The broadcast industry's comprehensive product directory

1982 Buyers' Guide Issue
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THE COVER for the annual Buyers’ Guide, traditionally, is a challenge for our editors and artists. Each year we try to find a way to capture the interests of both our radio and TV readers with the cover of our September issue. It is a tough assignment, and we welcome suggestions from anyone who thinks they might have an idea that will accomplish our goal.

This year, however, we elected to sidestep the issue! The cover has nothing to do with broadcasting. It is simply a colorful piece of art generated via computer. The original photograph was supplied by Digital Effects in New York City. Graphic design was provided by Kim Nettie.

COMING EVENTS...
Sept. 30-Oct. 2
RTNDA International Conference, Ceasars Palace, Las Vegas, NV.
Oct. 1-3
LPTV East Conference, Shoreham Hotel, Washington, DC.
Oct. 11-13
National Cable Television Association Business Development Symposium, Washington Marriott, Washington, DC.
Oct. 11-13
Electronic Industries Association 58th Annual Conference, Century Plaza Hotel, Los Angeles.
Oct. 19-20

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OCTOBER ISSUE:
• Third annual engineering/management salary survey
• Standards conversion for TV
• Wireless and professional mics
"I want the world. Consistent .05% corner registration and full auto-setup of up to 96 cameras on computer command."

Don't want much, do you?
Dynamic registration not just at dead center but at all four corners.
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You're asking for some smart camera system, networks of the world and top-drawer video production companies.

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In side-by-side comparisons with the Tektronix 60-MHz oscilloscope, the reasons for selecting the 50-MHz LBC-517 become apparent. Our 20 kV accelerating potential provides the sharp, bright trace that has always been the hallmark of a high-performance oscilloscope.

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To be really useful today, an oscilloscope needs more than bandwidth. The LBO-517 gives you:

**Four Channels (8 traces).** Essential for displaying clock or trigger pulses, or for simultaneously looking at three or four terminals of a logic gate. **B-Ends-A Mode.** For an even brighter delayed sweep display. Lacking this feature, some signals would just disappear. **B-Time Base Triggering.** For displaying some complex signals. Also eliminates jitter on delayed time base. **Automatic Video Triggering.** Separates either vertical or horizontal sync pulses for stable video waveform monitoring.

**Vertical Amplifier Output.** Lets you drive less sensitive instruments with just 1 mV input to the LBO-517. **Illuminated Graticule.** Needed when photographing waveforms. All of these capabilities, plus "UNCAL" Warning Lamps,

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<th>Manufacturer</th>
<th>LEADER LBO-517</th>
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<tr>
<td>Accelerating Potential</td>
<td>20 kV</td>
<td>10 kV</td>
</tr>
<tr>
<td>Bandwidth/Sensitivity</td>
<td>50 MHz/5 mV</td>
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<tr>
<td>NO. of Channels</td>
<td>4 CH</td>
<td>2 CH</td>
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<tr>
<td>MAX. No. of Traces</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Trigger View</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>B-Ends-A Mode</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Ext. Trigger of B Sweep</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Video Trigger Separator</td>
<td>V and H</td>
<td>V ONLY</td>
</tr>
<tr>
<td>L.F. Trigger Reject</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>CH-1 Amplifier Output</td>
<td>50(1), 100 mV</td>
<td>50(1), 100 mV</td>
</tr>
<tr>
<td>Graticule Illumination</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>&quot;UNCAL&quot; Warning Lamps</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>

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For Demonstration Circle (8) on Reply Card

Pushbutton Switches, and more, put the LBO-517 in a class by itself.

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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 tape transports.

**MASTERCLOCKS**

ES 163 Mounted in a 5 1/2" rack panel and chassis, displays six digits of time information on two 1" gas discharge displays.ES 161 has three second per month accuracy. Its standard output is a serial BCD. DMOS converters are available on this unit. ES 163 and 160 do not buffer all options, and outputs are through rear-mounted connectors.

Dimensions: 5 1/2" High x 15 1/2" Wide x 6" Deep $1050

ES 160/1 One second per month version of ES 160. $1250

ES 155 The ultimate in accuracy! Similar to ES 160, with serial circuitry for receiving and decoding a 1000 Hz tone at the start of each minute. The decoder output resets the seconds counter in the clock each minute except the first minute of every hour. These times are transmitted by radio Station WWV, with an oscillator accuracy of ±1 part in 10^11. ES 155 has an external and internal WWV receiver with audio output. Display switches are 2 red LED's. Serial output drivers ES 163, 161, 171, 991 and 993 Remote Displays. Dimensions: 5 1/2" High x 19" Wide x 15 1/2" Deep $1250

ES 192/194 The most economical Masters. ES 12 (ES 120 and 124) and ES 194 (24 hr) are configured 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 Data ES 161, 166, 171, 991 and 993 Displays. These are 6" in landscape format.

Dimensions: 2 1/4" High x 4" Wide x 6" Deep $325

**600 SERIES AND TEMPERATURE MASTER**

Displays the same as ES 162, but with gas discharge displays, panel mounting, standard BCD outputs for time and temperature. Displays in 12 and 24 hour format.

Dimensions: 2 1/4" High x 4" Wide x 6" Deep $766

**ACCESSORIES**

ES 181 REMOTE DIGITAL DISPLAY: Decodes serial time data and displays six digits of time on LED displays in 12 or 24 hour format.

Dimensions: 6" Wide x 2 1/2" High x 6" Deep $185

ES 182 IMPULSE DRIVER: Plugs into ES 160 chassis, can drive 20 Impulse Clocks.

ES 183 Serial Time Code Generator: $310 to $390

ES 184 COMPARATORS: $310 to $390

ES 192/194 The most economical Masters. ES 12 (ES 120 and 124) and ES 194 (24 hr) are configured 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 Master Clock ES 161, 166, 171, 991 and 993 Remote Displays. Dimensions: 5 1/2" High x 19" Wide x 15 1/2" Deep $1050

ES 190 TEMPERATURE SLAVE: Receives serial time code from ES 193, displays on 5 1/2" Gas Discharge Displays. ES 190 mounts in the chassis of a Standard Item.

Dimensions: 6" Wide x 2 1/2" High x 6" Deep $146

ES 191 SERIAL TIME CODE GENERATOR: An integral part of ES 160, 161, 190, 191 and 196 Master Clock units. ES 191 can be added to any other ES product, including ES 112, 124, 126, 184, 992, 994, 996, 751, 753, 761, 970 and all 380 Series Time Programmers. Drives ES 161, 166, 171, 991 and 993 Remote Displays. $145

ES 192, 193, 194: The most economical Masters. ES 192 and 194 provide 24 hour decoding; ES 193 provides 12 hour decoding.

Dimensions: 5 1/2" High x 19" Wide x 15 1/2" Deep $1050

ES 195 TIME AND EEE: Basically the same as ES 192. but with gas discharge displays, panel mounting and separate BCD outputs for time and temperature. Displays in 12 and 24 hour format. ES 195 has 6" incandescent type.

Dimensions: 2 1/4" High x 4" Wide x 6" Deep $325

ES 253 SMPTE TIME CODE READER: is an eight-digit SMPTE Time Code Reader displaying hours, minutes, seconds, and frame numbers. ES 253 is also a bidental, multi-speed eight-digit display. ES 253 is also a bidental display.

Dimensions: 10 1/2" High x 6" Wide x 2 1/2" Deep $900

ES 254 SMPTE TIME CODE READER: is a bi-directional, multi-speed eight-digit SMPTE Code Reader that can add the timecode to a video stream and display timecode information on a video portion of a tape, or for displaying it on a monitor. Reading speed is 1/20 to 20 times playback speed.

Dimensions: 10 1/2" High x 6" Wide x 2 1/2" Deep $1950

**780 SERIES RAM TIME PROGRAMMERS**

When programming more than eight events, the 780 Series RAM time Programmers are the most cost-effective way of dealing with the problem. They are flexible, able to use and provide 32 events (a maximum of 96) in 5 1/2 inches of rack space.

780 Series units operate from the power line, with a buffer over to a 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 set for normal operation. A small LED display is used when set for timing events.
- An output (event) occurs each time the time window begins. Time windows are preset by the operator, in one minute steps.

The RAM time Programmers are programmed in real time. The 780 Series RAM Time Programmers can perform the functions of Master Clock and ES event programmable timer.

**780 SERIES RAM TIME PROGRAMMERS**

ES 705 - ES 112 and 6 Digit Program

ES 711 - ES 124 and 6 Digit Program

ES 733 - ES 126 and two 4 Digit Programs

ES 754 - ES 126 and 4 Digit Programs

ES 793 - ES 126 and one 4 Digit Programs

ES 977 - ES 126 and 6 Digit Programs

ES 1296.5 - ES 126 and 2 Digit Programs

ES 192/194 The most economical Masters. ES 12 (ES 120 and 124) and ES 194 (24 hr) are configured 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 Master Clock ES 161, 166, 171, 991 and 993 Remote Displays. Dimensions: 5 1/2" High x 19" Wide x 15 1/2" Deep $1050

ES 253 SMPTE TIME CODE READER: is an eight-digit SMPTE Time Code Reader displaying hours, minutes, seconds, and frame numbers. ES 253 is also a bidental display.

Dimensions: 10 1/2" High x 6" Wide x 2 1/2" Deep $900

ES 254 SMPTE TIME CODE READER: is a bi-directional, multi-speed eight-digit SMPTE Code Reader that can add the timecode to a video stream and display timecode information on a video portion of a tape, or for displaying it on a monitor. Reading speed is 1/20 to 20 times playback speed.

Dimensions: 10 1/2" High x 6" Wide x 2 1/2" Deep $1950

**THUMBWHEEL PROGRAMMER/COMPARATORS**

ES 118 - ES 112 and 6 Digit Program

ES 181 - ES 124 and 6 Digit Program

ES 733 - ES 126 and two 4 Digit Programs

ES 754 - ES 126 and 4 Digit Programs

ES 793 - ES 126 and one 4 Digit Programs

ES 977 - ES 126 and 6 Digit Programs

ES 1296.5 - ES 126 and 2 Digit Programs

ES 192/194 The most economical Masters. ES 12 (ES 120 and 124) and ES 194 (24 hr) are configured 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 Master Clock ES 161, 166, 171, 991 and 993 Remote Displays. Dimensions: 5 1/2" High x 19" Wide x 15 1/2" Deep $1050

ES 190 TEMPERATURE AND TIME MASTER: basically the same as ES 192, but with gas discharge displays, panel mounting and separate BCD outputs for time and temperature. Displays in 12 and 24 hour format. Dimensions: 2 1/4" High x 4" Wide x 6" Deep $766
ES 112/124

DIGITAL CLOCK $185
ES 112 (12 hr.) and ES 124 (24 hr.) are solid state digital clocks. Six digits of time (thousands, minutes, seconds) and 4 digits of temperature (-50°C to +50°F or -55°C to +125°F) in gas discharge displays. 55° High. Temperature sensor on 25 ft. cable included.

Dimensions: 2” high x 6” wide x 6” deep

ES 142/144

DIGITAL CLOCK THERMOMETER $300
ES 142 (12 hr.) and ES 144 (24 hr.) are solid state digital clock/thermometers. Six digits of time (thousands, minutes, seconds) and 5 digits of temperature (-10°F to +125°F or -55°C to +25°C) in gas discharge displays. 55° High. Temperature sensor on 25 ft. cable included.

Dimensions: 2” High x 6” wide x 6” deep

ES 240/241

DIGITAL THERMOMETER $185
ES 240 DIGITAL THERMOMETER is a combination six digit clock and temperature sensor on 25 ft. cable included. Displays are planar gas discharge. 55° High. $256

Dimensions: 2’r High x 10” Wide x 6” Deep

ES 240 DIGITAL THERMOMETER is calibrated for °F and °C Displays are planar gas discharge. 55° High. $256

Dimensions: 2.16” High x 4.5” Wide x 4.13” Deep

ES 562/564

Six Digit Clocks

ES 562/564 is a combination six digit clock and timer. Displays are planar gas discharge. 55° High. $196

Dimensions: 2” high x 6” wide x 6” deep

ES 211/214

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The ES 211 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 ES 1/2” meter is true to one hundred times faster in responding to sudden changes in level. The ES 211 is recommended for use in applications requiring a calibrations, the display “catches up” with the correct level within 100 milliseconds. The ES 211 is highly accurate audio level indicator. 55° High. $135

Dimensions: 2” high x 6” wide x 6” deep

ES 556/554

DIGITAL CLOCK

ES 556 is a combination digital clock and 24 hour timer with memory, allowing the user to set the clock at any given time of day, switch to timer mode, then switch back to the time of day function when done. The clock can be correctly displayed in hours, minutes and seconds. The unit is powered by two rechargeable 9 volt batteries which can be replaced.
Broadcasters, as consumers, are protected by law against false claims and misrepresentations in advertising and promotional material. The regulations regarding truth in advertising may raise the price of our goods, but the improvement in customers' confidence resulting from the laws is worth the cost.

We take no issue with rigid laws and their strong enforcement concerning truth in advertising and sales literature. What we do take issue with is the laxness and vagueness in the language used in manufacturers' literature that make it virtually impossible to pinpoint what manufacturers are saying to broadcasters about their equipment.

You've all seen the terms: broadcast quality, state-of-the-art and professional, to name a few. Just what do they mean? Broadcast quality should imply a quality of excellence that meets a broadcaster's needs when the equipment is placed in a typical broadcast chain. However, the term is not specific, and the quality claimed in the specs may fall below the minimum requirements for sound and picture demanded by exacting broadcasters.

The much abused term state-of-the-art is even more nebulous. It's like morals—subject to time and place. The electronics technology is changing so rapidly that nearly everything is outdated by the time the circuits are designed and produced. Even more crucial, every product is subject to design and marketing constraints. There can be sound business reasons for a manufacturer not to use the latest devices and circuits for a specific product. Price, delivery and reliability are just a few of these reasons—and no manufacturer can be careless in considering these marketing factors. So if you acknowledge these facts of life, state-of-the-art has little meaning.

Professional tends to be a term flattering to our industry, but it is not specific for engineering purposes. Although it may serve as a buzzword to gain attention, it does little to convey the performance data required by engineers who are concerned about signal quality and who demand high reliability under stringent operating conditions.

But the confusion does not end with the non-specific nature of our technical language. To this can be added the wide range of practices followed in reporting equipment performance and specifications. Some companies report only peak performances obtained in the labs under idealized conditions. Others, remaining conservative, list typical specs that should be obtained under normal operation in a broadcast station with well-maintained equipment. Most companies probably fall between these two extremes, but we applaud those that lean toward the conservative end of the spectrum.

Thus, the engineer is faced with confusion in language and questionably reported specs when he slogs through ads, sales literature and equipment manuals. So, what is the solution? How can the confusing cobwebs created by buzzwords and practices be cleared away to reveal the truth in equipment performance?

Frankly, in practical terms, it probably cannot be done. Unless the standards-setting organizations—such as SMPTE, EIA, IEEE and AES (to name a few)—come to grips with the problem, set forth codes for reporting specs and define standard terms that are relevant and specific, the current practices will continue.

In the end, it will probably remain the role of the engineer to penetrate the communications barriers and get to the bottom line. The engineer will have to ascertain if the equipment meets his station's needs in terms of performance and reliability, especially in his broadcast chain. And this has to be done at a price that is reasonable for his operation.

On a practical level, engineers rely heavily on industry communications, local SBE activities, trade shows, personal communications with other engineers, local sales reps, and their own evaluations, for information vital to their purchases. All else being equal, the company with the best local service will probably get the order.

However, even though the engineer will probably continue to resolve the specs issue, we still urge that standards organizations stress exactness in the language and that manufacturers adhere to clearly described methods in reporting data. And, to those companies that adhere to the commendable practice of conservative ratings, we urge that they state this fact in their data.
There are some products by which all others are judged.

Tektronix introduces a new standard of reference for judging color picture quality. And color picture monitors. Look at the 690SR for an accurate, honest picture, every time. High resolution, precise convergence and stable color make it your best basis for subjective picture evaluation. You're not looking for re-takes. That's why you should be looking at the 690SR for the correct rendition of your input signal.

Engineered to be best. A true high resolution tube offers a sharp, accurate image. Superior for both subjective picture evaluation and camera registration analysis.

Set-up is simplified, with logical, noninteractive convergence controls. And maintenance needs are minimal. Modular design makes troubleshooting simple.

Judge for yourself. The 690SR is built in the Tektronix tradition of commitment to excellence. And backed by a worldwide service network and proven technical support.

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(In Oregon, 800-452-6773.)

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P.O. Box 4828
Portland, Oregon
97208

Circle (10) for literature
Circle (11) for sales contact
Comparative renewal standard affirmed
In July, the US Court of Appeals for the District of Columbia Circuit affirmed the commission's grant of the renewal application for station WESH-TV 2, Daytona Beach, FL, and denied a competing application. The court approved the commission's concept of renewal expectancy based upon "substantial" service by the incumbent licensee. The decision means that the usual comparative factors of diversification of control and integration of ownership and management will not be controlling, when a renewal applicant can demonstrate it has provided substantial service to the public during the license term under consideration. Under the commission's standard, the degree of renewal expectancy accorded to an incumbent licensee will be determined by the level of service the station has provided.

Network ownership of cable systems considered
The commission has adopted a Notice of Proposed Rulemaking seeking public comment on whether its multiple ownership rules should be changed to permit the major networks to own cable TV systems. The proposed changes signal the beginning of an overall evaluation by the Fowler commission of the present rules limiting multiple and cross-ownership of media interests. Within the next year or two, the commission is expected to re-examine its cable/broadcast, one-to-a-market and 7-station rules as well.

Dual-city station ID changes proposed
The commission has proposed to permit stations that provide city grade coverage to communities other than their cities of license to name those communities in their station IDs without first obtaining FCC approval. Dual-city station identification would be permitted upon certification to the FCC that the required signal strength to the second community was being provided. The proposed rule change is significant because signal strength has never been more than a threshold criterion for a showing to support a request for dual-city identification. Thus, if the proposed rule is adopted, no showings would be necessary with respect to the station's economic need for dual-city identification or the ties between the community of license and the second community. To begin to identify with another community, a certification of one of the following signal strengths would have to be provided to the FCC:

- TV - 74-80dBu (depending on channel number) over the entire city;
- FM - 3.16mV/m over the entire city;
- AM - 25mV/m over the business or factory areas and 5mV/m over the most distant residential section.

