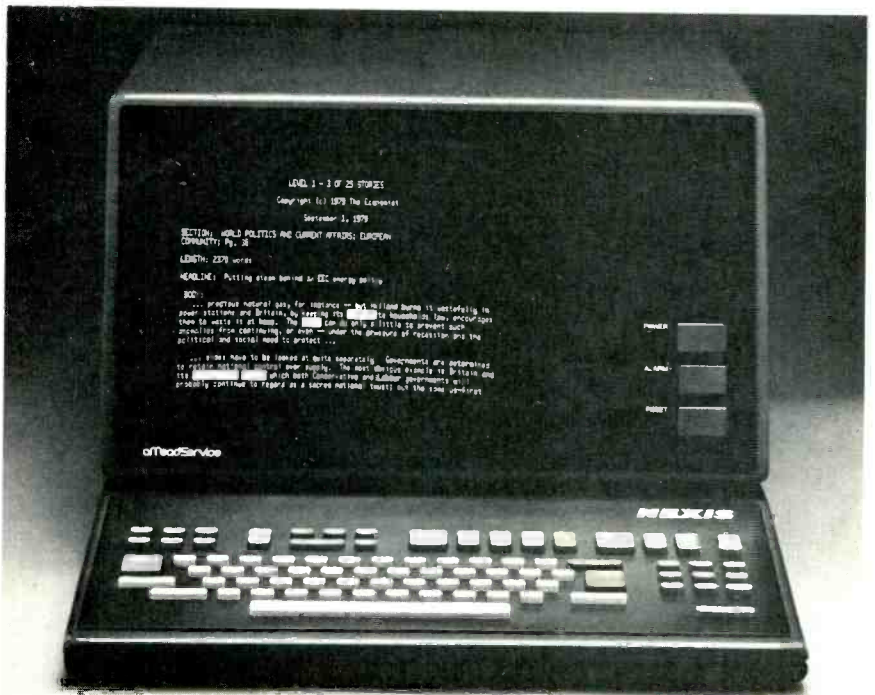
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NEXIS: A full-text library

Mead Data Central has introduced NEXIS, a computer-assisted electronic library that compiles news stories from major publications for instant access. To search for full text, a system is used that eliminates the need for an index or thesaurus. Also simplifying the process is a small video display terminal with controls labeled with straight-forward English names.


Copy goes into the computer exactly as it appears in the publication—in upper- and lowercase letters, in sentences with punctuation intact, and with indented paragraphs. Any word, name, phrase or number—or any combination that occurs in the copy can be the basis of a search.

For example, a story about the Royal Wedding can be summoned by telling NEXIS, "Find me stories in which the names 'Lady Diana' and 'Prince



This information was provided by Mead Data Central.

The NEXIS compiles stories in full text for easy access and reference.



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SECTION: Washington Dateline

LENGTH: 450 words

BYLINE: By DONALD SANDERS, Associated Press Writer

DATELINE: WASHINGTON

KEYWORD: FCC-Deaf

BODY:

CBS said Thursday it has declined to join the two other major commercial networks and public broadcasting on captioning television programs for the deaf because the equipment to be used might soon become obsolete.

The Associated Press, April 5, 1979

Gene Mater, a CBS vice president, explained the network's reluctance at a Federal Communications Commission briefing. At issue was the advisability of going ahead next year with a closed-captioning system already adopted by ABC, NBC and the Public Broadcasting Service, which serves about 240 stations.

Closed captioning differs from open captioning, now employed by PBS to air ABC News television broadcasts for the hearing-impaired. Closed captioning requires use of a decoder costing about \$250 which, when turned on, enables the deaf or partially deaf to watch captions on their television screens.

It is estimated that as many as 20 million Americans have some form of hearing impairment, and the number is likely to grow. "The rock generation is going to be a deafer one," FCC commissioner Abbott Washburn said.

The closed-captioning system is expected to start early next year. Start-up costs are being financed by the Department of Health, Education and Welfare.

Mater said CBS "wants to be sure that the method used is the best possible." He said the system being planned for U.S. use already is outdated, and "the equipment may soon be rendered obsolete."

EXIS NEXIS LEXIS NEX

A printout from NEXIS data base was made by station WEWS-TV3 in Cleveland, OH. The system was asked to find teletext and captioning information just before a trip to England by Bill Rhodes, BE editorial director, to research British Teletext developments.

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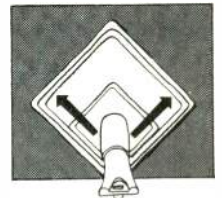
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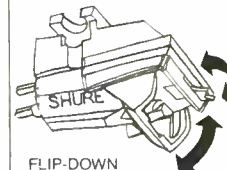
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NEXIS

Charles' occur together." Because the search is not based on an index, key words that would have been used by the writer of a story on the subject are the basis of the search. These words would occur many times in the NEXIS library, but both in combination would bring up a few stories only. If a search such as this found more than a few stories, another word such as "honeymoon" might be specified in combination with Lady Diana and Prince Charles. The system is rapidly interactive. The operator can conduct a search until the particular story is located.

The stories are displayed on the terminal screen in full text or in keyword-in-context (KWIC) form for efficient browsing. In KWIC, NEXIS displays blocks of text from stories. Each block consists of words used in the search, shown in the context in which they appear.

If while skimming the stories found by the search, something is uncovered that would suggest a different approach, the operator can easily modify the search—by starting over, by deleting something, or by adding to the search. The dialogue with the computer continues while the operator browses.

Aside from locating a story by using key words, it is also possible to locate stories published only on a certain date, before a given date, after a given date or between two dates. Also, stories can be limited by publica-



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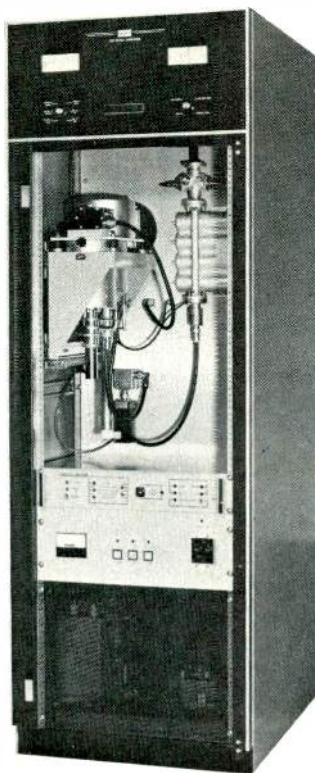
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NEXIS

tion—to stories, for example, from Newsweek. These limitations can be combined to find all the stories published in Newsweek since January 1981 on a certain subject.

NEXIS currently covers the full text of the *Washington Post* (1977 to present); *Dun's Review* (1975 to present); *American Banker*; the BBC's summary of *World Broadcasts*; the BBC's *Monitoring Report*; *U.S. News and World Report* (1975 to present); *Congressional Quarterly Weekly Reports and Editorial Research Reports*; *PR Newswire*; *Jiji Economic News Services*; *Kyodo English Language News Service*; and *The Associated Press* (March 1979 to present). Wire service can be done on the whole file, individual files, or groups of files (newspapers, magazines or wire services).

Mead Data Central and Disclosure Inc., a Washington, DC-based company, have made available in the NEXIS Service the DISCLO library, a library prepared by Disclosure, consisting of extracts of Securities & Exchange Commission corporate filings for the approximately 11,000 companies required to make filings with the SEC. These extracts comprise company profiles and significant items of information taken from 10-Ks, 8-Ks, registration statements, prospectuses, 10-Qs and proxies.

The initial DISCLO library available to NEXIS subscribers comprises company profiles for all companies and extracts of 10-Ks for listed companies (for example, those traded on the New York and American Stock Exchanges). Later this year, extracts of 8-Ks, registration statements, prospectuses, 10-Qs and proxy statements filed by these companies will be added to the library. In addition, these filings and extracts of 10-Ks will be added for the approximately 7000 companies traced over-the-counter.

NEXIS subscribers may gain access to the DISCLO library by executing an agreement letter. Standard NEXIS use charges applied to searches in the DISCLO library; there are no additional charges.

THE STL SOLUTION

Also available are *Encyclopedia Britannica*, the *Federal Register* and the *Christian Science Monitor*, as well as the *Japan Economic Journal* and *Xinhua*, the New China news agency. The *Latin American Newsletters* and *Regional Reports* and the *RayLux Financial Service* are also available.

DISCLO, available through an agreement with Mead Data Central and Disclosure Inc., provides abstracts and extracts of reports filed with the SEC by approximately 9000 of the companies required to make filings with the SEC.

Thirty-one McGraw-Hill publications were added last summer—other data bases and publications are being added on a weekly basis.

The following are some of the broadcast stations that subscribe to NEXIS: American Broadcasting Company (WLS-TV); Hubbard Broadcasting (WTOG, KSTP, KOB); Kronicle Broadcasting Company (KRON); Midwest Radio-TV (WCCO stations); National Broadcasting Company (WMAQ-Chicago); Scripps Howard (WCPO-TV, WEWS-TV); Taft Broadcasting (WBRC, WDAF, WKRC, WTVN); Westinghouse Broadcasting (KPIX); and WNEP Communications Inc.

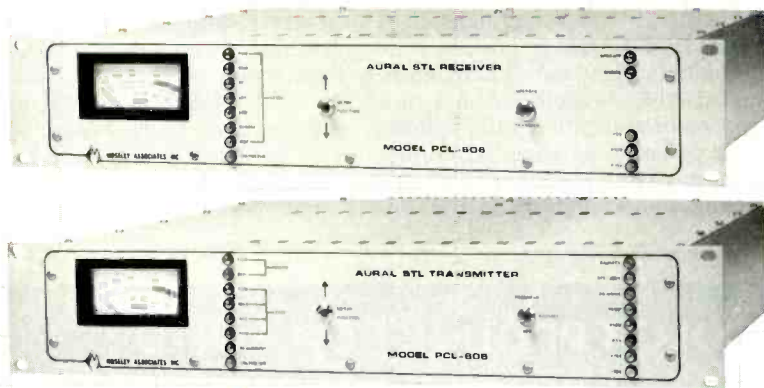
Full text is used rather than abstracts to preserve objectivity. If someone creates an abstract or index, there are certain value judgments made—which pieces of information are valuable and which are not. These judgments may not agree with the ones that someone looking for that story at a later date might make.

Indexers make their judgments on the basis of what they know at the time. A fact that now seems insignificant, an aside in the story, may in the future become the most important reference in that story.

An index limits the operator to a specified group of topics. NEXIS allows the search to be made based on any word, phrase, number or any combination of these.

The system is kept current by daily updates. However, this will not substitute for a subscription to a particular publication, because newspapers are not available in NEXIS until the day after publication and weekly magazines a week after they are published. Wire service copy will appear 12 to 48 hours after it goes over the wire depending on the arrangement with that particular wire service.