UHF comparability policy presented
The commission has issued a policy statement and several rulemaking decisions on the issue of UHF/VHF comparability. The commission found that UHF has become increasingly viable and profitable and is capable of substantial future growth. It said that the percentage of UHF stations reporting profits has risen consistently since the early 1970s. In 1980, 58% of UHF TV stations reported profits as compared to 59% of AMs, 55% of FMs, and 81% of VHF stations.

The commission took the following related actions:
- Instructed its staff to draft a notice of proposed rulemaking that would reimpose a limit of 12dB on UHF noise figures (the current limit is 14dB);
- Dropped proposals requiring manufacturers to install integrated channel selectors that use the same control for selecting VHF and UHF channels;
- Declined to require greater channel capacity for push-button or single-dial menu types of channel selectors, or require pre-tuning and labeling for UHF channels on push-button types.
VERSATILITY

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The TEN-X is available video-only...

Or—
Video-plus-audio...

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But—
Audio may be added later to your video-only version...

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TEN-X control from GVG includes local...

Or—
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Remote...

There's more—
The TEN-X operates by local
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Also—
Buy a TEN-X with local control, simply plug in a GVG remote panel later...
And—
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and eliminated other rule provisions concerning UHF selectors;
• eliminated the requirement that TV sets be capable of receiving Channels 70 through 83, because those channels have been reallocated to the land mobile radio service;
• dropped proposals that would have required equality between reception aids provided for VHF and UHF;
• decided to provide funding for an information program in the FCC's Office of Public Affairs to provide for the dissemination of consumer information about UHF reception; and
• dropped a proposal to require manufacturers to grade or label TV receivers or antenna systems.

Paid announcements to air on non-commercial stations
The FCC has announced it will permit non-commercial educational broadcasters to air paid promotional announcements for non-profit groups as long as the announcements do not interrupt regular programming. Non-commercial stations, however, still may not accept payment for announcements on behalf of for-profit entities.

NAB update
This column contains updates, revisions and corrections to our June NAB-82 coverage. Use the reader service numbers for more product information.

THOMSON-CSF COMPONENTS
TH347 tetrode
The TH347 coaxial design tetrode is suggested for linear amplifiers operating up to 1GHz (not 10Hz as stated in our June issue). With applications requiring common video and sound carrier translators, the TH347 anode dissipation is rated at 4.5kW.

Circle (450) on Reply Card

TH382 tetrode
Rated for 5.25kW (not 5.25W as indicated in our June issue) for common video/audio carrier amplification, the TH382 is capable of 11kW for video carrier only applications. Pyrobloc grids, using pyrolytic-graphite materials, give increased stability.

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Let the Ampex AVC switchers unlock the creativity inside you.

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When you think state-of-the-art in switcher technology, think about the AVC Series from Ampex. Find out more about the AVC before your clients start asking you about it. Call your Ampex representative or write Ampex Corporation, Audio-Video Systems Division, 401 Broadway, Redwood City, CA 94063 (415) 367-2011. Sales, spares and service worldwide.

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VRC technology doubts raised

Marketing efforts and design breakthroughs in video camera and recording technologies have not overcome substantial market resistance to the integrated Video Recorder/Camera (VRC)* technology. That resistance was clarified in a videotaped panel discussion, "The Search for Standards," recently distributed to US and Canadian subscribers of the Video Newscasting Network. VNN is a series of management-oriented tapes intended for the private viewing of industry professionals.

Julius Barnathan, president of engineering, ABC TV Network, challenged fellow panelists representing Sony, RCA and Bosch-Fernseh. He said that capabilities of the new VRC systems do not meet ENG requirements practiced at networks and stations. Barnathan said that the component video recording technique used in the Sony Betacam and RCA Hawkeye systems produced a signal requiring greater bandwidth than could be transmitted by field microwave equipment. As a result, users of VRC systems must physically transport their tapes to the station for airing.

Charles Felder, representing Sony, and Robert Thompson, for RCA, said that an adapter or an NTSC output on the camera could be used to encode the component signals into a compatible NTSC format for use in microwave transmission. Users of adapters would have to pay extra for that piece of equipment, besides the premium already paid for the single-piece VRC system. The purchase cost of the combo VRC systems exceeds that of existing ENG cameras designed with an NTSC output signal ready for microwave transmission.

Since the simultaneous appearance of four VRC systems at NAB-'81, the broadcast community has insisted on a concerted effort toward standardization, assuring users of multiple sources and intersystem compatibility. Although RCA and Sony have proposed sets of standards to the SMPTE, the panel discussion revealed that fundamental hurdles must be overcome before even standardized VRC systems could be viewed as staples for ENG operation.

During the discussion, Dr. Dieter Pohl, representing Bosch-Fernseh, presented the differences between his company's 1/4-inch system and the 1/2-inch equipment from RCA and Sony. The Fernseh KBF-1 system provides size and weight advantages and may not present as severe a problem for microwave transmission. After the explanation, Barnathan, impressed by the approach, suggested that if the system were deliverable, he would certainly be a prospective customer.

The panelists concluded that VRC technology may play a significant role in TV production activities for programs, documentaries and commercials, in which the systems' improved video quality could be advantageous. Such teleproduction needs rarely require microwave transmission. Also, the signal quality needs in teleproduction generally exceed those for newsgathering. That higher quality is

---

*The emerging video recorder-in-camera technology has moved too rapidly for standards in terminology to have developed. For simplicity, until such terms have been accepted, BE has elected to refer to these systems generically as VRCs (video recorder/cameras). The SMPTE reported at NAB-'82 some progress in standardization work for the VRCs.
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now found in 1-inch systems, but they tend to be too expensive and unwieldy to compete with conventional film equipment in single-camera field production applications.

Harris, Kahn AM stereo approved

On Aug. 4, the FCC approved AM stereo transmissions using the Harris approach. WQXI, Atlanta, GA, was expected to sign on in stereo on Aug. 6. Another 10 stations were expected to be in live stereo by Labor Day, according to Gene Whicker, vice president/general manager of Harris Broadcast Division, Quincy, IL.

Meanwhile, the Kahn AM stereo system was given approval with conditions on July 22. An FCC source explained that the commission requested further data to answer some items in the application which it felt were still unclear. The information was needed by Aug. 12, and if satisfactory would clear the Kahn system unconditionally. If not, the application would return to the pending status.

Questioned about the conditions, Leonard Kahn, Kahn Communications, Garden City, NY, stated that the conditions involved some instruction book materials and proprietary information. He said the data would be in the commission's hands by the due date and that he "felt very good about the progress in AM stereo." He noted that many stations are using Kahn systems in the large markets—including ABC, CBS and NBC affiliates.

Both Harris and Kahn have been working closely with receiver manufacturers. Whicker indicated that about six systems were reserved for US and Japanese receiver companies to develop home and automotive units. Kahn listed the Mura Corporation as active in developing circuitry for receivers, but he would not divulge names of other organizations also creating circuits for AM stereo. High interest is being shown in adapters for automotive radios as well, Kahn noted.

The implementation of receivers will remain the stumbling block for AM stereo. The binaural imaging is possible with the Kahn plan by the use of two AM receivers. A left channel may be heard by tuning one receiver slightly below the AM carrier; the right, by tuning a second receiver slightly above the carrier. Kahn indicated that surprisingly good sound is reported to him by many who have tried the experimental reception. Many are using two portable radios patched into external inputs of their home stereos.

At an NAB-'82/Dallas press conference, David Hershberger, designer of the Harris system, announced that the Broadcast Division and the Semiconductor Division, Melbourne, FL, were on a crash program to develop a decoder chip. His projection at the time was that devices should be available in three to four months. On Aug. 12, Hershberger updated his projection by saying that it was in the layout stage. Some changes had been requested by Delco Corporation as active in developing circuitry for receivers, but he would not divulge names of other organizations also creating circuits for AM stereo. High interest is being shown in adapters for automotive radios as well, Kahn noted.

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choice of features and cost advantages. He urged early adoption of the NABTS system as the single US standard for all teletext manufacturers and broadcasters.

Webster cited important benefits from a single teletext standard such as the ability of the consumer to move decoders from location to location, the opportunity to receive all teletext services in an area, and the inherently lower costs of a single system.

Webster said that RCA's support for the NABTS teletext standard was based on the following points:

- The NABTS features high resolution graphics, which are required for such applications as weather maps, news illustrations, games and advertisers' logos and products.
- The NABTS permits efficient transmission of data within the standard TV signal, offering consumers more pages of information.
- The NABTS system has been designed to be upgradable over time, in keeping with advances in technology. Performance upgrades would be done in a compatible manner so that early decoders would not become obsolete.

Smithsonian Galaxy receives gold medal

Smithsonian Galaxy, a series of twice-weekly, 2½-minute radio features from the Smithsonian Institution in Washington, DC, received a gold medal in June at the International Radio Festival of New York. The new radio competition, to be held annually, had more than 750 entries from many countries in its several divisions.

Smithsonian Galaxy won in the general interest category for information programs. A production of the Smithsonian's Office of Telecommunications, Galaxy explores the institution's 13 museums, the National Zoo and various research centers.

Executive discusses electronic film-making

HDTV technology will provide easier and less time-consuming production techniques for cinematographers, according to Grant Smith, executive vice president, Sony Technology Center.

Addressing the American Society of Cinematographers, Smith said that this technological advance is dependent upon scientists and film-makers arriving at a trade-off between video resolution and aspect ratio, as well as the proper quantity and color designations of channels in the video signals.

Video recorders, cameras, monitors and projectors have finite bandwidth. Required bandwidth increases rapidly in direct proportion to aspect ratio if equal horizontal and vertical resolution are to be maintained in HDTV images. As far as signal type is concerned, Smith said that options are being considered using a 2-channel path with one for black-and-white and one for color information, or using four channels with various distributions of black-and-white and color information.

Smith told the group that Sony planners envision a 3-step evolution in the application of HDTV to film-making. "In the first phase, original production would be accomplished on tape," he said. "Post-production could be executed entirely, including special effects, staying with tape until the edited master is complete. This master would then be transferred to film and duplicated for distribution."

In the second phase, Smith said that mini-theaters holding a few hundred viewers could use large-screen video technology so that distribution could remain on videotape. The third phase would come when a full-size, wide-screen video projection system is developed. The source of the video signal could be tape or, for better security from piracy, satellite or cable transmission.

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For years, newsmen have suffered from the recurrent nightmare of shooting in the dark. They've struggled with low-light situations where artificial lighting was either too intrusive or too difficult to achieve.

But now, thanks to the Sony BVP 330, the cover of darkness no longer stops reporters from covering a story.

The BVP 330 is used consistently in low-light situations by award-winning video journalists and documentary producers like Jon Alpert, Frank Beacham, and Warren Jones. It enables them to shoot under the worst
Suspect in police custody.  
Taped by Frank Beacham and Warren Jones.

Dade County Police questioning teenagers. 
Taped by Frank Beacham and Warren Jones.

NEWSMEN
LONGER THE DARK.

conditions, and capture elusive footage like the examples shown here.

The BVP 330 is so versatile in low-light situations, newsmen are surprised to learn that the camera is lightweight and sturdy enough to be taken into the jungles of Nicaragua. Or that its performance is good enough to enable it to be used as a studio camera.

But it makes sense that the BVP 330 should be this good. After all, when a reporter risks his life getting a story, the last thing he should have to worry about is losing it to darkness.

SONY
Broadcast
Located at the Studer headquarters building in Regensdorf are management, manufacturing and engineering operations, as well as most of the Studer final assembly and machine tool processes. This plant is operating at capacity and an identical building is under construction across the street to expand operations and to eliminate temporary facilities that have been set up to cope with the company's growth.

**Plant tour: Studer Revox**

**Broadcast Engineering** recently toured the Studer Revox manufacturing facilities in Switzerland and West Germany. We found that the reputation for quality and precision engineering that the names Studer and Revox have earned is no accident. Throughout the organization, there is an attention to detail and a commitment to quality that should be copied by any company that desires to be the best in its field.

Let's take a pictorial tour of the corporate headquarters and Studer manufacturing facility in Regensdorf, Switzerland, and the plants in Säckingen, Löffingen and Bonndorf, West Germany, which manufacture the Revox product line and most of the Studer component parts.

In the photography studio of the Studer Revox advertising department, a bookshelf speaker is being photographed. The Studer companies have complete photography, art, graphics and advertising departments, as well as their own modern printing facility. All promotional material, brochures and sales material are done in-house.

At the Sackingen plant, cable harnesses for a Studer tape deck are assembled. Most sheet metal work, anodizing and painting is done at this plant, which is the latest addition to the Studer facilities.

**Editor's note:**

Last year we began a department of journalistic plant tours to let you see some of the staff and facilities of companies manufacturing equipment for broadcasters. We included response numbers and our readers voted for us to continue such coverage.

We were invited by Studer Revox to tour its facilities in Europe and in Nashville, TN. Because of prior commitments, we asked the author to represent us for the European tours. Bill Rhodes, editorial director, and Carl Bentz, technical editor, toured the US facilities while attending the SMPTE Winter TV Conference in February 1982.

This information is provided as a service to BE readers who may or may not be able to take an actual plant tour. We plan to tour other facilities as time and space permit. If you would like to see a particular organization included, write and let us know.
Amid the hostility, the confusion, the competition, one microphone stands above the crowd.

The SM63.

No matter how rough things get in the field, the Shure SM63 Omnidirectional Dynamic Microphone gives your crew the whole story with a lot less handling noise than any microphone in its class. When Shure's engineers developed the SM63 and SM63L (with longer handle), their objective was to create a high-output, lightweight microphone perfect for the needs of electronic news journalists.

With the SM63's patented internal mechanical isolation system reducing undesirable handling noise, its high output and smooth extended frequency response lets your story come through crisp and clear. Its omnidirectional polar pattern prevents boominess that is often encountered during close miking situations. And its overall lightness makes continuous hand-held ENG/EFP assignments less fatiguing, without sacrificing ruggedness. Even its profile is small and elegant so it won't obscure faces on camera.

The output of the SM63 is a full 6 dB higher than comparable hand-held interview microphones.

And there are even more precision-engineered refinements. A highly effective internal humbucking coil rejects strong magnetic fields encountered around lights and other broadcast situations. And when things get really tough, the Shure-developed VERAFLEX® grille is virtually impervious to rust, moisture and dents. This system includes a highly effective internal anti-wind and -pop filter; and for more adverse conditions, a dual-density two-layer windscreen also is supplied.

The Shure SM63. The hard-working microphone for the working press.

For more information on the complete line of professional broadcast products, call or write Shure Brothers Inc., 222 Hartrey Ave., Evanston, Ill. 60204, (312) 866-2553.

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The one finished product made at Säckingen is the Revox consumer turntable. Here, some turntables undergo final checkout before assembly is completed.

This technician is operating one of the many test setups in the manufacturing facilities; this one at Löffingen. Studer builds much of its own custom test equipment, such as the bottom unit in this group. As part of the quality control arrangement, even the test technicians are tested. Samples that have passed through one technician's test station are periodically checked by another technician.

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Penny & Giles totally new 3000 series sets a new standard in fader technology.

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The Aurora/100 is the most powerful television artist’s tool ever developed. We’ve taken the time to do it right. In fact, our people pioneered in the design and application of digital videographic and animation systems starting in the early 70’s.

The Aurora/100 was designed first and foremost to permit real artistic flexibility. It’s not just an extended character generator but a complete graphic and animation system built from the ground up by creative people for creative people.

This is an extraordinarily powerful system. Yet it is simple to learn. Easy to use. And it requires absolutely no computer experience.

You will be amazed at the speed with which ideas and concepts can be transformed into exciting, colorful visual images.

The Aurora/100 features real-time animation, freehand painting, powerful graphic editing tools, character generation, video input and many other capabilities.

Digital videographics has come of age. Aurora systems are already in use in NTSC and SECAM broadcast, post production and industrial applications in the U.S., France, Japan and Canada.

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In the Bonndorf plant, automatic insertion equipment is used for much of the printed circuit board assembly, although much is still done by hand. All PC board etching and plating is performed here, as well as most of the wiring.

This automatic, computer-controlled PC board drilling machine drills six holes per second in four boards, and changes its own drill bits. It is an example of the move toward automated manufacturing that was started by the company in the early 1970s.

This is a look across the PC board manufacturing area at Bonndorf. After screening, all etching and plating is done automatically, with numerical control for timing and sequencing each step of the process. At the left of the photo, note the boards being lifted out of the plating tank to be taken to the next processing step. Also note the obvious cleanliness. The attention given to keeping the plants clean and tidy was underscored when our hosts actually apologized for the small amount of clutter and the appearance of the painting facility at Säckingen.
Comparing video from a conventional TBC to video from a Y-688 Total Error Corrector is like comparing apples to oranges. A time base corrector, as the name implies, corrects timing errors. The Y-688 Total Error Corrector corrects timing errors and virtually all VTR induced errors.

The major cause of video quality loss in 3/4 VTR's is inherent in the color under process. This process separates the input color video signal into its luma and chroma components, converts the chroma frequency for recording and playback and recombines the luma and chroma for color video output. The worst part is that this quality loss is cumulative, in that it is compounded with each pass through a VTR or conventional TBC.

**Total Error Correction**

The Y-688 TEC is designed specifically to overcome multiple generation quality loss from color under VTR's. The Y-688 TEC utilizes "dub" (Y-688) input and output as well as encoded video. The "dub" mode allows processing of component (Y-688) video by bypassing the separation, frequency conversion and recombination cycle. "Dub" signals processed through the Y-688 TEC are better than encoded video signals because they contain more information and are less degraded.

The Y-688 TEC also utilizes advanced signal processing techniques, some manufactured under exclusive license from Faroudja Laboratories. These techniques reduce chroma noise by up to 20dB, correct luma/chroma timing automatically, reduce luma noise by up to 10dB, improve chroma rise times, reduce second order ringing and eliminate luma/chroma crosstalk. Some processing is used during each pass through the Y-688, while the balance of the processing is used for the last copy or for broadcast to correct any minor degradations which have occurred.