Newspaper and wire service stories generally will be carried from January 1, 1977 to the present. Magazines will be carried from January 1, 1975. □



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BBC opens its first multimachine videotape editing suite

The BBC has recently opened its first multiple machine C-format 1-inch helical-scan videotape editing suite at the Television Centre in London. The corporation is gradually changing to C-format video recording and has developed its own edit control system.

Until recently, commercial editing systems have been designed for 1-man operation with a single dedicated con-

trol panel geared to computer-keyboard-type entry. The BBC system, however, offers a control panel per machine with dedicated switches for each function. Such a system is easy to use, allows for dual manning, thereby shortening editing time and also provides hands-on training for assistants.

Ray Taylor of the BBC's Engineer-

ing Designs Department, who had led the design team, said, "We set out to produce equipment that would meet the needs and specifications of the BBC's Television Engineering and Operations Department and they have been involved with us in the project from the start. Now we believe that we have ended up with an editing system which has most, if not all, the special features required by the BBC."

The suite consists of a new edit control system and can have up to four Ampex VPR2B 1-inch helical-scan videotape machines. Each machine has two microprocessors associated with it as part of the editing system. A Motorola MC 6800 handles the time code data and a Motorola 6802 checks and updates the incoming time code when the tape is running below the normal time-code reading speed.

With separate control panels for each machine, an editor and his assistant can work on a program at the same time. For example, the editor can complete one edit while his assistant is preparing the next. Editors can learn to operate the system more quickly because of the dedicated control buttons and switches for each function.

The system includes a data control unit, an events selector panel and playback control panels. The data control unit allows edit-point times to be entered into electronic stores either from small numeric keyboards or directly from tape time code. These newly entered time codes are then used to control the video and/or audio in-and-out points for the different edits. The stored times can be modified, removed from the store or transferred to another store during the editing session.

The events selector panel can be programmed to operate a mixer, a caption generator or a special effects unit within a sequence of up to 48 events. Event points, stored in the playback equipment, can be programmed to put the playback machines into a slow, play or stop mode at certain points in the program. Time code can also be used to start two 1/4-inch audio tape recorders. A time for an out-point, which is being rehearsed on a playback machine, can be automatically noted on the edit machine in this machine's own time code. Updating time code can be carried out when the tape is running at speeds that are too slow for the time code to be read, by using control track signals from the machine. In order to find a precise point, the tape can be

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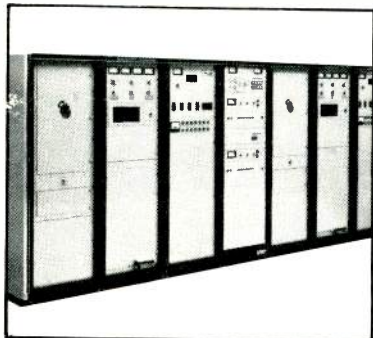
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The BBC new 1-inch editing suite. Shown (from left to right) are Don Kershaw (seated), BBC Television Engineering and Operations Department; Jerry Garratt, BBC Studio Capital Projects Department; and Ray Taylor, BBC Engineering Designs Department. The editing control panels are mounted behind the vision mixer within the three playback panels on the left. The edit control panel and the events control panel are on the far right.

Videotape

moved one frame at a time, in either direction, by special "jog" buttons.

The playback control panels are used to rehearse the material independently of the edit control panel. For example, with a 3-machine suite there is an edit machine and two playback machines. The control panel

on each machine has buttons for controlling the data control unit as well as for functions such as play, stop and spool—and also for the various controls for editing. During editing, however, the edit control panel becomes the master control.

Already the system is proving to be so successful that the BBC's Engineering Equipment Department is developing four more for use by the BBC. □

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WNYC

experiments with "high tech" FM sound

By Victor Campos, director of technical development, WNYC, New York, NY

WNYC, New York City's municipal station that encompasses AM, FM and a UHF-TV channel has a checkered and somewhat offbeat history. New York's charismatic mayor of the late '30s and early '40s, Fiorello H. La Guardia, achieved broadcasting immortality when he used WNYC to read the comics to children during a newspaper strike. More recently, Edward Koch, New York's current mayor, another colorful personality, decided that he wanted the names of men convicted of patronizing prostitutes broadcast in what became known as the "John Hour," a short-lived series.

Koch, who launched his administration at the height of the city's recent fiscal crisis, hired a new WNYC director, John Beck (formerly with WGBH, Boston's prestigious public service radio station), giving him the task of phasing out the city funding for the station and moving it towards financial independence. But until that goal is achieved, WNYC operates on a financial shoestring and must present its highly regarded classical music programming with archaic and substandard transmitting and electronic equipment.

Despite these problems, Beck, who has launched an ambitious fundraising drive, is determined not only to upgrade the station's sound, but to eventually make it New York City's sonic showpiece.

Within a year, Beck hopes to have a new studio, transmitter and updated audio equipment. To anticipate this, the author, a former WGBH associate, was brought in to produce and develop a series of experimental programs to showcase both the new high tech discs and the technical improvements that have already been achieved in the WNYC-FM signal.

Beck and I as co-hosts of the pro-

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gram *Audiophile Showcase* have been able to supplement the station's out-



The author finds that the Technics RS-M95 cassette player allows WNYC to showcase many outstanding pre-recorded cassettes.

(Courtesy of Grey & Davis, New York)

dated equipment with such new audio hardware as turntables borrowed from Panasonic's Professional Audio Division, and the Technics RS-M95 cassette player.

The ground-breaking *Audiophile Showcase*, running on Tuesday and Thursday from 8 to 10:30 p.m., during the months of June and August featured some of the latest commercial high tech recordings—sourced from 30ips original tapes, direct-to-disc sessions, and made from digitally recorded originals. When FM was introduced its performance far outstripped any other broadcast or recording mediums of its day. But today, the new digital processes have exceeded the dynamic range capabilities of conventional FM broadcasting—but only because digital techniques have not yet been applied to FM radio.

Unfortunately, as FM has become more commercial, some broadcasters have opted for a louder signal and maximum coverage by compressing, equalizing and otherwise processing the music signal until little of the original dynamics and spectral density remains. Our test program is trying to deal with the new, high quality, wide dynamic range recordings as much as is possible.

The program has enabled our listeners to hear the new digital high tech discs closer to the way they are meant to be heard; to broadcast them without seriously compromising their

sonic quality; to preserve in the broadcasts, as much as possible, the original dynamic range of those superior recordings.

Another goal of WNYC's high tech showcase was to develop a system so that the average station operator could broadcast the new high tech discs with maximum fidelity and with little compression. Within five years' time, there will be a whole new facet of the recording industry—there'll be a new generation of high tech recordings—made from digital originals;

wide-dynamic range, high-speed masters, etc. Because the Federal Communications Commission limits the loudness level you can put on FM carriers, you would seriously deteriorate the sound if you were to broadcast these discs by the conventional commercial FM transmission methods with heavy limiting and compression. Some of those recordings, if put on by untrained operators, particularly on those stations that have compromised the inherent high performance capabilities of FM broad-

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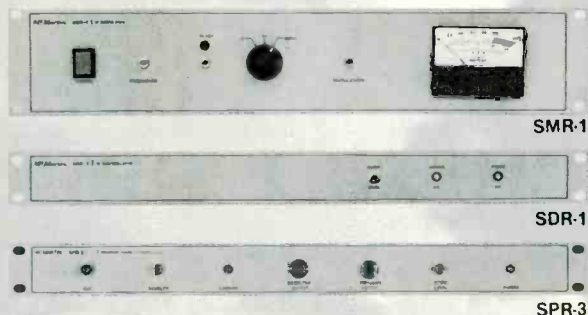
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WNYC

casting, would sound as though they had gone through a meatgrinder.

At WNYC-FM, the first thing we did was to identify the limitations of the station's present transmission with a view toward improving it as quickly as possible. We tried to immediately improve the overall signal broadcast quality with a long term goal of providing a system with which the average operator could showcase the new generation of discs. I had to assemble equipment that would perform so well that it would discover the problem areas in the broadcast chain. And we did find faults. We found the FM exciter was not up to broadcast quality of the original equipment; we found the limiter being used was unacceptable, and we removed it; and, we are not finished yet.

In the process of this experiment, I discovered that a great deal of the home equipment was superior to the broadcast equipment we generally have available. For example, there is no broadcast-type phono preamp that begins to approach the quality of the currently available home phono preamps. I am happy to say that many manufacturers came to our assistance—Technics, Panasonic Profes-

sional Audio, Allison Acoustics, Studer Revox, NAD, ADCOM and DB Systems were most helpful.

For our Audiophile Showcase, we used the Technics R&B Series SL-1025 quartz synthesizer direct drive turntables. We plan to eventually replace the station's current turntables with the highly suitable Technics units, which exploit the new disc's low noise level and wide dynamic range.

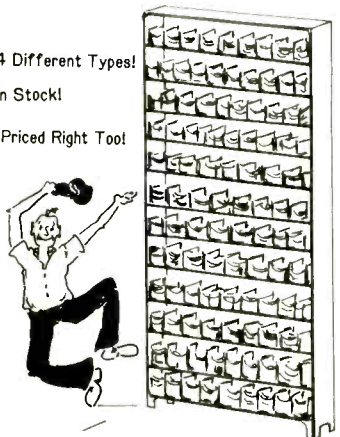
The Technics R&B Series turntable's tonearms were a revelation. They showed us the need for less massive, more stable tonearms that were simpler in design. I also like the turntable's instant start, and the tonearms Technics use are substantially higher in quality than the tonearms we now have in use.

We also found that the record and playback fidelity of such home audio equipment as the Technics RS-M95 cassette player is much better than the standard cartridge systems broadcasters normally use, although admittedly the ultimate application of cassettes and cartridges, as presently used in broadcasting, is very different. To date, we know of no classical FM station that uses a cassette player on the air,* but the Technics cassette player

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The author uses Technics R&B Series SL-1025 turntables for *Audiophile Showcase*. He likes the instant start and the tonearm's stability and simple, compact design.

(Courtesy of Grey & Davis, New York)

and its programmable features can be set up before going on the air. It permitted us to showcase many outstanding prerecorded cassettes.

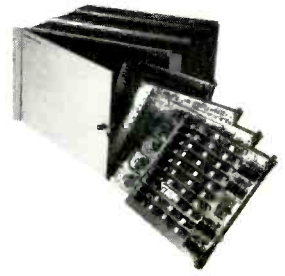
WNYC's current venture into experimental broadcasting, with its unique showcasing of high tech recordings, looks towards a new era at the municipal station. It may point the

way toward the use of FM broadcasting's highest performance capabilities.

***Editor's Note:**

There is increasing evidence that other broadcasters are using cassette systems in their operations. We suggest you submit a short note to us detailing your experience and we will consider your story in a special feature on this topic. Send your story to: **Broadcast Engineering**, Audio Editor, P.O. Box 12901, Overland Park, KS 66212. □

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station- to-station

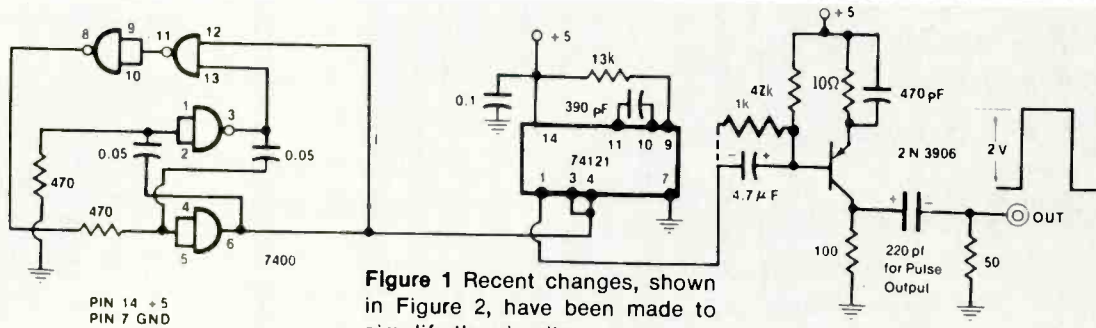


Figure 1 Recent changes, shown in Figure 2, have been made to simplify the circuitry.

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Circle (188) on Reply Card

Step generator for transmission testing

By Linn Boyd
Transmitter Supervisor
WRTV, Indianapolis, IN

In the April 1979 issue of **Broadcast Engineering** (page 78), an article described a circuit that helped make transmission line measurements under adverse conditions and using a Time Domain Reflectometer (TDR).

The main circuit from that article is repeated in Figure 1, with corrections and updates as noted. The 39Ω resistor on the emitter of the 2N3906 was changed to 10Ω to obtain more gain from this stage. (This suggestion came from Don Betts of WISN, Milwaukee.) Also, the addition of the 1000Ω resistor across the 4.7μF coupling capacitor helps smooth the leading edge of the square wave.

For reference purposes, the oscilloscope used in arriving at the changed values is a Tektronix 7613 with a 7A18 dual-trace plug-in. Please note that the circuit has been used only for 50-75Ω coaxial transmission lines. I have not tried it on a waveguide.

NOTE: If there is another source of RF nearby (FM, TV, etc.) do not use the 7600 series scope with the 7A18. It is too sensitive to RF. The 545 series works as well as the old 524.

Recent changes, as shown in Figure 2, have been made to simplify the circuitry of the step generator.

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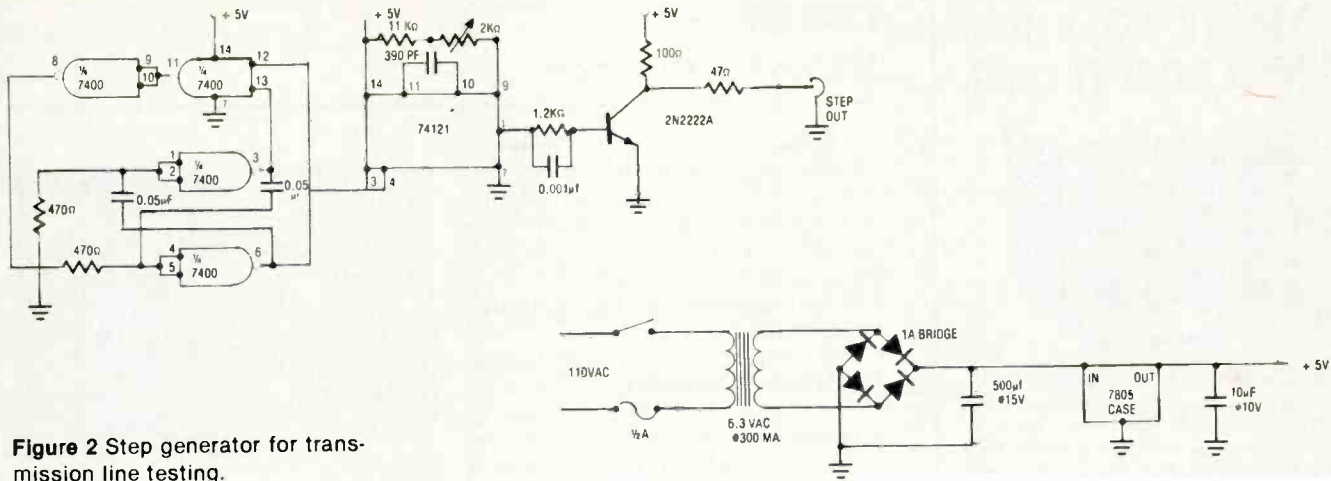


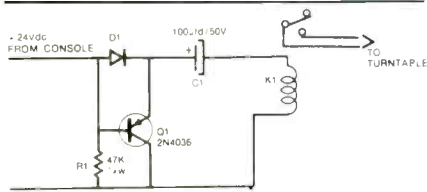
Figure 2 Step generator for transmission line testing.

Remote turntable start circuit

By Doug Howe
Chief engineer
WMUK-FM, Kalamazoo, MI

At WMUK we have designed a remote start circuit for our Technics SP-10 MKII turntables that we would like to share with other stations to eliminate half their problems in remote turntable start circuits. Every circuit we have seen so far for momentary closure from a console key switch uses two relays. We managed to do the job with one relay.

The circuit works as follows: K1 is energized through D1 and C1 when the turntable delegation switch applies a 24Vdc control voltage to the circuit. As C1 charges, the current through K1 decreases, resulting in a momentary contact closure to start the turntable. The forward drop across D1 during the initial charging of C1 helps ensure cutoff for Q1. When the 24V control signal is removed, D1 becomes Q1 and K1, resulting in another momentary contact closure to stop the turntables. We used a relay with bifurcated contacts to help minimize contact problems. There is nothing special about the transistor; we simply had a supply on hand. If a different transistor is used, the value of R1 will have to be selected for proper bias.



The parts used in the circuit are: C1, Electrolytic 100µF/50V Sprague TVA-1310; D1, diode Mallory 2.5A; K1, relay P & B R10-E1-Z2-V700, 24V; Q1, transistor 2N4036; R1, resistor 47kΩ 1/4W. □

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new literature

Electronic measuring instruments

A new, 28-page condensed catalog of electronic measuring instruments for telecommunications equipment and systems is now available from **Anritsu America Ind.**, headquartered in Oakland, NJ.

The new brochure, titled "Anritsu Electronic Measuring Instruments Condensed Edition," contains specification data, product features and photographs of a wide range of popular units.

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Coaxial cables

CATEL, a division of United Scientific Corporation and a subsidiary of Data Design Laboratories, has published a new issue of the "Catelegram," a newsletter concerning applications and technical developments in coaxial cable communications. The current issue introduces three new products, dealing with data communications (DM-2100), wideband FM transmission (WFMS-3000) and stereo simulcast (CATEL 245M).

The Catelegram is available to peo-



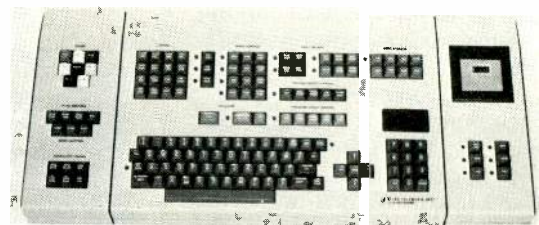
ple in the communications industry at no charge. For more information, contact: CATEL, PO Box 1389, Mountain View, CA 94042.

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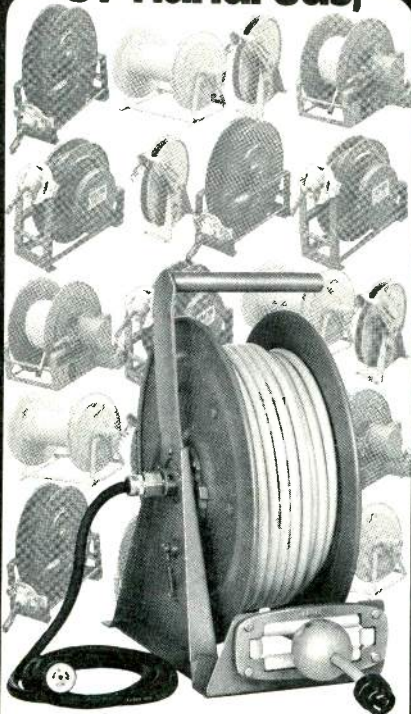
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Videocassette recorders

A 322-page book, "The Complete Handbook of Videocassette Recorders," has been released by Tab Books Inc. The handbook tells how to select the model best suited to the particular need, maintain it, troubleshoot and repair it. It is written in non-technical language and contains many photos, diagrams and schematics.

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Continuing education courses

A catalog describing 212 continuing education courses for engineers, "IEEE Continuing Education Courses—1981/82" has been published by the Educational Activities Board of the Institute of Electrical and Electronics Engineers Inc. (IEEE).

Featuring descriptions of 177 "live" short courses of one, two and three days' duration, the catalog also describes 18 individualized home-study programs—both interactive and self-study—and 17 videotaped courses for group instruction.

All courses are applications-oriented and cover the state-of-the-art in a broad range of topical electrical/electronics technologies, as well as business and management subjects.

To obtain a copy of the new catalog, contact: Continuing Education Department, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854; (201) 981-0060, Ext. 175/177.

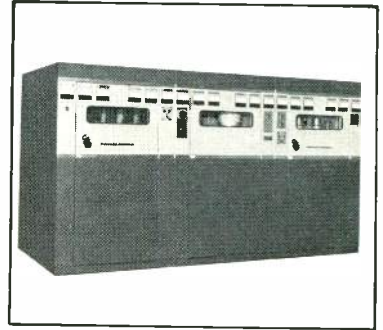
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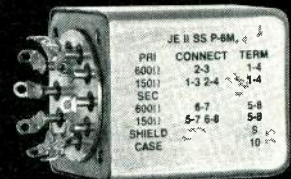
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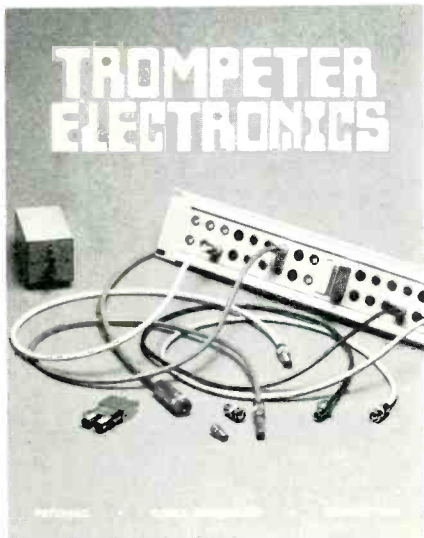
pany, 805 East Middlefield Road, Mountain View, CA 94043; (415) 969-6500.