**A Difference You Can See**

The improved quality of Y-688 TEC video can be seen in first generation playback. It becomes more obvious in successive generations. It is particularly noticeable in third and fourth generations because conventional TBC video has gotten worse with each pass, while fourth generation Y-688 TEC video approximates original quality.

The Y-688 TEC is simply the most powerful tool available for extending multi-generation quality from color under VTR's.

For more information on the Y-688 TEC or an on-site demonstration, circle the reader's card. For immediate response write or call Fortel today.
At Regensdorf, in the manufacturing portion of the facility, this diecast deck for a Studer A-800 is automatically inspected for machining accuracy by another computer-controlled device. Attention to the mechanical precision of each component by such machines assures that replacement parts will fit as well as the original ones did.

The European style of living is evident in the Studer plant cafeteria. In Switzerland, unemployment is almost non-existent. In fact, there are more jobs than workers, and a company desiring to keep its personnel offers such benefits as a nice place for lunch breaks and good food at an attractive price, in order to maintain morale and employee loyalty.

From another of the many numerically controlled machine tools at Regensdorf comes this machining of a half head shell for a 24-track tape head. This part will go to the Löfingen plant, where the manufacture of the heads is undertaken.

The author (right) addresses Dr. Willi Studer (far left) on behalf of the group of broadcast and recording industry journalists hosted by his company. As the only group member who knew more than three words of German, he was the unanimous choice to read a prepared thank-you speech in German.

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Los Angeles, CA 90066
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Studer also manufactures mobile broadcasting vans, which are very popular with European radio and TV broadcasters. These units provide broadcasters with quality recording or direct broadcast facilities for operation from any location.

Of special interest during this tour was the engineering laboratory work on this digital recorder. Using pulse code modulation techniques, the recorder puts eight tracks of digital quality audio on 1/4-inch tape, running at 30 ips. The first pre-production units should now be in test operation at several European recording studios.
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HARRIS

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Also new and interesting is the Camos 3000 automation system being developed. It is based on a cassette recorder/player, which is one of the first units built to handle the new Minisette audiotape. The Minisette is about the size of a ½-inch videocassette and uses ¼-inch tape. A complete system of players and a library of thousands of cassettes was under construction, to be installed by Bavarian Radio. This unit also has another Studer-promoted feature, SMPTE time code information located on a narrow center track. Time code allows cueing accuracy of 100ms.

An interesting experience in the manufacture of high quality audio equipment, the trip to Studer Revox showed us many things: the difference in lifestyle and business climate in another country; the results of carrying out to the last detail a commitment to quality and precision; and the pride that accompanies such an effort.

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Find out more today. For immediate information call (201) 592-6500.
On July 29, 1982, TV pioneer Dr. Vladimir Kosma Zworykin died at the Princeton Medical Center, Princeton, NJ, a day short of his 93rd birthday.

Elected an honorary vice president of the RCA Corporation upon his retirement in 1954, Zworykin was often called the father of television. However, he declined the accolade, telling interviewers that hundreds contributed to television's evolution over many years. He preferred to compare television's development with the building of a ladder, explaining that, as each engineer added a rung, "it enabled the others to climb a little higher and see the next problem a little better."

Father or not, there is no question that the achievement of practical television stems, to a large extent, from Zworykin's pioneering work in the 1920s and 1930s. His conception of the first practical TV camera tube, the iconoscope, and his development of the kinescope picture tube formed the basis for almost all important later advances in the field.

As a Russian immigrant, he came to the United States after World War I and worked for Westinghouse in Pittsburgh from 1920 to 1929. It was there that he did some of his early work on television.

But it was not until he teamed up in 1929 with another Russian immigrant, Gen. David Sarnoff, later president and chairman of RCA, that his TV work got the management and financial backing that enabled Zworykin and the RCA scientists working with him to develop television into a practical system.

Both men never forgot their first meeting. In response to Sarnoff's question, Zworykin, thinking solely in research terms, estimated that the development of television would cost $100,000. Years later, Sarnoff delighted in teasing Zworykin by telling audiences what a great salesman the inventor was: "I asked him how..."
much would it cost to develop TV. He told me $100,000, but RCA spent $50 million before we ever got a penny back from television.”

Zworykin had left Russia and come to America because he wanted to develop his dream—television. His adopted country treated him well. In 1966, President Lyndon Johnson awarded him the United States’ highest scientific honor, the National Medal of Science “for major contributions to the instruments of science, engineering and television, and for his stimulation of the application of engineering to medicine.” Including the Medal of Science, Zworykin received 27 major awards and numerous others from groups throughout the world.

He was elected to such prestigious American societies as the National Academy of Sciences, the American Philosophical Society, the American Association for the Advancement of Science and the National Academy of Engineering.

Zworykin was born on July 30, 1889, in Mourom, Russia, where his father owned and operated a fleet of boats on the Oka River. As the owner’s son, he had the run of the ships and often played with the push-buttons used to signal the engine room from the bridge. Thus, Zworykin would tell interviewers, he was intrigued with electrical communications well before he was 10 years old.

Perhaps because of this interest in communications, his father sent him to the Petrograd Institute of Technology, which awarded him an Electrical Engineering degree in 1912. At the institute, Zworykin studied under and assisted Professor Boris Rosing, to whom Zworykin credited both his decision to become a scientist and his special interest in television and electronics.

As early as 1906, Rosing believed that the solution to practical television was to be found, not in mechanical systems, but in the employment of cathode ray tubes. Zworykin’s iconoscope and kinescope followed this line of reasoning.

In 1912, Zworykin entered the College de France in Paris, where he studied X-rays under the noted scientist Professor Paul Langevin. His studies were interrupted by World War I, and Zworykin had to return to Russia to serve in the Army Signal Corps. After the war, he came to the United States, becoming a citizen in 1924. He received a doctorate from the University of Pittsburgh in 1926.

Soon after arriving in the United States, Zworykin joined the Westinghouse research staff. He began investigations in the field of photoelectric emission and resumed his research in television.

Dr. Zworykin (ca. 1940s), holding an early model of the iconoscope, which he developed as the all-electronic eye of the TV camera.
The world's finest TEST RECORDS are Now AVAILABLE made to YOUR SPECIFICATIONS

Are you a manufacturer who must explore the performance and measure the specifications of your phono cartridges? Are you a broadcaster who must verify the calibration of your phono cartridges and preamps? If so, you ought to know about JVC's Technical Record Series.

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<table>
<thead>
<tr>
<th>Record No.</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRS-1001</td>
<td>Frequency Response, Wow &amp; Flutter, S/N Ratio, Mechanical Impedance of Phono Cartridge (Mono)</td>
</tr>
<tr>
<td>TRS-1002</td>
<td>Frequency Response, Wow &amp; Flutter, S/N Ratio, Crosstalk (Stereo)</td>
</tr>
<tr>
<td>TRS-1003</td>
<td>High Frequency Response, High Frequency Crosstalk (Stereo)</td>
</tr>
<tr>
<td>TRS-1004</td>
<td>Quick Check of High Frequency (1kHz to 40 kHz, Stereo)</td>
</tr>
<tr>
<td>TRS-1005</td>
<td>High Frequency Response, Tracking Loss (Stereo)</td>
</tr>
<tr>
<td>TRS-1007</td>
<td>Sweep Frequency Response, Crosstalk, Harmonic Distortion (Stereo)</td>
</tr>
<tr>
<td>TRS-1007 MK II</td>
<td>UHQR version (Ultra High Quality Record) of TRS-1007 Utilizing specially made stampers and thicker disc</td>
</tr>
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The JVC Cutting Center is the exclusive North American representative for the JVC Technical Record Series. For more information, (including complete specifications), contact:

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Zworykin became associated with RCA in 1929. He served as director of the Electronic Research Laboratory, first in Camden, NJ, and from 1942 until his retirement, in Princeton, NJ. In addition to television, Zworykin applied his talents to a broad field of electronics and held more than 120 US patents on developments ranging from gunnery controls to electronically controlled missiles and automobiles.

As a result of Zworykin's research activities, important devices such as various forms of secondary emission multipliers and image tubes were developed and perfected. The Snooperscope and Sniperscope—important military developments in World War II—were practical applications of research on infrared image tubes.

Dr. Zworykin (ca. 1980), posing in front of David Sarnoff's portrait. Also a Russian immigrant, Sarnoff was instrumental in bringing Zworykin to RCA, thus providing him the resources to develop electronic television. However, Zworykin credited Sarnoff with having the vision to foresee television as a new form of home entertainment.

Zworykin's intensive study of electron optics directed his interest to the electron microscope. RCA's pioneering in the commercial development of the electron microscope typifies Zworykin's genius—not only his scientific expertise, but his ability to attract and motivate good scientists.

For example, in 1940, he hired a young Canadian graduate student, Dr. James Hillier, to work on the electron microscope. Hillier, who retired in
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September 1982  Broadcast Engineering  39
If you're ready to move up to a specialized mixer, you're ready for Ramsa.

The Sound Reinforcement Specialist: Ramsa WR-8716

When your sound says you're professional but your mixer doesn't. When you're wasting your subtlety and style on "make-do" boards. When you're creating compromises instead of clear-cut distinctions. Then you're ready for Ramsa—the mixers that are specialized so you won't have to compromise.

The WR-8716 is a fully modular sound reinforcement console with 16 input modules, 4 group modules, and 2 masters. It features 16 input pre-fader solo buttons, 4 group modules with pre-fader insertion patch points, and lockable post-fader solo buttons. There are 6 illuminated VU meters with peak LEDs for easy outdoor reading and a separate stereo variable frequency EQ for monitor sends. Pan pot controls allow panning to the left or right masters while level controls permit 16 x 6 board operation. The left and right direct channel assign function lets you bypass the group modules for individual sources. Portable operation is a snap with easy access connectors.

And the WR-8716 features plastic conductive faders for greater reliability and smooth, low-noise operation, external power supply for light weight, and switchable 48V DC phantom power for condenser mics.
The WR-8816 recording console includes the same modular construction, input modules, power supplies, and faders as the WR-8716 plus many important recording advantages. Like direct outputs for 4, 8, or 16 track recording and peak-reading LED meters that let you monitor any 4 out of 24 signals with clear, quick response.

You'll command a variable frequency EQ section with 3 frequency settings for the high and low frequencies plus continuously variable midrange. Stereo echo send replaces the separate mono controls you'll find on competitive boards. And you get two independent stereo monitor controls—one for musician's headphones, one for control room monitors—a special feature for any mixer in this class. And there are other important features like low noise electronically balanced mic inputs with high-speed IC's, 16 switchable post-fader solo controls and XLR-type mic connectors.

Ramsa offers a full line of specialty mixers including the more compact WR-8210 recording mixer and WR-130 sound reinforcement mixer. So don't hold down your professional sound, call (201) 348-7470, because you're ready for Ramsa.
Zworykin maintained an office in the Medical Electronics Center until he was 91 years old.

1977 as executive vice president and chief scientist of RCA, decided to work for RCA because Zworykin recruited him with one question—how long would it take Hillier to build an electron microscope—while other prospective employers engaged Hillier in theoretical discussions or emphasized their good working conditions and fringe benefits. Working under Zworykin’s guidance, it took Hillier little more than three months to build the first RCA electron microscope.

Coincidentally, just three years after Zworykin was elected to the US National Inventors Hall of Fame for his work on the development of television, Hillier was elected, in 1980, for his work on the electron microscope.

For a period of years following his retirement, Zworykin directed a Medical Electronics Center at the Rockefeller Institute in New York. In this capacity, as national chairman of the Professional Group on Medical Electronics of the Institute of Radio Engineers, as founder-president of the International Federation for Medical Engineers, as founder-president of the Institute for Medical Electronics and Biological Engineering, and as member of the board of governors of the International Institute for Medical Electronics and Biological Engineering in Paris, he worked toward the use of electronic methods in medicine and the life sciences.

Zworykin was often asked if, while working on television, he ever envisioned the worldwide entertainment media it became. He would reply that he hadn’t, and credited Sarnoff with seeing television as a new form of home entertainment. Zworykin would then explain that in his early years he looked upon television as a system that would enable man to see things in places where his eyes couldn’t reach. Thus, he was delighted with the first TV pictures of the back side of the moon. And, when he visited the Jet Propulsion Laboratories in California to see the reception of pictures of Mars, he remarked, “This is what television is really for.”

In October 1980, Dr. Zworykin received a special award from the Eduard Rhein Foundation for his many contributions to fully electronic television. (photo ca. 1970s)

As he grew older, Zworykin curtailed his activities, spending winters in Florida, but never gave up his interest in scientific research. For many years, he was a visiting professor for the Center for Theoretical Studies and the Institute for Molecule and Cellular Evolution of the University of Miami in Florida. And he maintained an office at RCA Laboratories. Even at the age of 91, he would drive from his home in Princeton to his office in the David Sarnoff Research Center to read from his large collection of scientific journals and reports.

It was in that office, after Zworykin’s 85th birthday, that a New York Times reporter asked Zworykin: “You’ve been involved in scientific research for many, many years. When are you going to stop working and really retire?”

A smile gathered quickly on Zworykin’s face, and he replied without hesitation, “When I die.”

In the fall of 1980, Dr. Zworykin honored the 122nd Technical Conference of the Society of Motion Picture and Television Engineers with a taped interview of early TV developments and with a brief personal address. He is shown here (center), following his speech, talking to Charles Ginsburg (left), of Ampex, and Frederick Remley, then SMPTE vice president for TV affairs. They are gathered around the Emitron camera that served the BBC from 1936 to 1954, the year that Zworykin retired.
Bob Taylor, General Manager of Wilmington’s WDEL-AM and WSTW-FM says, “We’ve had Auditronics 200 Series consoles on-line for over six months and our sound’s superiority is reflected in listener response. The psychological effect on our own on-air people was immediate and positive. They find the Auditronics boards comfortable to work with, whether it’s the 212 in the news booth, the 218s in the production rooms or the 224 in AM master control. “Best of all, when it came to price, Auditronics was affordable. I don’t mean the cheapest; I mean cost/efficient. For a few extra dollars, we have future expansion capability and the customizing that we needed. To us, that’s what affordable really means.” For complete product information and a report on why WDEL’s Bob Taylor chose four Auditronics 200 Series consoles for his new facilities, contact:
The Composite Signal: Key to Quality FM Broadcasting

By Geoffrey N. Mendenhall, P.E., vice president of engineering, Broadcast Electronics, Quincy, IL

The author, delivering portions of this paper at the WOSU Second Annual Broadcast Engineering Conference, July 20-22, 1982, at Ohio State University, Columbus, OH.

The FM composite signal is the sum of all the individual components that make up a multiplex system. FM broadcasting usually includes these individual components:

1. L + R information at the audio modulating frequencies (30Hz to 15kHz);
2. the 19kHz pilot tone;
3. L - R information at 38kHz plus and minus the audio modulating frequencies (23kHz to 53kHz); and
4. the 67kHz FM modulated SCA subcarrier (53-81kHz).

Figure 1 shows the composite baseband viewed on an oscilloscope with peak-to-peak amplitude shown as a function of time. Figure 2 shows the waveform of composite baseband containing stereo (one channel only at 10kHz) plus unmodulated 67kHz. Output taken from composite test jack on BEI’s FX-30 exciter driven by the FS-30 stereo generator and the FC-30 SCA generator.

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Use our toll free number and talk to the RF or microwave engineer who will design your special filter. He'll give you a prompt, on-line analysis of your specifications, and he'll quote price and delivery time. Before you hang up, you’ll know what you need, when you’ll have it and how much it will cost—all with just one phone call!

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With a Four Year Warranty & a Price That Makes Sense.

You're looking at our DC-38-8S. Built tough & engineered to perform like big, expensive boards you'll find in world-class recording studios. Its flexibility and features give you the ultimate broadcast production and on-air board.

Its price keeps you (and your accountant) smiling.

D.C. CONTROL—WE INTRODUCED IT FIRST!

While a lot of imitators are still playing catch-up, we’re moving ahead, by subtly improving upon a design we pioneered in 1975, by maintaining our reputation for reliability; by realistic and affordable pricing. We figure we’re still way ahead. Which means you can be too.

The Ramko DC-38 Series consoles are known to be highly interference-free because we don’t let RF and scratchy pots and switches attack the audio. All audio functions, from switching through attenuation, are done via D.C. control.

NOT ONLY QUIET. CLEANER AND MORE ACCURATE.

All inputs/outputs have the benefits of solid-state, transformerless design. We discarded the problems that come with bulky, unforgiving and expensive transformers. Like distortion due to impedance mismatching and compromised frequency response. Not to mention hum that sticks to a transformer like a magnet.

We give you a solid-state, L.E.D. metering for much greater accuracy. A cleaner, tighter sound can be yours too because the slower responding, mechanical V.U. meter belongs to another era—not on a Ramko console.

FEATURES FOR THE REAL WORLD.

There’s a dual cue mode that works by normal “potting down” or by pushing a button so you don’t have to change the mixer setting. All the pushbuttons are super-quiet. They route audio through error-free, solid-state logic without program-killing pops, clicks or momentary feedback associated with loud, clanking, short-lived mechanical switches.

Our exclusive electronic patch panels make selection of input gain extraordinarily flexible. From mic through line levels, and anywhere in between on each and every input. You have over four million combinations to accommodate any channel.

THE SECRET TO A FOUR YEAR WARRANTY WITH PARTS AND LABOR.

In the DC-38 you get three power supplies. L.E.D.s and lamps with an 11 year life expectancy. Pushbuttons spec’d at 20 million operations. Wear-resistant, crud-forgiving conductive plastic mixer pots that also take the heaviest of hands. In addition, all the critical electronic circuitry is burned-in so it doesn’t burn-out.

And, no console made is easier to service.

THERE’S MORE.

Like over a dozen specific models in addition to our DC-38-8S. With specs that compare to the ones on your left. Mono-Stereo. 5 inputs to 12, dual. Optional solid-state clock/timers and remote machine control interface.

We also have a free, two-week trial. So you can put our claims, and our reputation to the test. Give us a call, now. Collect. Discover the performance and versatility of a world-class broadcast studio board. Discover the pricing that’s also made Ramko's radio equipment reputation red-hot.

Engineered For Your Bottom Line.

RAMKO

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Rancho Cordova, California 95670 (916) 633-3600

DC-38 Series Numbers

<table>
<thead>
<tr>
<th>Feature</th>
<th>DC-38-8S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>+21dBm max</td>
</tr>
<tr>
<td>Signal-To-Noise Ratio</td>
<td>70dB</td>
</tr>
<tr>
<td>Frequency Response</td>
<td>-0.5 to 20kHz</td>
</tr>
<tr>
<td>Distortion</td>
<td>0.3% or less</td>
</tr>
<tr>
<td>Crossstalk</td>
<td>-70dB@1kHz</td>
</tr>
<tr>
<td>Inputs</td>
<td>4 per mixer,</td>
</tr>
<tr>
<td></td>
<td>balanced bridging</td>
</tr>
</tbody>
</table>

Price:
- Single channel 5 mixer mono SC-5M: $1808
- Dual channel 5 mixer mono thru dual channel 8 mixer stereo DC-38 series shown: $3302
- Dual channel 12 mixer, slide auto remote control, Mono $6432, Stereo $7996

*Prices subject to change without notice.
Figure 2. Frequency domain spectrum of composite baseband containing stereo (one channel only at 10kHz) plus unmodulated 67kHz SCA. Spectrum at composite test jack on BEI's FX-30 exciter driven by the FS-30 stereo generator and the FC-30 SCA generator.

composite baseband as viewed on a low frequency spectrum analyzer. This is a representation of amplitude as a function of frequency. It is now easy to identify the various frequency components within the baseband.

Non-linearity within the modulation/demodulation process will alter the composition of the baseband, resulting in distortion of the demodulated signal.

Signal degradation
Let's assume that we have a perfect demodulator, and focus our attention on the transmission portion of the total system. Also assume that we have perfect output signals from the stereo and SCA generators. Now there are only three areas in which signal degradation could occur. Each of these areas has its own special effect on the baseband signal. The areas are:

- the composite link to the FM modulator (stereo generator, SCA generator, composite processor and STL equipment);
- the FM modulator; and
- the RF path to the demodulator (FM exciter, IPA, PA and antenna system).

The composite link
The composite path from the stereo and SCA generators to the FM modulator should be linear in both amplitude vs. frequency and in phase vs. frequency response. Simply stated, this means that no frequency component within the baseband should be attenuated more than any other frequency component. Furthermore, all frequency components should propagate through the system at the same speed (constant group delay) and thus arrive at the modulator at the same time. The accompanying first set of equations mathematically relates stereo separation to amplitude response. The second set mathematically relates stereo separation as a function of phase response.

Stereo separation as a function of amplitude response.

Separation(A,θ) = \[ \left( \frac{\cos(θ) + A}{\cos(θ) - A} \right) + \left( \frac{\sin(θ)}{\sin(θ)} \right) \]

General Form

If θ = 0 (Perfect Phase)

Separation(A) = \[ \left( \frac{1 + A}{1 - A} \right)^{1/2} \]

Stereo separation as a function of phase response (group delay).

Separation(θ) = \[ \left( \frac{\cos(θ) + 1}{\cos(θ) - 1} \right) + \left( \frac{\sin(θ)}{\sin(θ)} \right) \]

General Form

If A = 1 (Perfect Amplitude)

In each equation:

θ = Phase error in degrees

A = \[
\frac{\text{Sub Main}}{L + R}
\]

Amplitude Ratio

Garner's one-pass, endless belt operation, you get complete erasures at the rate of 13 reels per minute.

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We're convinced that you'll agree that the Garner 1100 is the machine to handle one-inch degaussing. It's the machine of the 80's.

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Here's the best news yet: PhaseMaster can be performing in your studios for as little as $1,091.* At $2,600, our Stereo R/P is about half the price of the ITC/3M Series 99B. And the margin's even wider with Tomcat!** If you've given thought to adding the PhaseMaster, you're now up to, or over the price of a new PhaseMaster with all of its inherent advantages.

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All prices are introductory and subject to change without notice. Features upon manufacture's suggested professional prices 7/52.

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Rancho Cordova, California 95670 (916) 635-3601

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PhaseMaster's Numbers

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
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<tr>
<td>Wow &amp; Flutter</td>
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<td>Signal-To-Noise Ratio (Playback)</td>
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*Model PM-1 mono playback
**Model PM-1 mono playback

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Figures 3 and 4. Time domain pictures of non-ideal amplitude response.

Figures 5 and 6. Time domain pictures of non-ideal phase response.

Figures 7. Calculated separation

An amplitude and delay equalizer for the composite baseband is now available as part of the stereo generator. Equalization for amplitude and phase deficiencies in the STL or exciter will improve the overall system performance. An FM exciter with flat amplitude and phase response using a balanced composite input will avoid ground loop problems as well as minimize equalization requirements.

The use of any non-linear devices, such as clippers or limiters, in the composite line will alter not only the peak amplitude of the baseband, but also the frequency spectrum of the baseband. This generates several types of distortion at the receiver.

Figures 9 and 10 show the waveform and spectrum of unprocessed baseband, while Figures 11 and 12 show the waveform with correct amplitude and phase response. Shows output of BEI FS-30 stereo generator, with waveform expanded 10 times and pilot excluded for examination of baseline flatness.

Separation(A,θ) = \[ \left( \frac{(\cos A + \cos \theta)^2 + (\sin A - \sin \theta)^2}{(\cos A - \cos \theta)^2 + (\sin A + \sin \theta)^2} \right)^{\frac{1}{2}} \]

Where A = 0.99209 or 1.00798 (±0.069dB)
And θ = ±0.45°

S(A,θ) = Separation as a function of A and θ

S(0.99209, ±0.45°) = 45.06dB Separation

S(dB) = 20 \log_10(179) = 45.06dB Separation
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show the same waveform and spectrum after 1.25dB of composite clipping.

The following are types of distortion caused by composite processing:
- intermodulation of all baseband frequency components causing extraneous spectral components;
- harmonic distortion of baseband causing degradation of crosstalk and separation; and
- modulation of pilot injection level causing loss of lock at the synchronous detector.

The received audio is high in intermodulation distortion and non-correlated information due to aliasing of the extraneous spectral components added by composite processing.1,2

If minimum system distortion is the goal, composite processing should not be used. Audio processing should be performed before the audio is multiplexed into baseband.

Distortion of the composite baseband signal can also be caused by transient intermodulation distortion (TIM) within the amplifier stages.

Transient intermodulation distortion of the baseband signal is caused by the same mechanisms that produce TIM in audio signals. The composite amplifiers must have sufficient feedback bandwidth to accept

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baseband frequencies to 100kHz and should slew symmetrically to minimize slew-induced distortion. The TIM performance becomes largely a matter of operational amplifier selection and circuit configuration.

**FM modulator linearity**

The composite baseband signal is translated to a frequency-modulated carrier frequency by the modulated oscillator. Frequency modulation is produced by applying the composite baseband signal to a voltage-tunable RF oscillator. The modulated oscillator usually operates at the carrier frequency and is voltage-tuned by varactor diodes, operating in a parallel LC circuit.

To have perfect modulation linearity, the RF output frequency must change in direct proportion to the composite modulating voltage applied to the varactor diodes. This requirement implies that the capacitance of the varactor diodes must change as nearly the square of the modulating voltage as shown in the accompanying equations.

Unfortunately, the voltage vs. capacitance characteristic of practical varactor diodes is not the desired square law relationship. All varactor-tuned oscillators have an inherently non-linear modulating characteristic. This non-linearity is predictable and repeatable for a given circuit configuration, making correction by complementary predistortion of the modulating signal feasible. Suitable predistortion can be applied by using a piece-wise linear approximation to the desired complementary transfer function. Figure 13 shows a network of switching diodes and resistors for complementary predistortion of the composite baseband.

Figure 14 shows how the predistortion network is cascaded with a non-linear voltage-tuned oscillator to produce a linearized FM modulator. Modulator linearization has reduced harmonic and intermodulation distortion to less than 0.05% in newly developed equipment.

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Figure 14. Linearized FM modulator block diagram

Figure 15. Ideal demodulated composite baseband spectrum with no modulator distortion. L or R only modulated 100% at 5kHz. Unmodulated SCA at 10% injection.

Figure 16. Demodulated composite baseband spectrum with 0.05% harmonic distortion in modulator. L or R only modulated 100% at 5kHz. Unmodulated SCA at 10% injection. Interfering second harmonic stereo sidebands are 58dB below SCA. Only fundamental and second harmonic terms are shown.

Figure 17. Demodulated composite baseband spectrum with 1% harmonic distortion in modulator. L or R only modulated 100% at 5kHz. Unmodulated SCA at 10% injection. Interfering second harmonic stereo sidebands are 32dB below SCA. Crosstalk may now increase as much as 26dB, depending on the respective energy distributions in (L - R) and the SCA.

For illustrative purposes, Figures 15, 16 and 17 give representations of the fundamental and second order terms in the composite baseband spectrum with increasing amounts of harmonic distortion in the modulated oscillator. Figure 16 shows this spectrum after 0.05% harmonic distortion has been added to each component. Note that oscillation will have secondary effects on stereo and SCA crosstalk, which are quite noticeable at the receiver in spite of the small amounts of distortion to the baseband. For example, if the harmonic distortion to the baseband is increased from 0.05% to 1%, as much as 26dB additional crosstalk into the SCA can be expected.

For illustrative purposes, Figures 15, 16 and 17 give representations of the fundamental and second order terms in the composite baseband spectrum with increasing amounts of harmonic distortion in the modulated oscillator. The second order stereo (L - R) sidebands are 78dB below 100% modulation or about 58dB below a 67kHz SCA with a 10% injection. With normal energy distribution in L - R and the SCA, crosstalk from stereo into the SCA will be more than 60dB below the SCA subcarrier. Figure 17 shows the same baseband spectrum with 1% harmonic distortion. The second order stereo sidebands are only 32dB below the SCA. Crosstalk may now increase as much as 26dB, depending on the respective energy distributions in (L - R) and the SCA.

Assuring that the composite baseband signal undergoes minimal distortion in the modulation process will
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Figure 17. Demodulated composite baseband spectrum with 1% harmonic distortion in modulator. L or R only modulated 100% at 5kHz. Unmodulated SCA at 10% injection. Interfering second harmonic stereo sidebands are 32dB below SCA. Only fundamental and second harmonic terms are shown.

suppress undesired harmonic and intermodulation products in the baseband, making the FM exciter transparent to the signals coupled into it.

TIM distortion is usually not a factor in varactor-tuned modulated oscillators. The modulation bandwidth capability is generally more than 10 times the composite bandwidth and no negative feedback is used to maintain linearity.

*The RF path*

The FM modulator converts the composite baseband signal into the frequency-modulated RF signal containing a complex array of sidebands. The amplitude and phase of the FM sidebands are determined by the modulation index, while the frequencies of the sidebands are determined by the modulating frequencies.

If the modulating frequency and the FM frequency deviation are known, the modulation index can be calculated as shown in the following equation.

\[ M = \frac{\Delta f}{f_m} \]

Where:  
- \( M \) = Modulation index  
- \( \Delta f \) = Frequency deviation  
- \( f_m \) = Modulating frequency

By making the modulation index \( M \) the argument of a Bessel function, as shown in the above equation, we can determine the amplitude and phase of the carrier \( J_0 \) as well as the higher order sidebands \( J_1, J_2, \ldots J_n \).

Figure 18 is a graphical representation of the Bessel functions for the first eight orders. Figure 19 shows the frequency spectrum for a modulation index of 2.405, which is the first carrier \( J_0 \) null. After examining the Bessel function and the resulting spectra in Figures 18 and 19, it becomes clear that the occupied bandwidth of an FM signal is far greater than the amount of deviation from the carrier.

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* pulsed power
† peak sync, or 2.5 kW combined in translator service
From reliable VHF and UHF TV translators to innovative multi-channel MDS installations, EMCEE is there. Providing hardware. System planning. And installation. To learn more about how EMCEE can meet the requirements of your station, contact David Parmelee, Director of Marketing and Sales.

Consider the model shown in Figure 20, where a perfect FM modulator is connected to a perfect demodulator via an RF path of infinite bandwidth. The demodulated audio contains no distortion components.

In Figure 21, a passive LC bandpass filter is inserted between the modulator and demodulator in order to restrict the bandwidth. Audio distortion products now appear at the output of our perfect demodulator, due solely to the bandwidth restriction imposed by the passive BPF. The distortion in any practical FM system will depend on the amount of bandwidth available vs. the modulation index being transmitted.

Relating the specific quantitative effect of the bandwidth limitations imposed by a particular transmitter to the actual distortion of the demodulated composite baseband is a complicated problem indeed. The following are some of the factors involved:

- total number of tuned circuits involved;
- amplitude and phase response of the total combination of tuned circuits in the RF path;
- amount of drive (saturation effects)
Revox B710 MKII: Shamelessly Professional.

The Naked Cassette Deck—At Studer Revox, we're not ashamed to bare all. What you see above is an unretouched photo looking down inside a new B710 MKII cassette deck. If you compare what you see here to any other deck, you'll find that the B710 MKII is more professional where it counts—on the inside. This is the first cassette deck built to the exacting Studer Revox standards for craftsmanship, mechanical precision, long-term transport stability, and uncomromising quality control.

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Finally, because every part is made to professional specifications, you can depend on superior performance long after other cassette decks have succumbed to early retirement.

Features in Summary—Three head design • Automatic start-of-oxide cueing • Dolby B and C NR • Modular plug-in PC boards • Mic input mixing • Internal timer for programmable start/stop in record or play • Precise 4-digit LED counter • Headphone volume control • Optional remote • Full microprocessor control of transport modes and audio switching • Adapts to external computer control.

Look and Listen—Examine and audition the unabashedly professional Revox B710 MKII today at your nearest Revox dealer.
each class "C" stage; and
- non-linear transfer function within each amplifier stage.

In Figures 22 through 27, we view the various spectra generated by the composite baseband at different points within the system. From three baseband input signals, RF spectrum to the demodulator and the demodulated baseband are shown for wide- and narrowband paths. As the bandwidth is reduced, the RF spectrum and demodulated spectrum will change. The change in the RF spectrum is subtle, but the resulting spectrum after demodulation is clearly modified.

Some basic methods of optimizing the RF path include:
- maximizing bandwidth by using a broadband WA stage;
- using a single tube design or a broadband, completely solid-state design where feasible;
- optimizing both grid and plate circuit of the tuned stage for best possible bandwidth; and
- using a broadband antenna system with a low standing wave ratio on transmission line.

**Field adjusting transmitters**

Remember that all optimization should be done with the transmitter connected to the normal antenna system rather than to a dummy load.

The transmitter is first tuned for normal output power and proper efficiency. A simple method for centering the transmitter passband on the carrier frequency involves adjustment for minimum synchronous AM. Synchronous AM is AM modulation of the carrier caused by frequency modulation of the carrier frequency. If the bandwidth is narrow or skewed, increased amplitude modulation of the carrier will result.

A typical adjustment procedure is to FM modulate 100% at 400Hz and fine tune the transmitter for minimum 400Hz AM modulation as detected by a wideband envelope detector (diode and line probe). It should be possible to minimize synchronous AM while maintaining output and efficiency.

Another more sensitive test is to tune for minimum intermodulation distortion in left only or right only stereo transmissions. Stereo separation will also vary with tuning.

For stations employing a 67kHz SCA, transmitter tuning becomes very critical to minimizing crosstalk into the SCA. Modulate one channel only on the stereo generator to 100% with a 4.5kHz tone. This will place the lower second harmonic (L – R) stereo sideband on top of 67kHz SCA. Activate the SCA at normal injection level without modulation in the SCA. Tune

Continued on page 66
Progress by Design

Videotek’s philosophy is to progressively design & refine the quality, function, and reliability of our products, and to provide equally aggressive service after the sale.

Videotek’s state-of-the-art TSM-5A Waveform Monitor and VSM-5A Vectorscope reflect this on-going commitment, with such innovative features as Internal Graticule CRT for precise parallax-free signal analysis and Non-Glare Shields to eliminate distracting ambient light. TSM-5A also includes selectable 1H mode for easy one-line viewing, and 0.5 μs/div. scan rate for the most accurate time-base measurements.

Our popular Studio 12 picture monitor includes, as standard equipment, the features found on monitors costing twice as much: A-B Split Screen, Selective H-AFC, High Voltage Regulation, ACC-Defeat, Preset Controls, Pulse Cross, Underscan, External Sync plus more.

In only 7 years, Videotek has become an industry leader. We design and build more sizes and configurations of color monitors than anyone—worldwide! And our 1981 “Distinguished Video Industries Service Award” stands as a testimonial to our commitment to your needs.

Now that's Progress...by Design.

all available in PAL standard.)

Videotek
INC.

125 North York Street, Pottstown, PA 19464. (215) 327-2292. TWX 710-653-0125 / 9625 North 21st Drive, Phoenix, AZ 85021. (602) 997-7523. TWX 910-951-0621

Circle (55) on Reply Card
Baseband spectrum to BEI FX-30 modulator

Bandwidth limited RF spectrum to demodulator

Demodulated baseband spectrum from Boonton model 82AD

Figure 25. Two-tone (10kHz and 25kHz) modulation through narrowband RF path.

EDITORS:

Only Datatron Gives You HELP™

Only the Vanguard Video Tape Editing System gives you HELP™ the software feature that answers your operating questions right on the CRT.

No more fumbling with the User Manual in the middle of a session. Just press the HELP key and Vanguard prompts you with the correct procedure.

USER-FRIENDLY SOFTWARE

Vanguard frees you to be an editor instead of a computer programmer. Just decide what you want, and our software makes it happen.

Like rolling up to five VTRs in synchronized play. Controlling the switcher for cuts, wipes and dissolves in one edit pass. Getting precise animation automatically.

And edit list management includes list cleaning, block moves, and sorts. It's the last word in simplicity and flexibility.

PLUS SMARTSCAN™

Our SMARTSCAN slow-motion editing option gives you learning and replay of VTR speed and direction sequences; flexible freeze-frame control, forward and reverse motion over a broad range of speeds; expansion or compression of sequences ... to name a few.