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Interconnect systems

Trompeter Electronics Inc. has announced the publication of a 48-page catalog, the T-14. It features TEI's complete line of interconnect systems of coax, twinax, triax and quadrax cable connectors, patch panels and complete cable assemblies.

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Copies may be obtained by writing to Trompeter Electronics Inc., 8936 Comanche Ave., Chatsworth, CA 91311; (213) 882-1020.

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Direct broadcast satellite service

Satellite Television Corporation has released a brochure that highlights the public interest benefits of STC's proposed satellite-to-home subscription TV service.

STC, a COMSAT subsidiary, has filed an application with the Federal Communications Commission seeking permission to construct satellites for the first phase of a US direct broadcast satellite service.

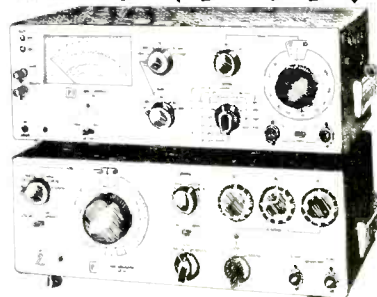
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Fiber-optics standards

The Electronic Industries Association Components Group recently announced the availability of Volume Two of the proceedings covering the First International DOD/Industry Fiber-Optics Standards Conference held on April 21-23, 1981.

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Catalogs and literature

forum for the exchange of ideas to achieve more effective communications between members of industry and government. The major thrust of the conference encompassed: standards needed, parameters to be covered and procedures in need of standardization. Volume Two includes those papers that were presented at the conference but not available for publication in Volume One.

Price is \$50. For more information, write to Mark V. Rosenker, Electronic Industries Association, 2001 Eye Street NW, Washington, DC 20006; (202) 457-4981.

Circle (267) on Reply Card

Circuit order wire system

Raven Electronics Corporation has announced the availability of a brochure on its new engineering service circuit order wire system for INTELSAT Standard B service.

The illustrated brochure presents complete details on the Raven 416 Series Order Wire System, which is designed to meet all INTELSAT Standard B requirements for Engineering Service Circuit (ESC) operation. A technical summary and specifications

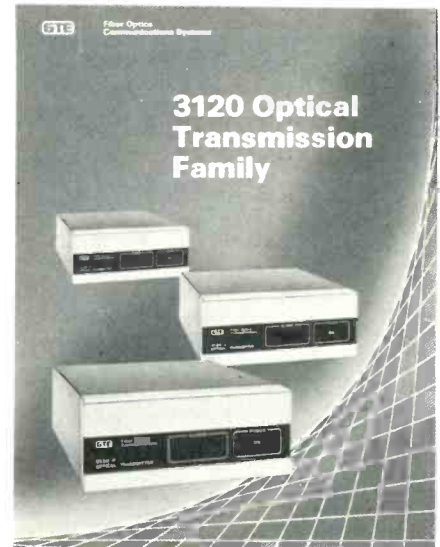
are provided for the system, which houses all circuitry for line conditioning, amplification, filtering, SCPC control and 2280Hz selective signaling in two rack-mountable cabinets.

More information is available from Raven Electronics Corporation, 395 Freeport Blvd., Sparks, NV 89431; (702) 359-3700.

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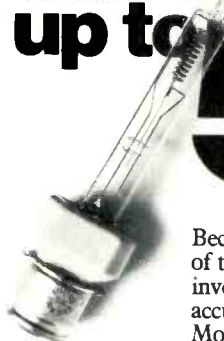
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munications Division has announced the availability of a 6-page brochure describing its 3120 Optical Transmission family.

The new 3120 family can transmit and receive voice, data or video signals over optical fibers, thus providing high quality, interference-free voice and data communications that are ideally suited for use in locations where communications quality experiences deterioration due to electromagnetic interference (EMI). Five models are available, each offering a transmitter unit and receiver unit that provide simplex (1-way) transmission through an optical fiber cable link.

For a copy of the 3120 Optical Transmission Family brochure, write GTE Lenkurt Inc., Dept. C720, 1105 County Road, San Carlos, CA 94070.

Circle (269) on Reply Card

Monitor oscilloscope

A 2-page bulletin from Gould Inc., Instruments Division, describes the new OS3350/5 TV Monitor Oscilloscope. This unit combines a line-by-line NTSC waveform monitor, a video monitor and a conventional 40MHz dual-trace scope with 5mV/cm maximum sensitivity. It is ideal for troubleshooting TV, CATV, CCTV, video recording, microwave repeater, mobile TV equipment, FLIR and digitally encoded signals.

Bulletin 449-15A provides complete specifications for the OS3350/5 and is available free of charge from Marketing Communications, Gould Inc., Instruments Division, 3631 Perkins Ave., Cleveland, OH 44114. □

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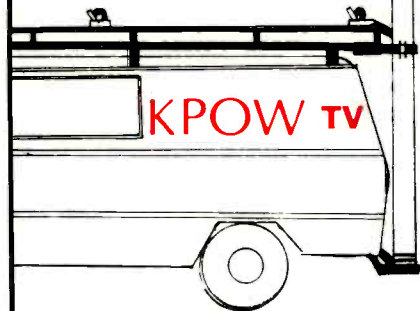
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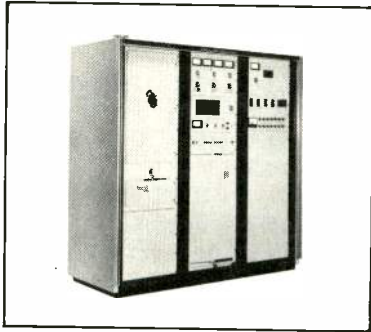
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Continental Electronics

Circle (210) on Reply Card

**new
products**

8x4x2 mixer

Fostex Corporation of America has introduced an 8x4x2 mixer, model 350, which is designed to be a companion to the Fostex A-8 recorder/reproducer.

The eight input channels are selectable for mix or line and are individually adjustable for any input level, with a 50 dB continuously variable trim control to accept other input sources.



External signal processors can be plugged in through any channel with individual accessory send and receive jacks.

Circle (272) on Reply Card

EFP Camera cable

A 14-conductor TV camera cable for electronic field production application has been introduced by Belden Corporation's Electronic Division. The Belden 9171 is made of color-coded vinyl-insulated 22-gauge conductors comprising five twisted pairs, each with its own Beldfoil aluminum foil-film shield and 22-gauge drain wire; two RG 59/U-type color-coded 75Ω coaxial cables with cellular polyethylene dielectric, 95% braid shield and vinyl jacket; and two color-coded vinyl-insulated 16-gauge conductors. The assembly is cabled together inside a chrome vinyl jacket 0.57 inches in diameter. Standard putups are 250, 500 and 1000 ft.

Circle (273) on Reply Card

Multichannel recorder

Sony has introduced its PCM-3324 24-channel stationary-head digital audio recorder, which provides 24-channel recording with 16-bit full linear quantization. Dynamic range is greater than 90 dB, frequency response is flat from 20 Hz to 20 kHz

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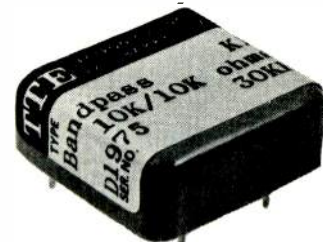
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Circle (250) on Reply Card

and harmonic distortion is less than 0.05%.

With the PCM-3324, edit points can be digitally cross-faded, and punches and punch-outs can be



automatically repeated with the same edit timing. The PCM-3324 has two additional analog tracks to allow

razor-blade editing and provides a separate SMPTE time code track for synchronized recording of up to 72 tracks. Advanced integrated circuits for the A/D, D/A converters have been developed for 16-bit accuracy with no adjustments.

The PCM-3324 incorporates a newly developed error correction system called the Cross Interleave Code, which presents loss of the music source, even if up to 88% of signal is interrupted within a constrained length of tape.

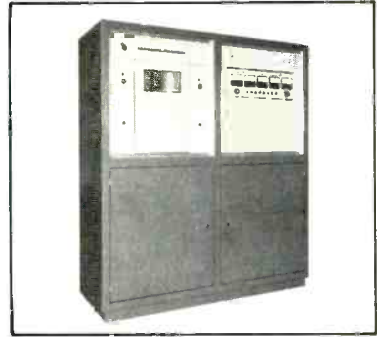
Circle (274) on Reply Card

VTR console system

The Winsted Corporation has announced the new model 3101-T VTR Console, which packages components in a compact, working module. It features adjustable height overhead bridge and rotating VTR turntable for ease of viewing and maintenance. Upper bridge includes 12-inch color monitor rack space and two half-rack spaces for waveform monitor and vector scope. Bridge adjusts up or down

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Circle (208) on Reply Card

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- No multi function controls.
- Power saving circuitry: 5 days normal operation with four AA cells, or plug into external 6-12 VDC source. NiCad batteries and charger are optional.
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Circle (209) on Reply Card

New products

in 1-inch increments to accommodate any 1-inch VTR. Roll-around base cabinet has 19¼-inch rack space for TBC, master on/off switch and convenient storage drawer for tools and service manual.

Circle (275) on Reply Card

Diagnostic equipment

Rank Cintel has introduced the T.O.P.SY. Diagnostic Equipment II, a microprocessor-based system that gives the T.O.P.SY. user access to all addresses in the T.O.P.SY. address field.

TDE II simplifies analysis and fault diagnosis and allows the user to program data externally for analysis of a required address area with an oscilloscope.

This system can be used to analyze the local interface, mainframe and remote racks either by running the pre-programmed routines or by writing a special program to examine a specific parameter under suspicion of failure.

Circle (276) on Reply Card

Broadcast aural exciter

Aphex Systems Ltd. has announced the Aphex II Broadcast Aural Exciter, which is designed to enhance multiple generation program materials to recreate the acoustical nature of sounds that may have been lost to heavy compression and bandwidth limiting. A tunable filter recovers audio information above 1kHz and creates a signal composed of frequency dependent, phase-shifted components, as well as amplitude dependent harmonics. This enhances

sounds originating from strings, voices and percussion for reintroduction into the source material. Designed for stereo operation, the exciter works equally well for monaural use with individual channel controls for the enhancement circuitry.