WAIT NO MORE

Vanguard is the reliable, sophisticated system the industry has been asking for. Highly competitive because it really works. Send today for our full-color, fact-filled brochure.

Datatron Inc., Video Systems Division, 2942 Dow Avenue, Tustin, California 92680, (714) 544-9970, TWX 910-595-1589.

datatron.inc.

FREEDOM AT YOUR FINGERTIPS

Figure 26. Stereo (L or R = 4.5kHz) plus SCA (unmod.) modulation through wide-band RF path.
WHEN A DISH WON'T DO

MICRODYNE'S CH-14 AND MAPS II OPERATE SIDE BY SIDE.

Satellite reception is difficult in certain locations. Tall city structures or even mountains often require that parabolic antennas be placed on property elsewhere to avoid interference. Microdyne's field proven, rugged CH-14 conical horn antenna operates where other antennas will not and may be co-located with your station's studio. It is recognized by terrestrial common carrier network operators throughout the world for its superior reception.

Microdyne's CH-14 is constructed of one-piece fiberglass. Its low noise temperature and narrow beam contribute to its unsurpassed reception capabilities. Furthermore, our CH-14 complements Microdyne's Antenna Positioning System (MAPS) II for simplified satellite selection.

MAPS II is a precise antenna pointing system with memory for permanent location storage. Our sophisticated satellite receiving system minimizes bicycled tapes and expands program selection for your market.

ONE UP ON THE WORLD

For more than a decade, Microdyne has manufactured satellite receiving systems for government, military, corporate and commercial communications. As a leader in the industry, Microdyne's products are one step on the world in technology, manufacturing and service.
the transmitter for minimum output from the SCA demodulator. This adjustment can also be made by listening to the residual SCA audio while normal stereo programming is being broadcast.

The following are field adjustment techniques in ascending order of sensitivity:

- Tune for minimum synchronous AM noise.
- Tune for minimum IMD in left or right only channel.
- Tune for minimum crosstalk into unmodulated SCA subcarrier.

In any of these tests, the grid tuning is frequently more critical than the plate tuning. This is because the impedance match into the input capacitance of the grid becomes the bandwidth limiting factor. Even though the amplitude response appears flattened when the grid is heavily driven, the phase response has a serious effect on the higher order FM sidebands.

The three areas in the transmission system that affect the composite baseband performance, the composite link to the FM modulator, the FM modulator, and the RF path to the demodulator, have been discussed. Each of these subsystems must be individually optimized before your complete transmission system can give you the best possible performance.

It is hoped that this information will encourage you to investigate your system, and will help you to optimize your composite signal, the key to quality broadcasting.

References

CMX computer-assisted time code editing for $13,250?

You bet.

THE EDGE™ from CMX. Now a proven standout when it comes to features and performance in videotape editing.

But wait. Look at that price. You can get a complete EDGE time code-based editing system including control and display console, electronics frame, cuts-only switcher, two-event GPI, re-edit with list ripple plus interface with two VTR’s for $13,250.

A three-machine system, including Edit Decision List I/O module, floppy disk drive and A/V dissolver sells for $23,400.*

And, in addition to the dollar EDGE remember that our SMART KEYS™ and layered screens let you set your own editing pace. Our plug-in modules allow you to make the change from two to three machines as well as incorporating product updates quickly and easily. Also we output a 340X Edit Decision List. And remember, we’ve been talking to VTRs for a long time at CMX. Our smooth-as-silk interface results in extremely reliable operation.

We mean it when we say price, performance and features give you the reasons why THE EDGE is the only system you should own.

See your CMX representative for more details or give us a call.

THE EDGE™

NEW Internal Memory with Re-edit and List Ripple

3303 Scott Blvd., Santa Clara, CA 95050. (408) 988-2000

Circle (59) on Reply Card
**Field report:**

**The RCA BTA-5SS transmitter**

By Glen Clark, president, Texar, Pittsburgh, PA

The age of solid-state RF is definitely upon us, as was evidenced at NAB-'82/Dallas with the presence of at least three solid-state 5kW AM transmitters. With this age come advantages such as greater reliability, lower operating costs and smaller size. However, two big questions have been raised about the transistor Power Amplifier (PA) stages: How will they survive in a lightning-prone environment, and will they perform poorly into a less than optimum VSWR?

I had the opportunity to test one of the new systems, the RCA BTA-5SS, in an on-air situation. The site chosen for the test, WWSW-AM, Pittsburgh, was an 8-tower DA-2, known for its high lightning incidence. During the test period, the log recorded slightly more than two months of 24-hour-per-day service and had only two brief outages. Both were due to causes external to the transmitter.

The station also converted a choice of two very different common point leads. The day and night phasors had been designed and built in 1949, long before serious effort was expended in broadbanding of directional arrays. No changes had been made to either phasor, so the common point loads looked exactly as they did in the original proof of performance in 1949. Not surprisingly, either one could present a transmitter with one of the worst loads likely to be found. Both are plotted on a Smith Chart in Figure 1. A dummy load (which was relatively flat) was available as a reference.

Extensive listening tests found no acoustic difference in the main lobe when the system was switched from one phasor to the other. Also, there was no measurable difference in the audio output of the modulation monitor (sampling the transmitter output) when the transmitter was

---

**The SPECTRA SOUND Model 1500**

**Performance You Can’t Hear**

The SPECTRA SOUND Model 1500 Twenty-Seven Band Graphic Equalizer is the result of nearly two decades of engineering excellence. The Model 1500 represents a significant improvement over current equalizer technology.

**The Lowest Distortion**

The Model 1500 has the lowest distortion of any equalizer available. The THD and the IM distortion of the Model 1500 are below 0.018%, test equipment residual, 20Hz to 20kHz, +18dBv.

**The Lowest Noise**

The Model 1500 is the quietest equalizer available. The signal-to-noise-ratio is 104dB below +4dBv, unweighted, 20Hz to 20 kHz.

---

3750 Airport Road
Ogden, Utah 84403
(801) 392-7531

Spectra Sound is a wholly owned subsidiary of Spectra Sonic.

Circle (60) on Reply Card
Camera location 3 behind home plate is no place to tear down a camera. Especially if the director wants to punch it up on air to catch the next pitch. That's just one reason why the rock-steady, works-every-time HK-357A is an outstanding choice for production in the field.

Beyond its reputation for legendary Ikegami reliability, the HK-357A has a lot more to recommend it as the ideal field camera. For example, its crisp, high resolution picture, signal-to-noise ratio of better than 53 dB, and superb colorimetry.

What's more the camera really shows off when it's time to set up. Use of the optional microprocessor control brings into play Ikegami's Emmy award-winning digital techniques for automatic setup. Simply press one button and the computer automatically refreshes all setup and registration adjustments in about 45 seconds. No chip charts blowing in the wind, no tweaking. Just unpack, plug-in, auto-setup, and shoot.

Hook up is a simple matter too. Choose the triax option and you can position the camera as far as a mile from the van with absolutely no compromise in picture quality as compared to multicore. And for versatility, our triax camera interfaces with TV-81 multicore at the flip of a switch.

Field test an HK-357A to see why Ikegami is the choice of so many networks, major market stations, and independent producers.

Ikegami HK357A

Ikegami Electronics (USA) Inc., 37 Brook Avenue
Maywood, NJ 07607. (201) 368-9171
Northeast: (201) 368-9171  West Coast: (213) 534-0050
Southwest: (713) 445-0140  Southeast: (813) 884-2056
Canada: (289) 368-9179
Circle (1) on Reply Card
### Table: Night and Day Phasor Conditions

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Figure 1. Smith Chart illustration of day and night phasor common point load impedances at 970kHz.

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**Redundancy for reliability**

One of the inherent advantages of a solid-state transmitter is higher reliability. Like an airplane with only one motor, a transmitter with only one output device, be it tube or transistor, becomes inoperative if that device fails. The maximum dissipation currently available in solid-state devices is a few hundred watts. As a result, any broadcast transmitter in the kilowatt power range will have a number of transistors in the output stage. The RCA system uses 168.

The stages were designed in a way so as to remove a defective device from the circuit, allowing the rest to continue operating. If a small number of devices fail, the transmitter will continue to operate at the rated power. If a larger number of devices fail, it will operate at reduced power, but operate, none the less.

The BTA-5SS has six PA modules with 28 transistors in each. Each of the four modulator modules uses 24 transistors. The modules mount on a set of plugs and may be replaced with a spare in seconds.

If your assessment included at least a handful of these unique features, then you should learn more about the AUDIO KINETICS O-LOCK. In fact, the only thing more impressive than our specifications is our prestigious list of satisfied users.
If you need rigid line, here's where to get it fast.

Phelps Dodge rigid coaxial transmission line is available in sizes from 7/8 inch to 3 1/8 inches in 50 ohm impedance and 6 1/8 inches in both 50 and 75 ohm impedances.

Not only available, but in most cases, we can ship from stock. You will rarely have to wait more than two weeks.

You can order twenty foot lengths or any shorter length cut to your specifications. You can request that line be fitted with flanges on both ends, one end or without the flanges.

Hardware and other installation accessories are also available from stock. Aluminum outer conductor is available, as well.

Quality? You can count on it. Every inch is constructed of high conductivity, hard drawn copper tubing and fitted with pin-type Teflon dielectric insulators produced to exacting standards.

And, all rigid line, flanges and conductors are manufactured in accordance with Mil-L-3980, EIA Standard RS-225 and international IEC recommendations.

While purchasing rigid line for system upgrading and repair may be a simple matter, you may encounter layout and design problems in a new installation. We can help here too, with appropriate technical and engineering assistance. Just ask.

Write, telephone or TWX for Catalog 779 with all the details: Phelps Dodge Communications Company, Route 79, Marlboro, NJ 07746. (201) 462-1880, TWX: 710-722-3861.
INTRODUCING U-MATIC SPECIAL EFFECTS WITHOUT SIDE EFFECTS.
Sony, the inventor of the U-matic® format, as well as every link in the chain, has evolutionized U-matic again.

Now, for the first time ever, you can make instant broadcast-quality edits of those dramatic events which call for freeze frame, slow motion, fast forward or reverse, without transferring to 1". And the implications of this in terms of saving time and money are enormous.

TWO NEW WORDS IN 3/4" VTR'S.
DYNAMIC TRACKING.

At the heart of the new, fully integrated, plug-compatible Sony editing system is the BVU-820 videocassette recorder.

It retains all the outstanding qualities of the BVU-800 series. Including up to 40x play speed in shuttle, which is more than twice as fast as ever before—to stop, instantly, without slewing or breaking up.

But there's one brilliant addition—Dynamic Tracking. Which means U-matic users now have the ability to broadcast special effects—something which, until now, has only been associated with more expensive reel-to-reel broadcast VTR's.

TOTAL FLEXIBILITY AT YOUR FINGERTIPS.

If the BVU-820 is the heart of the system, then the BVE-800 is most assuredly the brain. Not merely because of its 128 multi-event edit memory, but because of the way it gives you total motion control of three VTR's.

The BVE-800 is expandable and upgradeable and includes full A/B sync roll capability; time code or CTL editing; built-in BVS-500 Audio/Video switcher control logic and something else only Sony can offer:

A price that's at least $5,000 less than its nearest competitor.

A CHAIN WITH NO WEAK LINKS.

The Sony U-matic editing system features another marvel of Sony technology, the BVT-800 Digital Timebase Corrector.

Without it, the BVU-820 is capable of up to 10x play speed—fully viewable.

With it, it's capable of up to 40x play speed fully viewable, and full play speed in reverse to 3x forward with broadcast quality.

For all the facts on the state of the art, from the people who invented it, call Sony Broadcast in New York/New Jersey at (201) 368-5085; in Chicago at (312) 860-7800; in Los Angeles at (213) 537-4300; in Atlanta at (404) 451-7671; or in Dallas at (214) 659-3600.

SONY Broadcast
occurs, this design lets the engine get the transmitter back on the air at full power. He can then troubleshoot the module at his leisure, or return it to the factory for repair.

A number of authors have predicted in the past that someday it would be possible to repair a transmitter by module swapping, the same way we have repaired cart machines for years. That day is here. It will be interesting to see what the qualifications of the typical transmitter engineer will be in 15 years, as more and more transmitters of solid-state design reach the field. This is especially relevant in view of the abolition of the FCC First Class Radiotelephone License.

Operating economy

Measured power consumption of the BTA-5SS is 11.4kVA for 100% sine wave modulation. Rated power consumption for a competitive tube-type transmitter of excellent design is 13kVA at 95% modulation. Assuming a 24-hour broadcast day, the broadcaster who pays 10 cents per kilowatt hour will realize a $1400 annual saving in power consumption, compared to the cost of operating the comparable tube-type system. (The test station noted an increase in heating fuel oil consumption during the November test period.) Broadcasters who have a higher cost for electricity will save more.

These cost figures are not surprising, when one considers that the solid-state transmitter operates output devices in high efficiency switching mode; does not have a tube filament to

---

**Video Delay Lines**

ALLEN AVIONICS Video & Pulse Delay Lines replace 75 ohm coaxial cable, provide a more suitable method of achieving precise short delays. The units reduce size, weight, installation costs, save time & effort in making delay changes.

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**Rack Mountable Video & Pulse Delay Lines**

A complete Rack Mountable series of Video & Pulse Delay Lines, with the capability of replacing up to 1450 feet of cable, is now being marketed by Allen Avionics. (See listing in table at left.)

Impedance: 75 ohms.

Pulse Distortion: Less than 4% with an input pulse rise time of 20 nanoseconds.

Working Voltage: 50 volts maximum, 100 volts maximum for Rack Mountable series.

Return Loss: 20db minimum, 15db minimum for VP2075, VS2075 and Rack Mountable series.

Delay Tolerance: 5% or 1 nanosecond, whichever is greater.

**For Video Delay Lines & Filters Catalog**

ALLEN AVIONICS, INC.
224 EAST SECOND ST., MINEOLA, NY 11501
Phone: 516-248-8880
The Modulation Controllers are the only modulation controlling systems that provide a completely closed loop around the transmitter. The sampling of actual modulation levels after the PA output network assures precise adjustment for optimum modulation levels. The AMC-1/FMC-1 also keep a digital count of positive and negative overmodulation bursts for both present and previous one minute periods.

DAM-1

The Digital Antenna Monitor couples pushbutton ease of operation with digital accuracy. The DAM-1 will accept RF samples from up to 12 towers (with an auxiliary panel) and features ± 1° phase and ± 2% current ratio accuracies. Remote panels and other accessories are available.

AAM-1

The Analog Antenna Monitor gives stable phase and ratio readings even in high RF fields. Separate phase and ratio mirrored-scale meters assure accurate meter indications.

RCS-1V

The RCS-1V Remote Control System combines microprocessor technology with simplified operation. Features include direct interface boards for antenna monitors, patented remote modulation bargraph, automatic logging, and synthesized speech telephone interface. The modular design allows the customer to plug in additional input or control boards to expand remote control capabilities even after the system is operating in the field.

APC-1

The Automatic Power Controller is your insurance against citations for over- and under-power operation. The APC-1 continuously monitors the transmitter output power, and makes automatic power adjustments with the transmitter loading control. This assures proper power adjustment at all times.

6730-E
6740-B

Designed to switch two transmitters from antenna to dummy load, the 6730E interfaces with 1 5/8 inch coaxial cable. For 3 1/8" lines, the 6740-B transfer switch is used. Either manually or remote controlled, the Transfer Switch is fully interlocked and can be wired to existing equipment to prevent "hot" switching.

TCA

State of the art antenna current metering has arrived in the TCA Ammeter Systems. Accurate, Modulation-free, temperature stable current indications are found in the TCA. Models include single and dual scale meters.

TCT

Delta's Toroidal Current Transformers provide accurate sampling current and phase values without the problems associated with sampling loops. Three output voltage ranges are available, as well as high voltage models for high-power facilities.

CPB-1

The Common Point Impedance Bridge is designed for permanent installation, and allows continuous monitoring of the common point, thus facilitating network adjustment. This model can be provided with one of Delta's TCA ammeters mounted in the front panel.
consume power; and does not require large blowers to remove gross amounts of excess heat.

When the first 1kW solid-state transmitter was released several years ago, the question arose: When will solid-state come to the 5kW level? Now that 5kW is here, the next logical question is being asked: When will we see a solid-state 50kW transmitter?*

I think that the day is much closer than most people believe. Substantial improvements have been made in the last two years in the field of power

*Editor's note: We understand that such a system exists, but it is government classified.

FETs, making the technology simpler. But the real reason is economic. It is safe to say that the amount of power saved by use of a solid-state rather than a tube-type transmitter is proportional to the power level.

The 5kW comparison netted an annual power saving of $1400, so a 50kW station should realize 10 times that saving, or $14,000. Similarly, the 1kW station will save $260 for the same period.

By contrast, transmitter cost is not proportional to power level. If one assumes the cost of a 1kW transmitter to be $14,000, the price of a 5kW system to be $35,000, and the cost of a 50kW transmitter to be $140,000, it is apparent that the 5kW system costs only 2 1/2 times as much as the 1kW. Similarly, the 50kW is only four times as expensive as the 5kW. As a result, the yearly savings becomes a larger percentage of the transmitter's purchase price as power level increases. The 1kW station has saved 2%, the 5kW has saved 4% and the 50kW station has saved 10% of the cost of a new transmitter in one year. In many major cities with cost-per-kilowatt rates nearly double that assumed in the model, annual savings could be closer to 20% the cost of the transmitter.

As operating costs become a larger percentage of the purchase price of an item, older equipment can be retired sooner on economic grounds alone. A possible result is a strong industry demand for a reliable solid-state 50kW transmitter. Such things make manufacturers' accountants smile...and commit larger sums of money to research and development. I predict the release of a solid-state 50kW transmitter for broadcast use at or before the 1984 NAB Convention.

As a last economic comparison, solid-state devices do not normally age and require periodic replacement, as tubes do. Excluding a catastrophic failure, a transistor with 10,000 hours of service is just as good as a new one.