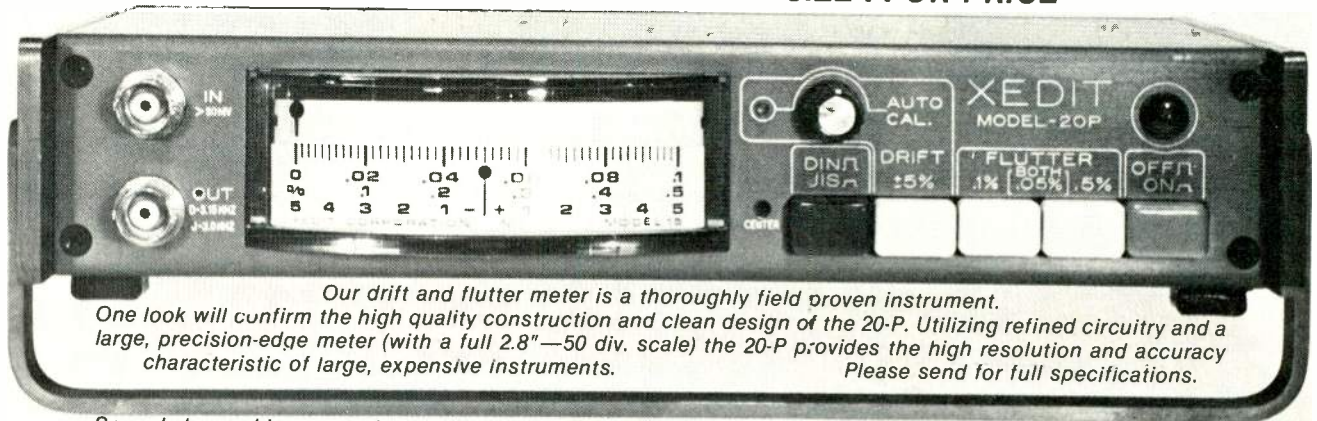
Circle (277) on Reply Card

Amplifiers

Raindirk Ltd. has introduced the Status 20 preamplifier and the Status 500 amplifier. The Status 20 features comprehensive faculties for professional or domestic use. It has 3-band sweepable tone controls, modular cartridge circuitry and outboard power supply. The Status 500 is a professional power amplifier featuring MOS, FET output stages, comprehensive protection circuitry bridging and 2.5Ω operation.

Circle (278) on Reply Card

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Circle (279) on Reply Card

Telescopic Hilomasts

Allen Osborne Associates has introduced a comprehensive line of telescopic Hilomasts. The NK series of Hilomasts are pneumatically operated with either a standard vehicle foot pump or a small air compressor. The series features five different models covering an extension range of 20 to 60 feet. A special feature is the full length keyways that prevent relative rotation between sections. This enables the masts to be used for directional antennas for frequent operations of short duration, without the necessity of locking the collars.

The NL series of telescopic Hilomasts feature seven models covering extension ranges from 26 to 70 feet. They are operated with a small air compressor. These masts have all the features of the NK series, but are of a heavier construction and will support larger antennas under more adverse weather conditions.

The NX series are the largest masts in the range. There are six models covering an extension range of 25 to 93 feet. These masts will support heavier head loads with greater stability, and are easily raised and lowered by means of a compressor. Both the NL and NX series Hilomasts are best used for vehicle installation.

The NP series are pneumatically operated with a standard vehicle foot pump or a small compressor. Three models cover an extension range of 17 to 30 feet. These masts are intended for use with light antennas where portability is of prime importance.

The WTM series of telescopic Hilomasts are hand- or machine-winch operated. They are suitable for use under inclement conditions. Four models cover extension ranges from 29 to 70 feet.

Supporting equipment for this line of Hilomasts include compressors, mounting hardware, winches and trailers.

Circle (280) on Reply Card

Delay system

MXR Innovations Inc. has introduced the model 151 Delay System II, which features such studio effects as flanging, chorus, Doppler shifting, doubling, hard reverb and echo. A 4-digit display indicates the actual time delay being used, and LEDs indicate the bandwidth of the system at

each delay setting. Front panel LEDs also indicate the optimum operating level, delay bypass and repeat-hold.

Other features include XLR and phone jack inputs and outputs and a level switch to optimize signal-to-noise for line and instrument level operation. Delay System II is housed in a sturdy, rack-mountable enclosure.

Circle (281) on Reply Card

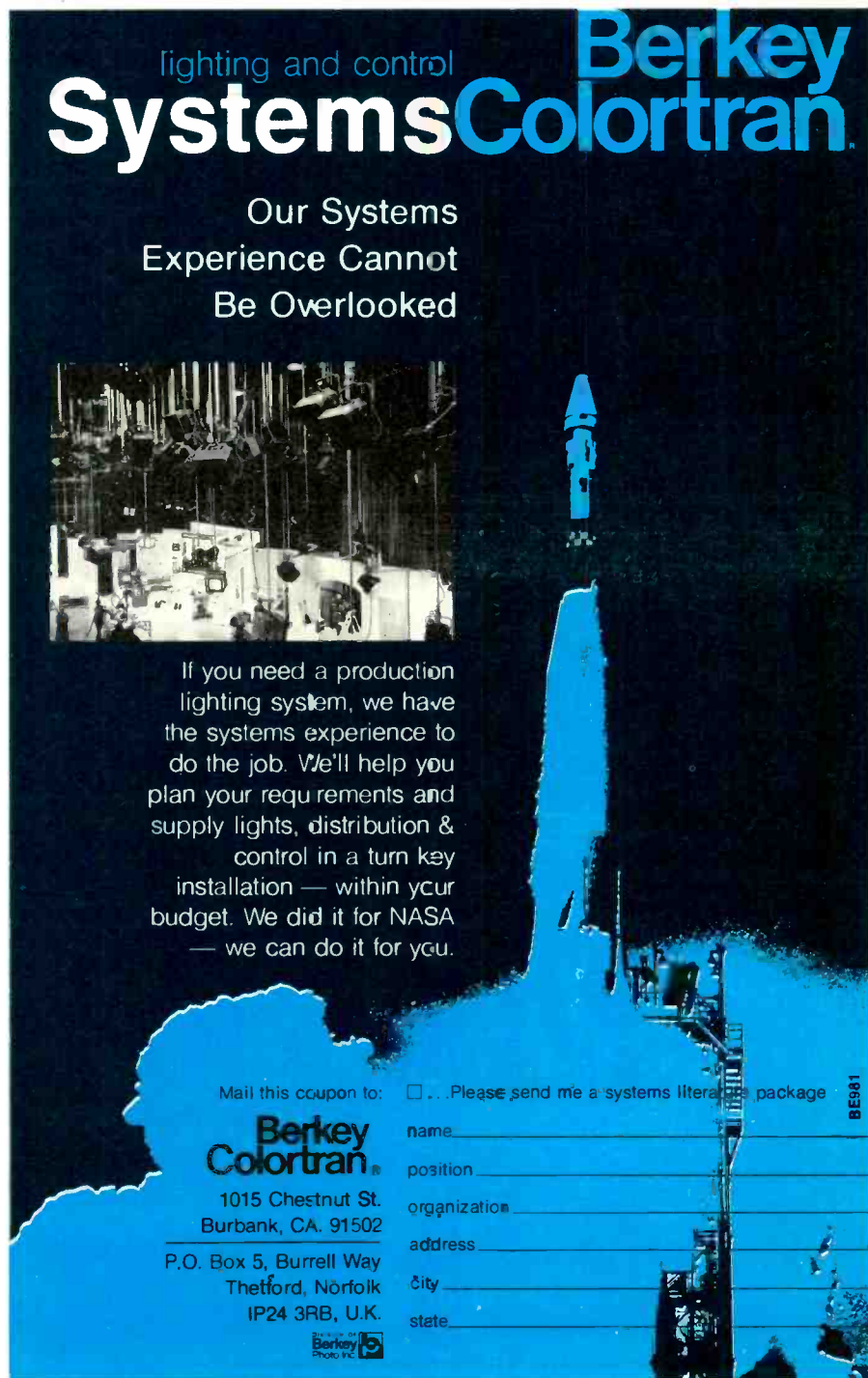
Bi-radial studio monitors

James B. Lansing Sound Inc. introduces the 4430 and 4435 bi-radial

studio monitors, each equipped with a bi-radial constant coverage horn, a new compression driver, new 15-inch low frequency drivers and an improved dividing network. The bi-radial horn is coupled to a compression driver which is crossed over at 100Hz. Recently developed in JBL's engineering laboratory, the driver features an aluminum diaphragm with a 3-dimensional diamond-pattern suspension.

Both the 4430 and 4435 are equipped with new 15-inch low-frequency drivers which feature new adhesives, voice coil formers and

continued on page 246



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people

McMartin Industries has announced the appointment of three broadcast district sales managers: **Jim Wagner**, serving Ohio, Indiana, Eastern Kentucky and Lower Michigan; **Richard Moen**, covering Delaware, Maryland, New Jersey, Pennsylvania, Northern Virginia, Eastern West Virginia, New York City and Long Island; and **Bill Harland**, serving Arizona, New Mexico, Southern California, the Southeast portion of Nevada and Hawaii.

Nick Adams has joined Videomedia as product marketing manager. Adams came to Videomedia from Orrox Corporation, where he held various key marketing positions for CMX editing systems.

Hitachi Denshi America Ltd. has announced the appointment of **Gino Nappo** to sales and marketing manager, southern region, which includes the Atlanta and Dallas offices. Nappo was most recently with Fernseh as regional sales manager. **James Morrison** has been appointed to the position of broadcast sales manager, western region. He has held numerous positions in both engineering and sales during his 30 years in the industry, including vice president of marketing for Ditek and sales manager engineer of Fernseh.

Joseph B. Howe has been promoted to division vice president and general manager of RCA's Commercial Communications Systems Division. Howe comes to the division from RCA's Government Communications Systems operations, where he served as division vice president and general manager since June 1979.

Rupert Neve Inc. has announced the appointment of **Anthony H. Langley** as vice president of sales. Langley most recently held the position of marketing manager for Neve's US operation.

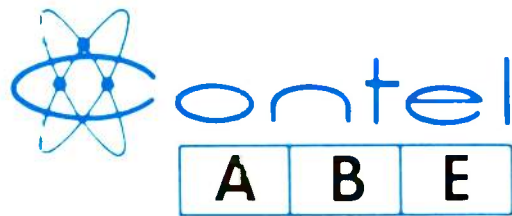
The Broadcast Electronics Systems Division (BESD) of Toshiba America Inc. has announced the appointment of two regional sales managers: **Ronald E. Zimbrick**, Midwest; and **Joy L. Wenzlaff**, Southern California and Arizona.

Cetec Vega has named **Kenneth M. Bourne** director of marketing, with responsibility for directing the firm's marketing, sales and product-planning activities, and for communicating with customers to satisfy their technical systems requirements. Before joining Cetec Vega, Bourne was manager of marketing services for Trio-Kenwood Communications.

Michael O. Felix, director of new product technology at Ampex Corporation, has received the 1981 Alexander M. Poniatoff (AMP) award, the company's highest honor for technical achievement given to employees. Felix was cited for his 21 years of extraordinary contributions to the development and design of magnetic recording systems. Awarded the gold medal and a cash prize of \$5000, Felix was honored at a recent banquet.

Joe Bean has joined Studer Revox America as a sales representative. Bean will develop the broadcast market for the Studer professional lines in the Southeast.

John L. Romanko has been named sales manager for Eigen Video, a California-based manufacturer of video



recording equipment. A 17-year veteran of the broadcasting field, Romanko will direct the growing company's sales efforts in the color broadcast, military, scientific and industrial fields. Romanko will also serve as liaison for Eigen with its network of North American sales representatives and be responsible for the company's marketing and advertising programs.

Larrie Rose has been named international sales manager of Belden Corporation's Electronic Division. Rose will be headquartered in Dusseldorf, West Germany, where he will direct a program to increase Belden's penetration of the western European electronic cable market.

Stanley Schwartz has been elected executive vice president at Rosco Laboratories. He was formerly president of an advertising agency bearing his name and had been associated with Rosco for more than 10 years.

Chip Ermish has been promoted to the sales staff of Katz American Television in New York. Ermish came to Katz in 1980 as a member of the American division's sales training program. Prior to joining Katz, Ermish was a broadcast buyer for Kenyon & Eckhardt. His previous experience includes positions with Benton & Bowles as an assistant broadcast buyer and target group as a media trainee.

Vicki Pierce has joined the sales staff of Katz Radio's Chicago office. Pierce comes to Katz Radio from Buckley Radio Sales in Chicago where she was an account executive. Her previous experience includes sales positions with several broadcasting stations.

Roy Raymond has been named manager, national interactive programs for Sony video products. In this newly created position, Raymond will be responsible for the national planning and coordination of Sony's new institutional video disc and Video Responder hardware with the national dealer network, end-users, production houses, and duplication facilities. He will be headquartered in New York.

Robert Bensman has joined Sony as market development manager in the southeast. He will be responsible for the marketing of interactive equipment including the videodisc and Video Responder in Florida, Georgia, South Carolina, North Carolina, Virginia and Washington, D.C.

Mary Ann Weisberg has been named west coast public relations account executive for the William B. Tanner Company Inc., Memphis, working out of the Tanner regional office in Los Angeles. She will report to Mr. William B. Tanner, chairman/president, through director of marketing/media sales Edward F. Hartnett. Previously, Weisberg was an account executive with ICPR, a public relations firm specializing in service to the motion picture and broadcasting industries.

Vital Industries Inc. has announced the appointment of **Stanley E. Basara** as senior vice president and general manager of its facility in Gainesville, FL. Basara was formerly division vice president and general manager of RCA's Broadcast Systems. Basara will be responsible for the full line of video products designed, manufactured and distributed by Vital Industries Inc.



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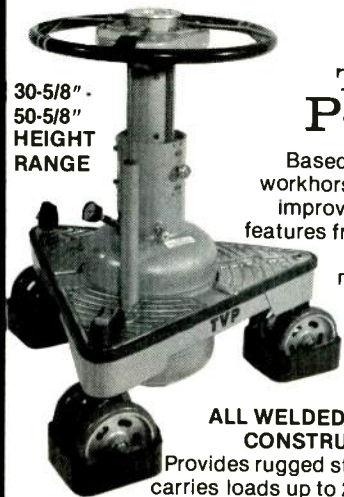
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New products

Symmetrical Field Geometry (SFG) magnetic structure. The 4430 and 4435 differ in their low frequency system design. The 4430 incorporates a single 15-inch driver and can handle full-power input (150W) to 27Hz. The 4435 uses two 15-inch low frequency loudspeakers; the second operates below 100 Hz in parallel with the first. The 4435 will handle full power (300 W) from 100 Hz down to 22 Hz.

Circle (282) on Reply Card

Flash filter, soft contrast filter

Tiffen Manufacturing Corporation has introduced the new Tiffen Filter Number 812 designed to reduce excess blue when using electronic flash. The 812 absorbs the excess blue of both portable and built-in electronic flash units and achieves a more natural rendition of skin tones with Kodacolor or Ektachrome film. The new Tiffen Number 812 Filter can also be used outdoors or in shaded areas to produce a warmer, more pleasant tone.

Tiffen has also announced a new soft contrast filter. This filter tones down bright colors to produce a

softer, muted effect. With the new soft contrast filter, blacks remain black and sharpness is maintained without graininess. Available in all sizes, supplied in densities 1 through 5.

Circle (283) on Reply Card

Chargers

Perrott Engineering Labs Inc. has introduced three new products. The PE 8100 Kwik-Charger is a lightweight, compact microprocessor charger, which can charge any major manufacturer's 12, 14.4 or 30V battery packs, as well as VTR and Ampex packs. The PE 62 Minipack, a 13.2V/8 AH ni-cad pack, operates the Ampex VPR-20 for more than an hour. The PE 200, MP 114 Gemini Kwik-Klips, a lightweight battery and charger combination, are available in ni-cad and silver. These units clip on to cameras for convenience.

Circle (284) on Reply Card

Split recording/remixing console

MCI has announced the release of the JH-652 Recording/Remixing Console, designed for true split operation. The JH-652 incorporates 52 inputs, physically installed 26 on either side of the master control section. The

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revolutionary feature is that the mix outputs, effects/foldback outputs and automation of each side can be operated independently as if they were two separate consoles, or joined to operate as one larger console. This makes the console ideal for use with dual synchronized multi-track recorders or in applications requiring separate monitoring facilities. Standard features on the JH-652 include MCI patented Plasma Display PPM bargraph metering, full level and mute automation, six wild faders usable for pan or effects automation, 3-band equalization on each input and transformerless circuitry throughout the recording chain.

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Mastering recorder

Fostex Corporation of America has announced a 2-track, 2-channel mastering recorder/reproducer, the



A-2, a 3-head machine that operates at 15 ips and 7½ ips with 7-inch reels. The A-2 features a transport section with three lightweight dc motors and an FG servo on the capstan motor.

The A-2's sync capability permits last-minute adjustments during production. A digital tape counter with LED readout includes a memory function. The A-2 weighs 29 lbs and measures 13½"x14"x6¾".

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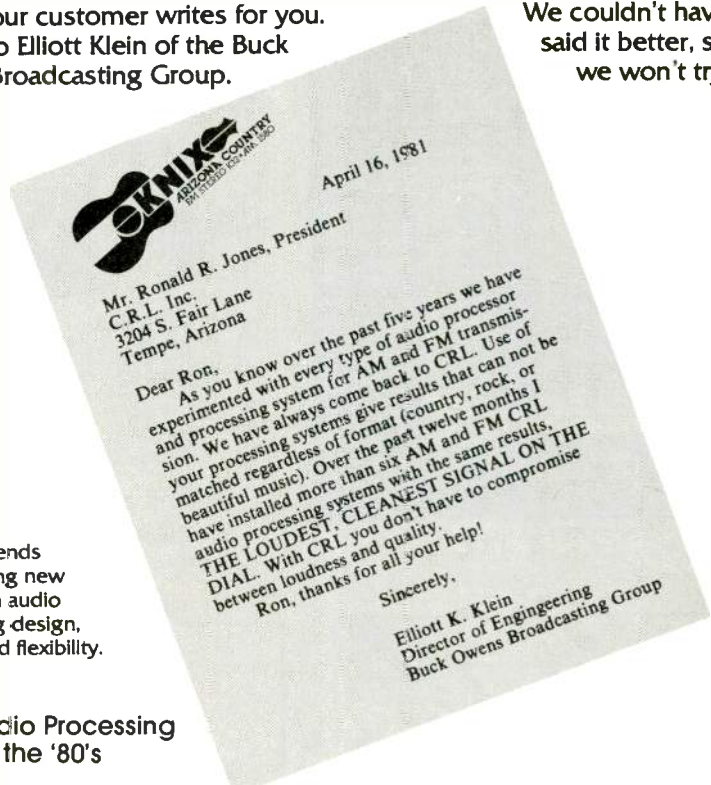
SMPTE test cassette

SMPTE's videotape test cassette for receiver monitor setup is now available in a ½-inch format, in addition to the ¾-inch format. There are three ½-inch tapes available: Type G 1-hour (beta) format (code no. V2-RMS-B1); Type G 2-hour (beta) format (code no. V2-RMS-B2); and Type H 2-hour (VHS) format (code no. V2-RMS-V). The ¾-inch Type E (U) format (code no. V3-RMS) has been available for about a year. The video test tape is intended to verify that the videocassette playback system is operating normally and to supply reference signals useful for adjusting operating controls on the receiver or

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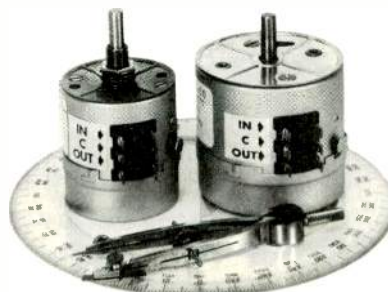
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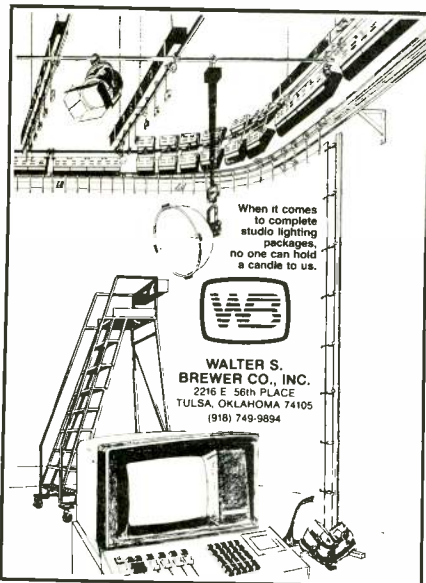


A new series has been added to SSAC's line of "B-Kon-Flash". The new devices with a load current rating of 300 Amperes Inrush will operate up to four beacons at 230 VAC, two beacons at 120 VAC. Also available are auxiliary units for synchronous operation of additional beacons on separate lines or for alternating flashing of beacons.

Lamp Life is increased by approximately 10 X due to Zero Voltage Switching. Device measures 2 x 2 inches and is completely encapsulated. Price in 1-9 quantity, \$41.52 each, FOB Factory. For more information call (315) 622-1000.

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New products

monitor for its intended use. The cassette is used for the subjective evaluation of receiver or monitor setup and for checking out the overall video and audio performance of magnetic helical-scan tape reproducers. No test instruments are required. A commentator describes each scene and what it is intended to check. Each cassette comes in a case and is accompanied by a Wratten 47B blue filter (or equivalent) and an instruction sheet on tape usage. The tapes are made in accordance with SMPTE Recommended Practice RP 96.