Reduced maintenance

The BTA-5SS has no tuning controls. Once the coil taps are set at installation, there are no adjustments to make, other than remote control sample voltage calibrations. I expect other solid-state designs are similar.

Weekly transmitter cleaning is also likely to be reduced to more frequent intervals or longer. Dust builds up in transmitters primarily because of the large volumes of air that must be moved through the transmitter to remove excess heat. Also, the high potential of the B+ supply acts as an efficient electrostatic air cleaner, drawing from the air and attaching it to the charged components.

Because cooling of the BTA-5SS is done with several small muffin fans, air movement is minimal. Not only is the volume of air moved less, but also...
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The transmitter building and four elements of the 6-tower array required to attain what is reported to be one of the most difficult radiation patterns in the United States.

power system. By contrast, the solid-state transmitter has one, possibly two, separate supplies with potentials exceeding 100V. The highest potential will be a few hundred volts. It is not unthinkable that transmitter maintenance of the future could be done by one careful engineer, rather than by two.

Final thoughts
Since the beginning of broadcasting, the transmitter has required a substantial part of the engineering department’s time and has been a major force in determining the way in which engineering departments have evolved. Separate though they are, most engineering departments have tended to evolve into similar organizations, mainly because they have similar duties.

Solid-state transmitters offer many economic advantages that will move them into the field faster than if they were just another series of new transmitters. These same transmitters, however, require less and different maintenance than the transmitters that we have grown accustomed to in the last six decades. As this once pivotal point of the engineering department has evolved into something quite different than what it has been in the past, so also is it likely that the engineering department of the future will evolve into something different than what it is now.

Editor’s note:
Before and during the time that arrangements were being finalized for this report, the author was chief engineer of WWSW-AM, Pittsburgh. He subsequently left that position to form Texar. However, he was allowed access to the station’s facilities for testing regarding this article. The transmitter system was installed by RCA, with FCC permission, for in-field testing and evaluation.

These tests and the author’s research proved valuable to RCA. Following the tests, the subject transmitter was returned to RCA’s facilities in Meadowlands, PA. At that time, the author, Bill Rhodes, BE editorial director; and Fred Huffman, RCA’s manager of radio sales development, met to observe and perform more in-house tests. As a result, the author made several suggestions in design and specifications that he thought would be beneficial to broadcasters.

For more information on the BTA-5SS AM 5kW transmitter, contact: RCA Commercial Communications Division, Front and Cooper Streets, Camden, NJ 08102.

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Satellites
big in European television

By Michael J. Adams, British correspondent, United Kingdom

Developments concerning satellites are the focus of attention in London, where an announcement has recently been made of Europe's first experimental satellite TV service. A more immediate development, however, is the latest move in the breakfast TV area.

The governors of the BBC have sanctioned a breakfast-time service, possibly to be initiated on-air before Christmas. This will be well before TV-AM, the commercial service scheduled to go live in May 1983. There is some concern within the commercial company, and Peter Jay, chairman, is pressing the Independent Broadcasting Authority for an earlier launch date.

The BBC has budgeted £5 million a year for its proposed two hours of news and interviews, to originate in its London Lime Grove studios. Using the European Space Agency's Orbital Test Satellite (OTS), the first phase of the satellite tests consisted of a full 5-hour schedule on each day of the last week of May 1982. The service was transmitted from the Independent Broadcasting Authority's mobile dish transmitter. The signal, scrambled to prevent unauthorized use, was received by closed circuit only in Britain, Algeria, Austria, Belgium, West Germany, the Republic of Ireland, Italy, Malta, the Netherlands, Portugal, Spain, Switzerland and Tunisia, all members of the European Broadcasting Union.

The initial week of transmission was designed to test the feasibility of a full-scale European service. Four 1-week trials will follow, coordinated by other national broadcasting services. Schedules will include a wide selection of material provided by participating countries. The objectives of the experiments are to demonstrate and test different schedule patterns for a pan-European TV service; to

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The AU-100 has a direct-drive motor for precise tape movement and a capstan motor designed for reduced gyro effect. And for accurate assembly edits after every shot, the AU-100 backspaces 30 frames every time the VTR trigger is released.

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assess possible audience reaction to such a service and its impact on existing national services; to assess the costs and effectiveness of multichannel audio and teletext subtitling in different languages; to seek new ways of making programs understandable to a multilingual audience; to access the nature and cost of the central services, including news and information services required for an operational European service; to identify and resolve the technical, legal and financial problems that an operational service would present; and to draw attention to the interest of European public service broadcasters in cooperation in the field of direct broadcast satellite.

The experiments, coordinated by an international operations group headed by Neville Clarke, the Independent Broadcasting Authority's (IBA) senior TV program officer, will also employ the latest techniques in digital sound. Up to four different language channels will be possible.

Figure 1. A comparison between the existing PAL system and the Independent Broadcasting Authority's proposed MAC system.

Enhanced signal format

A recent report from the IBA discussed an enhanced TV signal format for satellite broadcasting. This format, known as MAC (multiplexed analog component signals), tries to provide a quality equal to, perhaps better than, that available from terrestrial transmissions on existing receivers. It should be possible to display these pictures on existing receivers with the minimum of additional complexity in the satellite converter unit.

The MAC system retains the 625-line format. However, instead of 50 interlaced fields of 312 half lines, it
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The AC 20 gives you two channels of digital time base correction in just seven inches of rack height, saving space, maintenance, capital cost, cooling, and power. The Production Remote gives you digital switching effects at very little extra cost.

In fact two channels of time base correction with 2:1 digital effects are priced at only $17,500.

Two of the effects are shown above: Corner Wipe, and Push Off. You also get Vertical Wipe, Vertical Interval Cut, Fade/ Dissolve, Push On, and Pull Off, plus Reverse and Mid-Stop controls and a choice of four transition speeds. Not bad for a TBC.

This means that with three VTR's and an AC 20 (with the Production Remote option) in an editing suite, your ENG post-production crew is ready for A/B-roll editing with digital effects, some of which have only been seen on upscale switchers until now. No need to tie up your production switcher. And you can remote the AC 20 to your editor, if you like.

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color cameras now feature such automatic setup functions as white balance, black balance, white and black levels and picture size. Even so, their automatic ranges can be exceeded and, under field production conditions where ambient light conditions can change almost instantaneously, an operator can easily make mistakes. Consequently, microprocessor-controlled features of the CEI-300 series of cameras from Crow of Reading are significant. Instructions from the microcomputer, visible on the viewfinder and monitor screens, give instant guidance to the operator when an adjustment is beyond the auto range. Instructions are in plain English superimposed on the picture and include prompts regarding mode settings, as well as unambiguous directions for manual adjustment.

When operating in natural light, color temperature may change beyond the camera's auto white balance range. This can be checked instantly against any small white area—corresponding to about 5as on a single raster line—in the scene. If balancing is required, a flashing "W" appears in the lower left hand corner of the screen with a brief instruction for adjusting the manual controls (for example, turn gain up or turn B up and R down). When auto balance takes over, the flashing W disappears. The complete adjustment takes less than half a second.

The Chromoscope P135 video synthesizer is now available in an NTSC version from CEL Electronics.

Video synthesizer

The Chromoscope P135 video synthesizer from CEL Electronics has been available only in a PAL 625 version. Now, an NTSC version has been produced. The new synthesizer provides the same facilities as the PAL version, and accepts such sources as a videocassette recorder or a live camera. The unit incorporates external images in patterns and can superimpose patterns, shapes and colors onto the images provided. It will even put color into a black-and-white picture. It creates a constantly changing design of abstract, multicolored images.

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Creating
an AM stereo system

By David Hershberger, associate principal engineer, Broadcast Division, Harris Corporation, Quincy, IL

Designing an AM stereo system in a vacuum would be much easier than doing it in the real world. Without having to concern themselves with existing transmission or receiving equipment, engineers would probably converge on a pure quadrature AM stereo system. Such quadrature techniques are used in color TV transmissions, proposed FM quadraphonic systems and in many sophisticated communications and data systems. A pure quadrature system would require no additional bandwidth, would provide excellent signal-to-noise ratio, and would be totally compatible with synchronous detection. The problem in the real world is that there are millions of AM mono receivers in the field, virtually all of which employ a single diode as an envelope detector.

All AM stereo system proposals have to go through the NAMSRC and the FCC, seeking approval. The pure quadrature system seems ideal in almost every aspect, except that its harmonic distortion through a narrowband envelope detector measures higher than what is expected by today's high fidelity standards. Many people are influenced by comparative numbers, so a system that does not look good on paper might never get off the ground. However, the problem with these distortion measurements is that they don't correlate with what the listener hears.

Numerous tests in the United States, Japan and Europe have demonstrated that listening to a pure quadrature system through an envelope detector produces no objectionable listening characteristics. The measured distortion is mainly second order in nature and is closely harmonically related to the original program. In fact, several manufacturers of power and musical instrument amplifiers deliberately increase the second order harmonic content to make their units sound more powerful.

In designing the Harris linear AM stereo system, the company started with a quadrature (90°) system and sought ways of improving how the system measured. Reducing the modulation angle from 90° to 30° created a system that measured well, sounded good on envelope detectors, and operated as well as an AM stereo system.

Further experimentation developed the present linear AM stereo system, which varies the transmitting angle as a function of the L - R content of the program. The system senses possible measured distortions that could occur in envelope detector receivers and compensates for this condition by

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altering the L-R channel at the transmission end. This dynamic control information is conveyed via the stereo pilot tone, which tells the receiver circuit how to properly decode the signal.

Exhaustive laboratory and field tests on various types of program material (such as music and speech), show that the system tends to be a quadrature system most of the time. (See Figure 1.) The smallest angle ever observed was 45°, observed once in the lab and once on air tests at CKLW, an AM radio station in Canada. The probability curve derived from long analysis of the system indicates that 99.9% of the time no more than 4.5dB of gain control is required. This is conservative when one considers that Dolby B uses about 15dB and dbx up to 50dB.

The design criteria for the Harris linear system was based on five key objectives:

- conservative use of AM spectrum—As any nighttime AM radio listener can testify, there is tremendous congestion on the AM broadcast band in the United States. The condition seems much worse in Japan and Europe when one considers that there is at least one, and often many, megawatt stations operating on each AM frequency authorized in Europe and Asia.

The Harris system was designed to allow maximum fidelity transmission of an AM stereo signal without increasing the required bandwidth. (See Figure 2.) This is different from other systems proposed, all of which re-
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Figure 3. Block diagram of Harris AM stereo transmitter, the SX-1, 1kW solid-state AM transmitter.

require increased bandwidth to accommodate the sidebands of their stereo transmissions. These systems could never be considered for European or Asian broadcasting, because stations there are already on 9kHz spacing. Any increased bandwidth occupancy would severely increase the overall interference level.

* full audio fidelity from 50-15,000Hz—if AM stereo is to survive and prosper it must offer the listener a service almost as good as FM stereo. If the bandwidth is limited to 5kHz or 8kHz, as it is in most other systems, the listening public will not perceive a substantial user benefit from AM stereo. The “gimmick value” will quickly wear off and listeners will return to their FM stereo habits. The Harris system provides a full fidelity transmission system compatible with existing mono receivers.

* easy interface with existing transmitters and antennas—For an AM stereo system to be successful, it must interface easily with the existing transmitter, antenna system and phasor in a directional array. Because some systems have increased bandwidth requirements, they may require modification of the antenna and phasing systems. Failure to make the antenna system broadband enough to accommodate the AM stereo signal of these other proposed systems could result in high distortion at the receiver.

Harris estimates that required modifications on a typical AM station could cost between $5000 and $60,000, and could mean that the station would have to sign off or operate at reduced power for an extended time while modifications are made.

* compatibility with pre-emphasis—In a recent survey, more than 57% of AM broadcasters said that they are using pre-emphasis on their AM stations. Another 14% said that they planned to install pre-emphasis in the near future. Pre-emphasis in AM radio tries to overcome the poor received quality and limited frequency response on most home and car AM radios. Pre-

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Circle (90) on Reply Card

Broadcast Engineering September 1982
**INNER VIEW:**
A closer look at Conrac Monitors

**Active Convergence:**
Registration made simple.

Conrac's Active Convergence System gives you complete control over color registration adjustments and greatly streamlines convergence checks.

It uses 36 independent controls to individually adjust nine separate areas on the CRT screen—including corners!

You spend less time on convergence checks—and the adjustments you make will be much more accurate.

Conrac's system uses 24 operational amplifiers to independently control red, green, and blue in each screen area. Vertical and horizontal waveforms are referenced for shaping the signals that excite the convergence yoke assembly. Dynamic blue lateral convergence is achieved with operational amplifiers.

**Beam Current Feedback:**
The Ultimate in Black Level Stability.

Conrac's unique Beam Current Feedback system automatically maintains black level stability.

Conrac's exclusive Beam Current Feedback system maintains a more stable picture for a longer period of time. It automatically maintains black level stability—regardless of CRT aging or component drift. In fact, black level is held to within 1% of peak luminance level between 10% and 90% APL (Average Picture Level).

Conrac's active system uses a keyed back porch video amplifier and beam current sensing that occurs during the vertical interval. The video signal is ac coupled to the video amplifier, thus eliminating the dc component and retaining the level between black and white. It is then amplified and applied to G1 of the CRT. The feedback loop is completed when a sample cathode current (gated by the brightness pulse) is applied to a sample and hold circuit.

If the cathode current changes for any reason, the video amplifier's dc level is automatically adjusted. Result: reference black level will remain constant.

**Conrac Technology:**
30 years of leadership.

Conrac's track record of technical innovation stretches back nearly three decades. And what we've learned since then goes into every monitor we make today. That's important to you. Because the more technology we pack into each monitor, the more performance you'll receive from it.

Active Convergence and Beam Current Feedback are just two ways Conrac technology can save you time and money.

For the complete inner view of Conrac technology, call or write us today: Conrac Division, Conrac Corporation, 600 North Rimsdale Ave., Covina, CA 91722, Telephone: (213) 966-3511, Telex: 67-0437
OMNIMOUNT
IT HANGS TOUGH...
But you can push it around.

We think good looks and good use go together. The Omnimount System has a handsome technical look. Its artfully simple design follows inevitably from the work it has to do.

Which is: To hang your speakers strong and solid. In an infinity of positions. Not only speakers but television monitors, security cameras, lighting—and more.

Omnimount is of industrial quality, built to last a long time. A key to its remarkable performance is the ball joint design. The ball is moulded of an ebonite polymer compound, with excellent memory-return; and it is just about indestructible.

The ball is bonded to the thick-walled carbon steel tube in the same way that heavy duty motor mounts are bonded. The clamp/flange is made of 356-T6 aluminum alloy. The ball-and-clamp unit decouples electricity and helps absorb vibration. The Omnimount System ends up so stable, it is even used in moving vehicles.

You can mount Omnimount on the wall or ceiling—or even the floor. It does its job with extraordinary flexibility, not limited to the usual “pan and tilt” functions.

With Omnimount, little things mean a lot. For example, the leads can dress down right through the tube for a neat and clean installation.

Omnimount is one of a kind. You'll know why when you use it. You can focus speakers easily for a balanced stereo image; just aim it and lock it. The sound stays where it belongs and goes where it belongs—in splendid acoustic isolation.

Omnimount looks great of itself—and where it belongs. It's artfully simple design follows inevitably from the work it has to do. It hangs, indeed, like a magic.

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This transmitter combines the latest in solid-state and tetrode technology. Low level diplexing, pioneered by Acrodyne, and IF modulation insures many outstanding features for UHF broadcasters. These features include: 10 second instant-on from a cold start; all solid-state, broadband, hybrid-combined drivers and integrated forced air cooling.

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September 1982  Broadcast Engineering  99
The technical proposal: An engineer's bridge to management

By John M. Cummata, chief engineer, KNEI-AM/FM, Waukon, IA

For a more efficient team effort in the broadcast environment, the engineer must become a part of management decisions. Communication is the key to that involvement.

Recently, members of the broadcast industry have been calling for more engineering participation at the management level. The main obstacle to this participation has been communication. Engineers must go beyond speaking electronics to become more involved in management decisions.

To gain acceptance on the management team, the engineer has to do two things: He must gain a deeper understanding of how other departments affect the health of the station, and he must learn to communicate his ideas in terms with which management can identify. Whenever an engineer presents an idea of importance, he must answer management's questions: "What?", "How?", "When?", "Why?" and "How Much".

Most engineers' point of contact with management is their involvement in some station activity or plan. It may be the engineering angle on a remote broadcast, the engineering response to a competitor's latest move, or the engineering solution to an ongoing problem. In any case, the engineer is called upon to solve it or simply implement a decision already made by the manager and some other department head. The point of contact is the same whether you are an in-house engineer, or a contract or consulting engineer; the difference being the depth of your knowledge of the station, its personnel, community and resources.

In either case, your mission is to respond with confidence to management's call, and to communicate effectively what you offer in that response. The technical proposal is a tested and successful method of bridging the communications gap between technicians and their non-technical managers. And the professional image projected by a well-constructed proposal goes a long way toward winning its author respect and repute from management.

The technical proposal bridges language or jargon barriers and focuses management energy where it will accomplish the most good. First, it identifies the problem in objective and basic terms. Next, it proposes the solution(s). Then it presents alternatives for management's consideration. It answers management's favorite questions, including the cost, and finally, it clearly presents your strong endorsement for the suggested course of action.

A technical proposal is an extended memo with sufficient structure and

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RCA's revolutionary new handheld HAWKEYE ENG camera was built around a revolutionary new RCA tube—the ½ inch SATICON*. Its superior performance is the direct result of enlightened design techniques and the inherent characteristics of the Selenium-Arsenic-Tellurium photoconductor.

The SATICON tube offers outstanding resolution, and handles high-contrast scenes without unpleasant distortion or discoloration. Color pictures come through spot-free, without flare. For these and many other reasons, SATICON tubes are now used in over 50% of the new color cameras sold in North America and Japan.

On the basis of performance, reliability and general user acceptance, they will soon predominate in color television cameras worldwide.

SATICON tubes are now available as new or replacement equipment for most ENG, studio and remote cameras. For more information, please write RCA Camera Tube Marketing, New Holland Avenue, Lancaster, PA 17604. Telephone: (717) 397-7661. Or RCA Brussels, Belgium. Sao Paulo, Brazil. Sunbury - on - Thames, Middlesex, England. Paris, France. Munich, W. Germany. Hong Kong. Mexico 16 D.F., Mexico.