Circle (301) on Reply Card

Office computer system

Patrick Computer Systems Inc.'s iC436 Office Computer System is a small, in-house computer system with general accounting, word processor, inventory and mailing list software. The Model 1 is designed for one user incorporating four Z-80A microprocessors. A memory size of 114 kilobytes combines with a storage capacity of 2 megabytes. By adding more microprocessors to the system and including multifunction/multi-user software, the iC436 can easily handle the additional tasks needed for the broadcaster of billing, for example, available spot checks and program logs. Compilers for Fortran, Cobol, RPG and Basic are available for this system, which may include up to five users with 338 kilobytes of memory and access to 100 megabytes of storage. Line printer; four double-density, double-track, double-sided disks; and a 131-key keyboard with a 12-inch diagonal video display unit ease input, output and storage.

Circle (302) on Reply Card

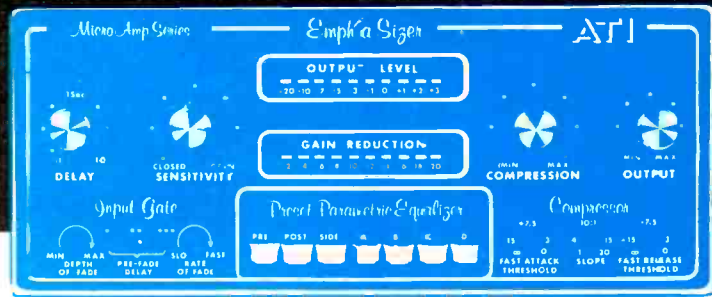
Cable access van

Tele-Measurements Inc. has introduced the CAV-1 cable access van to provide technical production facilities for on-site camera coverage and videotape editing.



An Econoline-type vehicle, the CAV-1 comes equipped with a 6.5 kW continuous-duty generator for full electronic operation, heating, air conditioning and work lights. The van is

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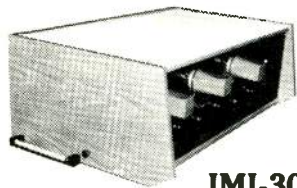
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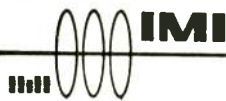


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New products

supplied with two color cameras, camera extension cables, camera control units, and both color and black-and-white video monitors. Electric components are mounted on two portable rack consoles, which may be rolled off the van for close-to-the-scene operation.

Circle (303) on Reply Card

Wireless diversity tuner

Sony's Professional Audio Division has introduced the WRR-37 UHF diversity tuner for use with the WRR-27 belt-pack transmitter and lavalier microphone or the WRT-57 hand-held wireless microphone. The portable tuner is designed for ENG and EFP use, as well as studio applications.

The WRR-37 uses two independent receivers on the same frequency, two separate antennas and a diversity switching circuit that continuously samples the outputs. The battery-powered WRR-37 measures 6"x1½"x8" and weighs 2.8 lbs.

Circle (304) on Reply Card

Low frequency drivers

James B. Lansing Inc. has introduced two new 15-inch low frequency drivers, models 2225H/J and 2235H. Both loudspeakers feature Symmetrical Field Geometry (SFG) magnetic structure, high temperature adhesives, optimized coil former construction, ¾-inch voice coil and suspension elements.

The model 2225H/J is specifically designed for both horn-loaded and vented box enclosures. The drive is available as the 2225H with an impedance of 8Ω or as the 2225J, when a 16 Ω impedance is required.

Circle (305) on Reply Card

Audio adapter kit

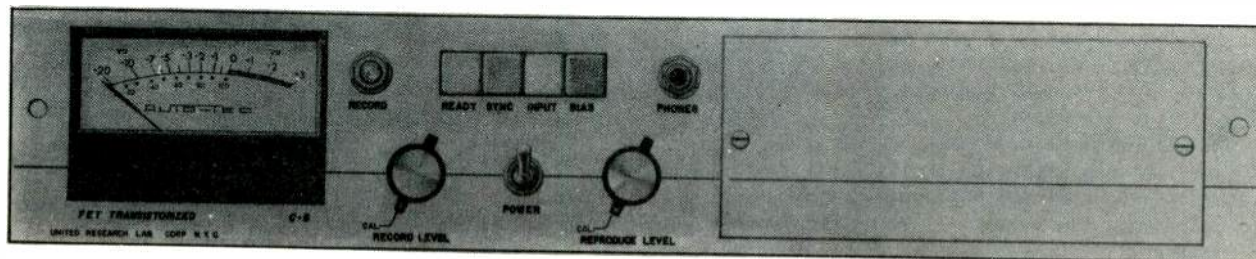
Switchcraft Inc. has introduced Series 399M audio adapters for its line of "Q-G" audio connectors. Included in the public address audio adapter kit are a 3-pin male "Q-G" to 3-contact female threaded-coupling microphone connector; a 3-pin male "Q-G" to 3-contact male threaded-coupling microphone connector; a 3-pin male "Q-G" to 4-contact female threaded-coupling microphone connector; and a 3-pin male "Q-G" to 4-pin male

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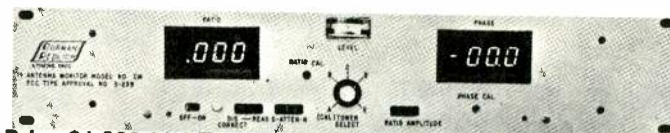
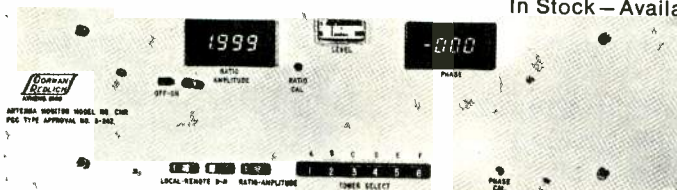
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Gorman Redlich Mfg. Co.

6 Curtis Street

Athens, Ohio 47501

614-593-3150

Circle (234) on Reply Card

threaded-coupling microphone connector. These adapters are designed to mate with all Switchcraft 3-pin male "Q-G" audio connectors and similar types. On the other end, they mate with Amphenol 3- or 4-contact male or female threaded-coupling microphone connectors.

Circle (306) on Reply Card

Edit time code reader

The SMPTE Edit Time Code Reader introduced by J.S. Wiener Associates requires only 1 5/8" X 4 1/4" of panel space. This self-contained reader has front panel selection of either time code or user bits in 3/10-inch LED displays. Drop frame flag (color timing) is also decoded and displayed on the front panel. Unique circuitry is used to freeze the display, useful for off-line edit decision logging or to enable/disable the self-contained error bypass logic.

Circle (307) on Reply Card

Dual limiters

New from MXR Innovations Inc. is the MXR Dual Limiter, which offers mono-stereo limiting capabilities and

musically natural response.

The Dual Limiter can be viewed as two independent mono limiters patched together via front panel switches for stereo limiting applications. Each channel features an in/out switch, slope switch, input, output, attack and release controls and an LED to show the amount of gain reduction. The rear panel has both XLR and 1/4-inch phone jack input and output connectors.

Other features include balanced inputs, the ability to drive 600Ω loads, ±19 dBm input and output and standard rack dimensions (1 3/4 inches high).

Circle (308) on Reply Card

Audio router/amplifier

Ramko Research has introduced the Model ARA-1612 Audio Router/Amplifier, which uses CMOS and opamp circuitry to electronically switch 16 monaural inputs to any of 12 outputs, either individually or simultaneously, with an LED display of the activity status. The system may be programmed for stereo and monaural combinations of inputs and outputs. Stacking allows increased capacity of inputs or outputs. The

power supply includes auto-switched redundancy. Remote control facilities and optional battery pack for logic "keep-alive" are optional.

Circle (309) on Reply Card

Digital Grain Reducer

Rank Cintel has introduced its Digital Grain Reducer. The unit enables automatic film-grain reduction achieved by assessing input noise, picture content and picture movement to determine maximum reduction.

The equipment operates at a clock frequency of 851 times line frequency and uses 16K dynamic RAMs based on NMOS technology for the picture store and Schottky TTL and low-power Schottky TTL integrated circuits to complement this technology.

Certain diagnostics have been built into the equipment including a digital sawtooth signal to enable checks to be made at specific test points and, to aid fault location in the main picture store, a flashing cursor that may be superimposed at each store location and viewed on the output picture monitor. □

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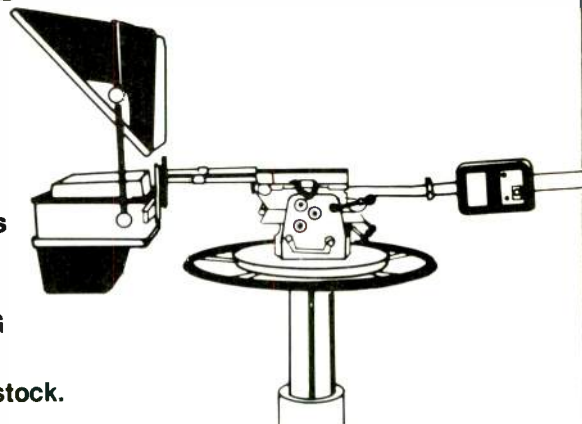
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calendar

Sept. 23-25

The *Sixth Annual Conference on Satellite Communications*, entitled "Space Communications in the '80s," will be held at the Washington Hilton Hotel in Washington, DC.

The conference features a look into the future of the space communications industry. "Satellite Communications in the '80s and '90s" will be presented by Winston Himsworth, first vice president of Lehman Brothers Kuhn Loeb.

For registration information, contact: Director of Communications, Public Service Satellite Consortium, Suite 907, 1660 L Street NW, Washington, DC 20036.

Oct. 5-7

The *1981 International Electrical, Electronics Conference and Exposition* will be held in Toronto.

The conference theme is "Change, Challenge, Opportunity." Topics include the application of microelectronics and microprocessor technology in all areas of electrical and electronics engineering.

A topic of interest, communications systems—satellite, vehicular, TV digital and fiber-optics—will be discussed. Other topics of discussion include: computer technology, microcomputer technology, electronic circuits and systems, power technology, power systems, industrial systems, biomedical engineering, energy systems and electromagnetic capability.

Oct. 7-8

Three chapters of the *Society of Broadcast Engineers* are cooperating to bring about a tri-state regional SBE Convention. This year the convention will be held in Indianapolis, IN.

The SBE chapters of Indiana (25), Southwest Ohio (33) and Kentucky (35) have planned this regional convention to be rotated among the states: Indiana in 1981, Ohio in 1982 and Kentucky in 1983.

Papers are being evaluated by the Ohio chapters. To present a paper, contact: Chairman, SBE Chapter 33, c/o WCET, Cincinnati, OH.

Oct. 25-30

The *123rd Technical Conference and Equipment Exhibit of the Society of Motion Picture and Television Engineers (SMPTE)* will be held at the Century Plaza Hotel in Los Angeles, CA.

The conference will include five days of sessions on the technical aspects of television and motion pictures. Also, there will be a 331-booth equipment exhibit featuring TV and filmmaking equipment. A full week of social activities is planned, including a luncheon, a banquet and a program for spouses.

Howard LaZare, Consolidated Film Industries, has been appointed general arrangements chairman and will be responsible for many of the non-program arrangements for the conference.

Committee chairmen responsible for conference functions include: Harry Teitelbaum, Hollywood Film Co.; Ted Fogelman, Consolidated Film Industries; Bud Stone, DeLuxe General; Bea Hopkinson; Charles Kircher, Foto-Kem Industries; Esther Kessler, ABC; Irwin Freedman, Agfa-Gevaert; Tony Dieniewski, Golden West Broadcasters; Glenn Berggren, Schneider Corp. of America; Don Kloepfel, consultant; Frank Pontius, Westrex Corp; Fred Godfrey, Eastman Kodak Co.; Scott Robertson, Eastman Kodak Co.; and Gus Dato, ABC.

Julian Hopkinson, Agfa-Gevaert, has been appointed program chairman. He will organize the program to attract a diverse audience from among SMPTE members and others in the motion-picture and TV industries.

The associate program chairmen are Chester D. Luton, MGM Labs Inc.; M. Carlos Kennedy, Ampex Corp.; and John D. Moseley, Comtrak.

The topic chairmen include Gary L. Borton, Eastman Kodak Co.; Michael V. Chewey, Lab Methods Corp.; Larry Evans, Ampex Corp.; Charles P. Ginsburg, Ampex Corp.; Linwood Dunn, A.S.C., Film Effects of Hollywood; Fred J. Hodge, 3M Mincom Division; James J. Nowack, MGM Labs.; Robert J. Ringer, Ringer Video Services; and Leonard Sokolow, C.F.I.

There are two topic chairmen at large, Dennis J. Kimbly, Kodak Ltd.; and Stephen C. Chamberlain, DuArt Film Labs.

More information may be obtained from SMPTE, 862 Scarsdale Ave., Scarsdale, NY 10583.

Nov. 1-4

The 1981 Annual Conference of the National Association of Educational Broadcasters will be held at the Hyatt Regency Hotel in New Orleans, LA.

Among the special events at the meeting will be a schedule of minicourses, seminars and specialized classes along with innovation and information halls, the program exhibition library and the job center.

The conference will continue its emphasis on professional development for individuals working in public radio and television, and educational, informational and other areas of noncommercial telecommunications.

For more information about registration and accommodations, contact: NAEB, 1346 Connecticut Ave. NW, Washington, DC 20036; (202) 785-1100.

Nov. 1-4

The Annual Satellite Communications Symposium will be held at the Hilton Hotel in Atlanta, GA.

The symposium is expected to attract about 700 participants from the broadcasting, business data and cable TV industries and from related international groups. Workshop sessions, guest speakers and panel discussions are scheduled to cover updated technical and business aspects of satellite communications.

There will be a \$125 registration fee to cover costs of meals and conference material. For more information, contact: Scientific-Atlanta Inc., One Technology Parkway, Box 105600, Atlanta, GA 30348; (404) 441-4000.

Nov. 10-12

The Second Annual Visual Communications Congress/West, with its program of comprehensive seminars and an equipment exhibition, will be held at the Century Plaza Hotel in Los Angeles, CA.

There will be seminars covering a variety of subjects dealing with film and TV production, photography and audiovisual presentations. In addition to the seminar program, associations such as the International Television Association, the Information Film Producers and the Association for Multi-Image will conduct concurrent meetings.

For information on the seminar program, contact: VCC/Conference Management Corporation, 500 Summer St., Stamford, CT 06901. Exhibit information is available from Visual Communications Congress Exhibit, 475 Park Avenue South, New York, NY 10016. □

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TV ENGINEER: Progressive southeastern PTV station seeks experienced person to operate/maintain state-of-the-art equipment, including RCA TK-45 & 46's, TK-28, TR-600, AE-600, Sony BVH-1100. High school diploma, 2 years technical school, 2 years TV broadcasting experience required. Call/write WDCN-TV, P.O. Box 120609, Nashville, TN 37212, (615) 259-9325. M—F 8:00 a.m. to 4:30 p.m. by September 18. AA/EEO Employer. 9-81-11

CHIEF ENGINEER for newly equipped University telecommunications center. Facilities include 50KW FM, UHF, ITFS, CCTV, and production studio, EFP and remote units. BS in related field and 3 years engineering experience required. Competitive salary plus university fringe benefits. Apply to: Joel L. Hartman, Bradley University, Center for Learning Resources, Peoria, IL 61625, (309) 676-7611 X235 An Affirmative Action/Equal Opportunity Employer. 9-81-21

HELP WANTED (CONT.)

Discovision Associates, a leader in the video disc industry, has immediate needs for Television Engineers and Technicians. Hands-on experience in the maintenance of TV production and post production equipment: Quad, 1" c, CMX, GBG, Rank, etc. Must have strong technical background.

Excellent salary and benefits. Located in the Newport Beach, CA area. Write to: Ms. Donna Leverett, Discovision Associates, Box 6600, Costa Mesa, CA 92626. Equal Opportunity Employer M/F/H.

TELEVISION TRANSMITTER MAINTENANCE ENGINEER KPIX—SAN FRANCISCO, applicants should have a minimum of 3-year broadcast experience covering VHF transmitters, video processing equipment, remote control, and microwave systems. Send resume to Charles Rose, KPIX, 855 Battery, San Francisco, 94111. We are an equal opportunity employer.

AUDIO LEAD ENGINEER (Broadcast Technician III) for major market Northwest PTV VHF station to establish audio standards, plan and implement system, and lead proper maintenance and operation of all audio equipment and systems including multi-track recording equipment. MQ four years full-time experience/training in radio or TV broadcast technician work. Must have three years experience in complex audio mix setting; two years in installation, working with creative staff on production, establishing audio standards in large broadcast or recording studio; one year experience leading, training staff, drafting purchase specs, executing stereo pickups for symphony, opera, etc. Salary: \$19,992—\$25,584 liberal benefits. Deadline October 19, 1981. For official Broadcast Technician III application form contact Henri McCleney, Staff Employment Office, University of Washington, 1415 NE 45th, Seattle, WA 98195. (206) 543-2869. AA/EEO.

UHF XMTR & STUDIO MAINTENANCE: Immediate job opening for person qualified to perform maintenance and proofs on UHF TV transmitter. Also must be experienced in maintenance of quad and C-format VTR's, studio switchers, cameras, etc. Competitive salary and benefits. Send resume and application to: R. Snow C/E, KTSF-TV, 185 Berry Street, San Francisco, CA 94107. (415) 586-2638. 9-81-21

HELP WANTED TECHNICAL: N.Y.C. post-production facility is looking for a maintenance engineer who has a working knowledge of video electronics and experience who has a working knowledge of video electronics and experience in the repair and maintenance of Sony 3/4" VTR's and One Inch Type "C" VTR's. Responsibilities will include assisting in the construction and set up of new facilities which will include; 2 computer editing suites, broadcast quality insert stage, and maintenance after construction. Salary will be commensurate with experience. Send resumes to: TAPEPOWER, 18 East 50th Street, New York, NY 10022 9-81-11

TELEVISION: HELP WANTED TECHNICAL. SEE THE USA! and the Big Events in a Super Kenworth 40 footer and a top flight 27 footer, both with all new Hitachi 96's, Sony 1100's, Grass Valley 1600's, RTS and more! We do quality shoots and we need quality engineers to keep us rollin'! Call John Glawe at Northeast Productions 1-800-233-4777. In PA call: 717-826-1616. 9-81-11

POSITION WANTED

RADIO ENGINEER seeks a secure position with a non-commercial educational entity. Multi-faceted with a desire to do live recording/remotes, especially jazz. Also enjoy board shifts, and can do any routine studio/transmitter maintenance. Strong background in analog/digital technology. Quality oriented attitude with ear for high grade sound. First class radiotelephone. Willing to relocate for the right job. TV and commercial stations need not reply. Contact T. Eifert, 1102 Catalpa Circle; Madison, WI 53713 9-81-11

WANTED

WANTED; Pre-1928 radio equipment and tubes. August J. Link, Surcom Associates, 305 Wisconsin Ave., Oceanside, CA 92054, (714) 722-6162. 3-76-11

HIGHEST PRICES PAID for 112 Phase Monitors and for clean, 12 year old or less, 1 KW and 10 KW AM Transmitters. All duty and transportation paid. Surplus Equipment Sales, 2 Thorncliffe Park Dr., Unit 28, Toronto, Ontario, Canada. M4H 1H2, 416-421-5631. 2-79-11fn

INSTANT CASH FOR TV EQUIPMENT: Urgently need transmitters, antennas, towers, cameras, vtrs, color studio equipment. Call toll free 800-241-7878. Bill Kitchen, Quality Media Corporation (in Georgia call 404-324-1271). 6-79-11fn

SARKES TARZIAN cross points Part #85-386 for Sarkes distribution switches also release modules Sarkes Tarzian part #85-387. Call or write Gordon Ginsberg LC2 SUNY at New Paltz, New York 12561 (914) 257-2525. 9-81-11

INSTANT CASH FOR BROADCAST EQUIPMENT: Urgently need UHF Transmitters, Microwaves, Towers, Weather Radar, Color Studio Equipment, AM & FM Transmitters. Call Bill Kitchen, Quality Media. 800-241-7878. In GA call 404-324-1271. **Reward for UHF Transmitters.** Quality Media will pay a \$500 reward for information which leads to our purchase of any UHF television transmitter. One reward per transmitter. Call Bill Kitchen 800-241-7878. In GA call 404-324-1271. 9-81-11

NEUMANN, TELEFUNKEN, AKG tube microphones, all models, functioning or not, wanted; some transistor models. Also RCA ribbon microphones; Pultec Equalizers; EMT reverb plates; Teletronix, Fairchild, Universal Audio, Urei Limiters. J. MANDEL, TRITON PRODUCTIONS, 38 BROOKS ST., BRIGHTON, MA 02135, (617) 787-2220. 8-81-21

WANTED: Radio Transcriptions 16" E.T.'s, any Eddy Arnold, or other Country 15" or 12" Transcriptions. Will consider others. Interested in Radio Station Libraries to purchase, all speeds of records. Boyd Robeson, 2425 W. Maple, Wichita, Kansas 67213, (316) 942-3673, 722-7765 Ev. 9-80-11fn

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