* Used by permission of trademark owner.
Substance to move management. It follows a summary-background-facts-outcome format that flows logically from the presentation of the problem or project to the recommended solution or plan. (See Figure 1.)

A brief summary of the problem is the first element in a successful technical proposal. This can be a problem that management has asked you to solve or a project that you have identified that would benefit the station. The problem and your solution will be defined more clearly later in the proposal; the summary is just a general preface.

An introduction section should be the next ingredient in your proposal. The introduction accomplishes two important goals: It clearly defines the problem to be overcome or the goal to be reached, and it establishes exactly why it is a problem or a goal toward which to strive. The proposal is structured much like an outline, and the introduction segment should contain necessary subsections describing each element of the problem, such as effect on equipment, long-term costs and human engineering.

Now that you have clarified what you are up against with the summary and introduction, it's time for a discussion on how the problem can be solved, or the goal reached. There are four segments to this discussion:

- **The objective** is a definition of parameters or criteria for an ideal or acceptable solution. This tells management what you see as the best possible outcome.
- **The proposed solution** is just that. You should define what it is, the result you would achieve, how your station would implement it, how much it would cost, and its advantages and disadvantages. Here is where you lay your cards on the table. Your motivation for writing a technical proposal in the first place was that you believed you had a solution for a station problem, or an idea that could benefit the organization. This is where you delineate all its assets and liabilities.
- **Alternative solution(s).** For each alternative, list what it is; the result it would achieve; how it would be implemented; its costs, advantages and disadvantages; and why it is not as effective as the proposed solution. There may be overriding facts known only to higher management that would make one of your alternatives the preferred solution. The fact that you present other perspectives shows your awareness of management's informational needs.
- **The evaluation** is a brief trade-off analysis. It refers to the objective and compares the effects of adopting an alternative, or taking no action. This is where your narrative takes management down the various paths, as you have evaluated them, and shows how yours is the true yellow brick road. It also makes clear that sitting idly at dead center will cause the situation to deteriorate, or at least not to improve.

The final element of a successful technical proposal is your recommendation for action. This should be a strong, positive statement of confidence in your program's ultimate success. Or, if your proposal is designed to secure permission for an expenditure or a certain course of action, your recommendation should be a direct and specific request. The key to this wrap-up to the technical proposal is confidence. If you don't really believe in what you're suggesting—don't write a proposal.

Format design may vary, but neatness and professional appearance are musts. The following are some suggestions:

- Put your proposal's title in caps at the top center of the first page. Also on the first page should be an identification of to whom the proposal is addressed and whom it is from, along with the date.
- Leave space between the proposal's sections so that the paper is orderly and easy to review. It would be a good idea to title the sections as well.
- Include any graphics or visual aids, such as block diagrams or flow charts, that will add to the clarity and comprehension of the proposal. Don't, however, add diagrams just to be impressive. Also, any lengthy visuals or sets of figures that might interrupt the flow of the narrative should be presented as attachments to the proposal and referenced in the text.

The technical proposal is a communications bridge between the engineer and the manager, and it accomplishes two important things: It helps the station solve its problems, and it defines its author as an effective member of the management team.

**Figure 1. Technical proposal format**

- **I. Summary**
  - (text)
- **II. Introduction**
  - (text)
- **III. Discussion**
  - A. Objective
  - B. Proposed solution
  - C. Alternative solution(s)
  - D. Evaluation
- **IV. Recommendation**
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By John H. Battison, director of engineering, WOSU-AM/FM/TV, Columbus, OH

Last summer Dale K. Ouzts, director of the Telecommunications Center, and I were invited to visit Beijing (Peking) in the People's Republic of China. Our invitation came from the director of the Beijing Broadcasting Institute and included not only lecturing to the students at the institute but also untrammelled sightseeing in the Beijing area. As broadcasters we were particularly interested in the organization and operation of the Central Broadcasting Administration of China.

First impression

Before passing on to the TV portion of this article, I would like to pause in an attempt to convey this Westerner's reaction to the newly opened People's Republic of China.

Our arrival, six hours late, at 3 a.m. was hardly auspicious. Fortunately, our hosts were still awaiting. A 40-minute, decorous drive at about 40 miles an hour down the tree-lined road from the airport was my first awareness of the strong feeling of peace in China. In fact, peace was the prevailing impression that I received during my stay. We saw very few automobiles on the road and no armed police, either in the city or in the outskirts. In fact, we saw none of the signs that I had anticipated in a Communist country. On the contrary, there were many groups of cyclists on their way to work.

Later, of course, we were overwhelmed by the multitude of cyclists in the city of Beijing and the lack of automobile traffic. However, this scarcity was more than compensated for by the efficient and frequent bus and electric trolley services that ran continuously throughout the city.

Beijing Broadcasting Institute

Our first visit to the Beijing Broad-

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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.

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casting Institute was a fascinating experience. It was founded in 1959 and was forced to close once during "The Cultural Revolution." The institute is the sole source of personnel for the Central Broadcasting Administration of China (CBAC). It has graduated more than 3000 students who have gone into the broadcasting and TV industry in the People’s Republic of China.

While we were in Beijing, there were about 800 students with 276 teachers, including 197 professors and professorial staff. This staff is composed of specialists, journalists and radio engineers who are qualified to teach by reason of experience, education and training. Although, by US standards, the buildings are somewhat old and worn, the spirit and enthusiasm of learning is apparent.

We were shown the model of the new Beijing Broadcasting Institute buildings (Figure 1), a project to be proud of. Already one wing is nearly completed. This building will house the various foreign lecturers whom, it is hoped, will visit to pass on their experience to the students at the institute.

About 300 of the 800 students currently enrolled are in the undergraduate degree level in radio and TV engineering. The remaining 500 are devoting their energies to obtaining degrees in journalism, programming, announcing and similar program-oriented occupations. We were impressed with the enthusiasm shown by the students and the staff. Although classrooms were full—one class I attended had more than 100 students in TV engineering—there was no horseplay, and classroom behavior was exemplary.

Figure 2 was taken during a lecture on the subject of color TV receiver design and was a good example of student interest. Along the one wall of the classroom is a banner that advises the students: "You must overcome all difficulties you meet when you study." (I think this is something that many US students might do well to observe!) There was another notice beside the blackboard, saying: "You must be quiet."

The school is well-equipped with electronic training equipment. Reasonably sized studios provide facilities for students to practice camera handling and general TV production techniques. One item that impressed me considerably was an optical light demonstration showing how red, green and blue light combine to form all the hues in the color TV picture. Although basic, it was an authoritative demonstration.

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Figure 1. Architect's model of Beijing Broadcasting Institute's new buildings.

Figure 2. Typical Beijing Broadcasting Institute engineering classroom.

Figure 3. A clipping of the Beijing TV program, May 19, 1981.
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**TV broadcasting**

As I mentioned earlier, one of the things that struck me was the feeling of contentment and peace that I found everywhere I went in Beijing. I was also impressed greatly by the industriousness of the people and the conscientious way in which they went about their work. Probably because of the long working hours, Chinese television is generally aired only during the evening hours. Figure 3 is a clipping of the Beijing TV program for Tuesday, May 19, 1982. Although these programs were printed in English (they were in the China Daily, the English language paper), all the programs were in Chinese. Although most of the programs are produced in China, a few dubbed syndicated programs are also aired from time to time.

**Figure 4.** Crosstalk straight man and comic were so good that we often laughed although we did not understand Chinese! Note numerous microphones.

The hotel suite was supplied with a 21-inch color TV receiver that was made in China, and it worked well on its indoor antenna. The ghosts that appear in Figure 4 were unavoidably introduced by the rabbit ears in the room. Operating on the PAL-M system using 625 lines and 50 fields per second, the system provides higher definition than NTSC (525 lines, 60 fields). Many of the smaller cities have single VHF TV stations interconnected by microwave to carry the national program.

The studios we saw at the Central Broadcasting Administration were smaller than we are accustomed to in the United States and the equipment was not new. However, they were well-maintained and, once again, the spirit of striving to work to the best of one's ability was apparent among the broadcast staff.

Notice that the programs on all three channels start at 7 p.m. and run about three hours. With such a short program period available daily it...
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might seem that $290 for a black and white receiver, and about $800 for a color receiver is a high price to pay. It is, because a large portion of the general workers, and even the professional staffs, receive less than $100 US per month. But because the state makes available all the necessities of life at unbelievably low cost, it is not as unusual as one might expect to find citizens enjoying the benefit of monochromatic or color television.

Channel 2 is small and basically the central TV source. The same national program is carried nationwide. On holidays, the programs may run later than 9 or 10 p.m. and in the afternoon. Educational programming is often available on Mondays, Wednesdays and Fridays between 9 and 11 a.m., and sometimes on Tuesdays, Thursdays and Saturdays from 5 to 7 p.m. These instructional programs are aimed at all segments of the viewing population.

Channel 6 is basically the local education channel, although none of the three channels carries concentrated special interest offerings.

Channel 8 appeared to be a general entertainment program. To our surprise, most of the commercials that we observed between some programs were for large pieces of machinery such as earthmoving, diesel or similar heavy manufacturing items. There were some Beijing consumer goods, and these were generally the type produced by the staff of the Beijing Broadcasting Institute.

The production techniques that we observed were interesting, and reminiscent of our own earlier US days of television. Many of the plays appeared to originate in either a public theater or a studio theater/stage. Microphones were much in evidence (Figure 4), across the front of the footlights and, because of this, sometimes the sound was less than perfect. In some of the other productions the sets seemed to be shallow. Production was sometimes reminiscent of the early days of live television before VTRs removed spontaneity from television.

On several evenings international news received by satellite was telecast. Several of these were from the United States, and snatches of English could be heard underneath the Chinese language dub. Antennas for the three TV services are located atop the Central Broadcasting Administration's building, and the familiar batwing antennas can be clearly seen on the tower of the building (Figure 5.) There are probably about 8 million TV receivers in use in the People's Republic of China today. The number is increasing, but rather slowly.

Summing up, TV broadcasting in
China is regarded with far more respect for its educational potential than is frequently apparent in the United States. The need, interest and drive on the part of the Chinese people to improve themselves and to develop the scope and usefulness of their broadcasting system was apparent. One of the biggest problems that China faces today in the expansion of its broadcasting facilities is a scarcity of qualified broadcast personnel. The Beijing Broadcasting Institute, which is the only one in the country, is doing its best to meet this demand, but it will be a long time before it is filled.

The time we spent in Beijing was a wonderful experience. It not only brought out the friendliness and industriousness of the Chinese people, and their genuine friendship and interest in the United States, but provided an insight into the TV and broadcasting industry of this sleeping giant nation. I left with the strong feeling of having brought something needed with me that was grasped with gratitude by the students. In return there was a feeling of appreciation and the sincere desire to know Americans better. I have accepted their invitation to return to lecture for three months, beginning this month.
As many of you may already know, last year we introduced the Chinese Language Edition (CLE) of Broadcast Engineering. On Feb. 9, 1982, Cam Bishop, publisher, and I went to China to visit with broadcasters and to do research for this year's CLE.

In a word, the journey was magnificent. If you ever get an opportunity to visit China, go. But call me first and I will give you some tips that do not appear in guidebooks.

The China leg of our trip included Beijing (Peking), Hang Zhou and Shanghai. We also visited Tokyo and Hong Kong. We toured radio and TV stations in Beijing and Shanghai, visited a broadcast equipment manufacturing plant in Beijing, and toured an electronics plant in Shanghai. In all three cities we held technical discussions with broadcasters that were quite enlightening. And, in Beijing, I lectured to about 200 broadcasters and administrators on new developments in radio and television throughout the world.

But, it wasn't all business. We toured each of the cities to see how the Chinese lived and worked. All information was freely given, and we were treated with unbelievable courtesy and hospitality. Also, the food and drink, especially the beer, were superb.

In Beijing we visited the Great Wall of China and climbed the east and west walls to the mountain peaks—perhaps the first Americans from our city ever to have done so. In Beijing we also visited the Ming Tombs, the famous Forbidden City, Mao's monument, and several beautiful parks.

In Hang Zhou, we cruised its famous lake, visited its parks with beautiful gardens and enormous pools of goldfish, attended a Chinese situation comedy play, toured China's second largest silk factory, and visited the famous Dragon Well tea site. In Shanghai we attended an evening of spectacular acrobatics and saw the performance of an exceptionally talented panda.

I think that the reception to our visit would have been welcomed simply because of the unusually polite attitude of the Chinese. But the success of our CLE publication lent dignity and prestige to our visit.

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- Remote control up to 1000 feet for each data store.
Keep in mind that our CLE is the first publication of its kind available to Chinese broadcasters and that their thirst for reliable information on every aspect of radio and TV broadcasting is virtually unquenchable. It was interesting, almost amusing, to see that Chinese engineers are like all others - radio people want an all-radio issue, TV people want an all-TV issue, and they both want more, more and more technical data.

Chinese engineers were eager to discuss broadcast trends in the West.

Programming for both radio and TV is strictly in-house or in-field, often with the BBC or other source material. Consequently, programming is severely limited, with priority emphasis on communications and education rather than entertainment.

To underscore the extent to which broadcasting is used in education, a Broadcast College links 36 of the 39 Chinese provinces. About 500,000 students are enrolled in this educational network that leads to a 3-year degree. Land-line microwave links are presently used for this system, but consideration of satellite distribution appeared to be food for thought.

Much of the equipment was made in China, including the flying spot scanner in the background.

So, our technical discussions had an air of excitement about them. For the Chinese it was an opportunity to learn the latest from the West; for us it was the chance of a lifetime to visit a land of mystery and to present recent advances in broadcasting technology.

Our overall impressions are varied. FM broadcasting is in its infancy, an experimental phase that appears to be gaining rapidly in acceptance. Radio broadcasting itself is extensive, with programming in about 38 languages. TV is rapidly being modernized, with heavy emphasis on Japanese, American and European high technology equipment.

Three-camera techniques in color-program production have been common since the early 1970s, with recent modernization to 1-inch editing equipment and the latest in ENG and video switchers. (In fact, our Chinese translator was told by the engineers not to attempt translation of "ENG" because they understood the term as we do.) Radio programming is mainly on reel-to-reel recorders, and both foreign and Chinese-made equipment was seen. Audio signal processing is just beginning, with the latest equipment from the West sitting atop audio consoles as engineers experiment.

Color cameras of both Chinese and foreign manufacture were seen.

Radio broadcasts are the most extensive, with more than 130 hours per day being broadcast in more than 30 different languages. TV broadcasts are more restricted. General programming, limited to about 30 hours per week, is mainly in the evening from 7 to 10 p.m. and on Sunday. However, educational TV programming averages about 10 hours per day.

Our trip to China was marvelous. But the bottom line is that the feedback from Chinese broadcasters was invaluable in helping us optimize the editorial package for this year's Chinese Language Edition of BE.
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Improving UHF transmitter efficiency

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

As power costs become more significant in broadcast operation budgets, users will seek more efficient transmitters as one means of cost reduction. The author looks at the status of efforts to improve the efficiency of current UHF transmitters and to develop new ones. Views from an engineering session on this topic held at NAB-'82/Dallas are also included.

The increase in cost of electrical energy in the United States and other countries around the world is causing operators of high power UHF stations to continually seek methods for improving the efficiency of their transmitter final amplifier stages. When the 4- and 5-cavity klystrons were introduced in the UHF market...

Continued on page 122
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several years ago, they were greeted with open arms because of the enormous decrease in the complexity of the overall transmitting equipment that was realized. Coupled with IF modulation, it was possible to eliminate outboard vestigial sideband filters and all necessary circuitry and paraphernalia required for modulation at high levels. The very high gain and high power output quality of these klystrons was considered to be a major advancement in the state-of-the-art for UHF transmitters.

The klystron amplifiers still represent the most desirable way to operate high power UHF transmitters at the present time. However, the poor efficiency of these amplifiers could be improved and brought closer to the efficiency of VHF amplifiers. A number of techniques have been developed starting with the anode pulsar used to decrease the anode current in the klystron during those periods of the TV waveform when full output power is not required. That is, the klystron current was increased to the larger value during sync pulses when it was necessary to develop peak output power, and then reduced during those periods when a lower power output was acceptable.

The use of the anode pulsar still did not bring the efficiency of the internal cavity klystrons up to the efficiency that was achievable from external cavity klystrons. This internal vs. external cavity discussion has continued for the past several years using not only the efficiency argument, but ease of replacement and other parameters that are of interest to broadcasters.

One new development has caused another increase in efficiency of the internal cavity klystrons. This has been the development of an external adjustable output coupler that can be used to optimize the output circuitry of the internal cavity klystron. This topic was discussed by Robert M. Unetich of RCA at NAB-'82/Dallas. He said that an efficiency improvement of approximately 6% was possible when the coupler was properly adjusted. He also said that it is necessary to adjust this coupler carefully to obtain a reasonable improvement without severe degradation of the output signal quality. It is possible to improve the efficiency to a higher amount if signal quality is allowed to decrease. A reasonable compromise would be necessary for the broadcaster who wished to maintain the signal quality at the state-of-the-art level. Still, the addition of an external coupler to an existing facility is a reasonable ap-
approach for a slight efficiency improvement.

Unetich also said that additional compensation networks were necessary in the exciter to reduce the incidental phase modulation in the klystron amplifier when the output coupler was used. In older transmitters that do not have sufficient capabilities to reduce this phase modulation, only about 3% improvement in efficiency would be realized.

The second speaker at that seminar, Robert S. Symons of Varian Associates, discussed a possible change in klystrons, the design of depressed collector klystrons. These klystrons possess the capability for approximately 56% average theoretical efficiency. However, Symons said that this is not realizable in practice. What is being sought in the klystron design is a way to make a significant improvement in the efficiency. Adding 1% or 2% is nice, but a real improvement of about 20% to 30% would be necessary to bring UHF transmitters into line with VHF. The depressed collector concept being evaluated by Varian and other klystron manufacturers may some day lead to a significant improvement in efficiency at 55kW and higher power levels.

The final speaker at the seminar, who discussed the actual transmitters, was Heinz Bohlen of Valvo-Philips. Bohlen discussed a modulated grid klystron that is available from Philips for use at the 55kW power level. This klystron uses an annular electrode to control the beam current. The video signal is applied to this annular electrode after having passed through a bandpass filter that limits the frequency of the video signal to that portion where double sideband operation is acceptable by the FCC. This signal is then applied to the annular electrode to vary the beam current in the klystron in accordance with the actual level of the incoming signal. A second signal is applied to the klystron in a conventional manner that possesses full bandwidth and contains all necessary corrections to compensate for the non-linearities of the klystron amplifier. This operation results in an efficiency improvement of 20% to 30% over the external cavity klystron operating in the normal mode. The overall efficiency of the final amplifier klystron operated in this fashion is between 60% and 70%. This is a significant step in the state-of-the-art.

Symons said in his paper that the UHF broadcast industry currently spends approximately $22 million a year for electrical power to operate its transmitters. If the industry were to convert all the existing UHF transmitters to beam-controlled klystron systems, the power bill would be reduced to about $12 to $14 million.
Such a savings would cause a gleam in the eyes of many station managers. However, that's the good news; the bad news is that not all transmitters will be capable of being converted simply. It may be necessary to install a new exciter or to modify the existing exciter to provide the necessary compensation circuitry. Also, the modulating section that provides the control voltage to the control electrode in the klystron will have to be added. If the broadcaster is currently using an integral cavity klystron amplifier, a change will have to be made to an external cavity klystron. There are other advantages that may offset some of this cost. The price of the beam-controlled klystron is approximately the same as the existing external cavity klystrons. It seems that the life of these klystrons may be longer than the life of the existing klystrons, because the beam current necessary for the same power output is somewhat reduced. Also, the heat load that is seen by the cooling system for the klystron is greatly reduced. Furthermore, the load on the transmitter power supply will be reduced, which may result in longer life for existing equipment or in smaller required capacity for future systems.

One additional speaker at the NAB seminar on transmitter efficiency was Thomas J. Vaughan of Micro Communications. Vaughan discussed the possible efficiency improvement gained by changing from coaxial transmission line to circular waveguide. His company manufactures this waveguide and has installed it on several towers. The technical aspects of circular waveguide usage or design will be covered in a separate article to be published later, but it is significant to note that substantial power savings can be realized by use of circular waveguide instead of conventional coaxial cable. This results in power savings to the operator in a facility that is operating at 5MW effective radiated power. If the station is not operating at the maximum limit permitted by law, the savings in power consumption probably will not be realized, but an alternative advantage of obtaining a higher effective radiated power for the same transmitter output would be just as desirable. Vaughan presented figures demonstrating that a station with a 2000-foot tower operating at 220kW transmitter output to obtain 5MW effective radiated power would save approximately $37,000 per year using circular waveguide.
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**October 22-23**

SBE Chapter 54 will hold its first Telecommunications Show at the Virginia Beach Dome in Virginia Beach, VA. More than 12,000 square feet of space will be used for 65 booths with vendors showing everything from microphones to satellite terminals. Technical sessions will be held throughout the 2-day period. For more information contact Jack Beck, WHRO-TV, 5200 Hampton Blvd., Norfolk, VA 23508; 1-804-489-9476.

**October 23-27**

The 72nd Annual Audio Engineering Society Convention will be held at the Disneyland Hotel in Anaheim, CA. Technical papers and exhibits will be featured at this convention, whose theme is "Audio in a Changing World." On Sept. 23, there will be no workshops or seminars. The exhibit hall will be open, however. For more information, contact AES at 60 E. 42nd St., Room 2320, New York, NY 10165; 1-212-661-8528 or 1-212-661-2355.

**Oct. 26-28**

The Third Annual Visual Communications Congress/West will be held at the Century Plaza Hotel in Los Angeles. Topics will include interactive video, videotex, teleconferencing and videodiscs. Seminars deal with film and TV production, photography and audio-visual presentations. Concurrent meetings will be held by the International Television Association, the Information Film Producers of America, the Health Education Media Association, and the Association of Audio-Visual Technicians. For more program information, contact the VCC Conference Management Corporation, 17 Washington St., Norwalk, CT 06854; 1-203-852-0500.

**Nov. 1-3**

Atlanta's Marriott Hotel is the site of the Eighth Annual Satellite Communications Symposium. Sponsored by Scientific-Atlanta, the symposium will feature panel discussions led by SA personnel and outside industry leaders. Topics will include programming by satellite, teleconferencing, high speed digital transmission and earth station design. A technical book will be furnished to attendees. For more information, contact Scientific-Atlanta, 3845 Pleasantdale Road, Atlanta, GA 30340; 1-404-449-2000.

**Nov. 7-10**

The 1982 National Telesystems Conference, "Systems for the Eighties," will be held in Galveston, TX. The conference's technical program will focus on systems for telecommunications, radar, navigation and remote sensing. For more information, contact Dr. B.H. Batson, general chairman, Johnson Space Center (EE8), Houston, TX 77058; 1-713-483-4647.

**Nov. 7-12**

The 124th SMPTE Technical Conference and Equipment Exhibit will be held at the New York Hilton Hotel. The conference will have five days of sessions on the technical aspects of motion pictures and television. Also, there will be a 300-booth exhibit featuring the latest motion picture and TV equipment. More information on the conference is available from SMPTE, 862 Scarsdale Ave., Scarsdale, NY 10583; 1-914-472-6606.

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September 1982  **Broadcast Engineering**  127
Here are five no-nonsense products that have been developed by A.F. Associates in direct response to requests from broadcast and cable engineers across the country:

1. **AFA Joy Stick Camera Control Panel (RCC-200 Series)**
   Provides mobile and studio operations with a fast, simple method of controlling camera shadings.

2. **AFA Slate Camera System (SC-300)**
   A compact, self-contained title card camera for mobile and studio operations.

3. **Marconi Videotape Monitoring Unit**
   Provides monitoring selection and TBC controls in a single unit.

4. **AFA Rack Rack Extender Unit**
   Provides a friction-controlled turntable that facilitates servicing of Ampex VPR2 & VPR2B and Marconi MR2 & MR2B VTRs when rack mounted.

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Circle (241) on Reply Card
630 product categories and more than 850 listed manufacturers are featured in our most comprehensive guide yet

- **Product Directory** section begins on page 130.
- **Broadcast Product Manufacturers' Addresses** section begins on page 188.
- **Broadcast Product Dealer/Distributors** section begins on page 211.

Since our first edition of the *Buyers' Guide* 14 years ago, the broadcasting industry has grown tremendously in complexity of equipment and completeness of broadcast services. Just as the industry has responded to the use of new technologies—most notably the microprocessor, in all phases of automation—the *Buyers' Guide* has responded by providing the most complete directory possible for engineers, managers and purchasing agents requiring broadcasting equipment or services. Reflecting the current healthy state of our industry, this year's *Buyers' Guide* features 630 product categories, lists more than 850 manufacturers, and contains more than 300 advertisers. It is the result of a dedicated staff effort to make it our finest tool for purchasing the industry's hardware, software and services.

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

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

Broadcast product manufacturers' addresses are featured beginning on page 188. In this section, you will find a complete, alphabetized index of mailing addresses for all of the companies listed in the *Product Directory*. Additional information appears in the index listing for advertisers in this issue: the name and telephone number of the home office sales manager, followed by, in many cases, a roster of regional sales contacts for that company.

Broadcast product dealer/distributors are listed separately in the section beginning on page 211, followed by the states they serve and the products/services they provide. Ads for dealer/distributors in this issue appear either on the page of each company's listing or on the facing page. A complete explanation of this section appears on page 211.

Reader service cards are bound into this edition for your convenience. Each card is valid for one year. By circling the appropriate numbers on the card, you can secure information directly from the advertiser through August 1983.
Product directory

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- Marti Electronics
- Logitek Electronic Systems, Inc.
- Gregg Laboratories
- Elcom-Bauer
- DYMA Engineering, Inc.
- Delta Electronics Inc. (VA)
- Circuit Research Labs, Inc.
- Hoffman Electronics, Inc.
- Broadcast Electronics, Inc.
- BGW Systems Inc.
- Potomac Instruments, Inc.
- Video Aids of Colorado
- Telcom Research
- Potomac Instruments, Inc.
- Hughey & Phillips Inc.
- Communitronics Ltd.
- Coastcom
- Bird Electronic Corp.
- B & I Electronics, Inc.
- Amplifiers, AF-AGC
- Broadcast Electronics, Inc.
- Channel Engineering
- Pyramid Loudspeaker Corp.
- RTS Systems, Inc.
- Rayco Research Inc.
- Orban Assoc., Inc.
- Processing Plus, Inc.
- Pyramidal Loudspeaker Corp.
- Sonomag Corp.
- Marti Electronics
- Modular Audio Products Unit of
- Modulator Devices, Inc.
- Monorog Electronics
- Moseley Associates, Inc.
- Motorola Semiconductor Products Inc.
- Rupert Neve, Inc.
- Opamp Labs, Inc.
- Processing Plus, Inc.
- ProTech Audio Corp.
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- Richmond Sound Design, Ltd.
- Scientifc Systems, Inc.
- Sphere Electronics
- TM Systems, Inc.
- Transist-O-Sound Inc.
- MCB International Corp. Combo Div.
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- Advancing Technology Corp.
- Altec Lansing Int'l.
- Aphex Systems Ltd.
- Arrakis Systems Inc.
- Audio & Design (Audio & Design Recording, Inc.)
- Bogien Div. Lear Siegler, Inc.
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- Video Aids of Colorado
- Ward-Beck Systems, Inc.
- Wilkinson Electronics, Inc.
- Amplifiers, AF Peak Limiting
- ATK-VF
- Advancing Technology Corp.
- Altec Lansing Int'l.
- APG Audio & Design (Audio & Design Recording, Inc.)
- Broadcast Electronics, Inc.
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- Delta Electronics Inc. (VA)
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If you're not delivering a top-quality TV signal into every corner of your service area, you could be missing the picture.

CETEC C/P/TV ANTENNAS PAY HANDSOME DIVIDENDS WHERE IT COUNTS: MARKET SHARE. By now there shouldn't be any argument about the superiority of C/P/TV. In less than three years, nearly 100 stations have quietly converted their horizontal signals to CP. That's important to tens of millions of Americans who were receiving a second or third-rate TV picture. It's a critical fact of life to the broadcaster who recognizes the competitive advantages to delivering the highest-quality video signal in his market. To all of his market.

IN C/P/TV, CETEC IS THE LEADER. Nearly a decade has passed in the refinement of CP technology. CETEC Antennas has clearly become the recognized leader in this refinement.
• Starting in 1973, we pioneered the design in C/P/TV.
• CETEC's first Spiral design was on-the-air in 1976.
• A CETEC C/P/TV Spiral recently went on-the-air at superstation WLS-TV.
And there's three patents that are licensed to us from the world-renowned authority on C/P/TV antenna design—Dr. Raymond DuHamel.

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- Martin Electronics
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#### Antennas, Transmitting UHF/VHF
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- Cetec Broadcast Group
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GBC Closed Circuit TV Corp.
Hitachi Denshi America, Ltd.
Ikegami Electronics (U.S.A.), Inc.
Marconi Communication Systems Ltd.
RCA Broadcast Systems
Sharp Electronics Corp. Professional Products Div.

Cameras, Film Cine

Arriflex Corp.
Canon USA, Inc. Optics Div.
Cinema Products Corp.
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Frezzolini Electronics, Inc.
Alan Gordon Enterprises Inc.
Karl Heitz, Inc.
Mitchell Camera Corp.
J. O'Shaugh.
Pioneer Marketing Corp.
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Asaka/Shibasoku Corp.
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Robert Bosch GmbH
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CFA-Media Specialties, Inc.
Calzone Case Co.

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Fernseh Inc.

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Inekami Electronics (U.S.A.), Inc.

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DYMA Engineering, Inc.

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Cetele Broadcast Group

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Broadcast Electronics, Inc.

Old Dominion Broadcast Eng. Service Processing Plus, Inc.

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Media Concepts, Inc.

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Aristocart Div. Western Broadcasting, Ltd.

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Gotham Audio Corp

McCurdy Radio Ind. Inc.

Micro-Trak Corp.

Russco Electronics Mfg. Inc.

Shure Brothers Inc.

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VIF International

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Calzone Case Co.

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Maxell Corp. of America

Memorex Corp. Professional Products Group

Panasonic Industrial Co. Video Systems Div.

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Re-Play Video Cartridge Service

Schuessler Case Co.

Sony Corp. of America

SM Co. Magnetic A/V Products Div.

Cartridge, Equipment

A & S Case Co.

Advance Products Co.

Anvil Cases, Inc.

Bretford Mfg. Co.

Broadcast Electronics, Inc.

Cases Inc.

Comprehensive Video Supply Corp.

Deltamond Corp.

Fiberbit

Gruber Products Co.

K & H Products

Lee-Ray Industries, Inc.

Lowenthal Mfg. Co.

Neumann Industries Inc.

Parsons Mfg. Corp.

Phase Audio, Inc.

Quick-Set Inc.

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Hardigg Industries Inc.


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William Ball Corp.

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Cases Inc.

Comprehensive Video Supply Corp.

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East Coast Sound Inc.

Environmental Container Systems, Inc.

Excabibur Industries

Goldenberg Brothers Inc.

Hardigg Industries Inc.

Innovative Television Equipment, Inc.

K & H Products


Lowenthal Mfg. Co.

Maxell Corp. of America

Memorex Corp. Professional Products Group

Neumann Industries Inc.

Parsons Mfg. Corp.

Plastic Reel Corp. of America

Radmar, Inc.

Reliance Plastics & Packaging Div.

Research Technology Int'l.

Schuessler Case Co., Inc.

Star Case Mfg. Co., Inc.

Thermodyne International Ltd.

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Magnaflex Int'l., Inc.

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Panasonic Company

Recortec, Inc.

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Foundation Elec. Instruments Inc.

King Instrument Corp.

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The BTV Corp.

Robert Bosch GmbH

CMC Technology Corp.

Calzone Case Co.

Chiron Corp. Telesystems

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Computer Operations Inc.

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Datametrics Inc.

Datatron, Inc.

Datum Inc.

Dubner Computer Systems, Inc.

EEG Enterprises, Inc.

ESF Fernseh Inc.

For - A Corp. of America

Gentronix (1977) Ltd.

Grove Video Products

Interand Corp. Telestrav Div.

Kratonics Corp.

Knox Video Products

Laird Temelena Corp.

Lang Video Systems Corp.

MCI/Quartel

MPB Technologies Inc.

McInnis, Skinner & Associates

Motorola Semiconductor Products Inc.

Panasonic Company

Portac Inc.

OSS Systems Inc.

Quanta Corp.

Reynolds/Leteron Co.

Shintron Inc.

Spry Weather Systems

Symtec Inc.

Telecom Research

Teledec Inc.

Texscan Corp.

Texas/MSI Corp.

Thomson-CSF Broadcast, Inc.

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Unitek

VA Video, Inc.

Video Associates Labs

Video Data Systems

Videomedia, Inc.

Character Generators, Wire Service Memory System

B.E.I. (Boston Electronics Inc.)

Computer Video Systems, Inc.

Integrated Technology, Inc.

Portac Inc.

Quanta Corp.

Teledec Inc.

Teleservice Communication Services

Texscan/MSI Corp.

Unitek

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Choppers

Feathercam Inc.

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All Mobile Video

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Olesen

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Crossroad Latch Corp.

ECHOLab, Inc.

Electricraft Consultants Ltd.

Grass Valley Group, Inc.

Industrial Sciences, Inc. (ISI)

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Select your routing switcher and distribution amplifiers as if your reputation depended on their stability . . . because it does.

As you enter and re-enter your distribution system to produce a tape you discover the value of a truly transparent plant . . . one that stays transparent even when interchanging modules or re-configuring inputs and outputs.

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Townsend Associates, Inc.

Cleaner, Magnetic Tape Head
Alisop, Inc.

Clocks and Chronographs
Beaveronics, Inc.

Clocks, Digital and Digital Driver
Arrakis Systems Inc.

Clocks, Station Master Control
Beaveronics, Inc.

Communications Systems, Multiplex
American Telephone & Telegraph
Atlantic Research Corp.
Ariel Communications Corp.
Atlantic Research Corp.
Baily Engineering Ltd. Member of AEG-Telefunken Group
Brabury Group
Broadcast Microwave Services, Inc.
Calset Div. United Scientific Corp.
Coastcom
Edcor
HN Engineering Inc.
Harris Corp. Broadcast Microwave International Microwave Corp.
Johnson Electronics Inc.
Kaitronics Corp.
Kaitronics Corp. Marconi Communication Systems Ltd.
Marconi Electronics Inc. Broadcast & Communication Div.
M/A-Com Microwave Power Devices Marconi Communication Systems Ltd.
Martel Electronics
Micro Computers Inc.
Motorola Communications and Electronics
Moseley Associates, Inc.
Motorola Communications and Electronics
Nec America, Inc. Broadcast Equip.
R.F. Technology Inc.
RHG Electronics Laboratory Inc.
Rockwell Int'l. Commercial Elec. Operations
TFT Inc./Formerly Time & Frequency Technology Inc.
Tepco Corp.
Varian Associates Electronic Device Group
Western Tele-Communications, Inc.

Communication Systems, Teleprinter
American Telephone & Telegraph
HN Engineering Inc.
Johnson Electronics Inc.
Modulation Associates Inc.

Comparators, Video
Moseley Associates, Inc.

Compensators, Dropout
A F. Associates, Inc.
Robert Bosch GmbH

Computer Software
Cromax Inc.

Connectors, Cable
ADC Magnetic Controls
AMP Inc.
All Mobile Video
Andrew Corp.
AVA Electronics
Avtech Electronics Inc. (formerly Team Electronics)
B&W Cable Systems Inc.
Baily Engineering Ltd. Member of AEG-Telefunken Group
Belden Communications, Inc.
Cambridge Products
Cranford Audio
Comprehensive Video Supply Corp.
Ercora Corp.
G C Electronics Div. Wallace Murray
Global Communications & Engineering Systems, Inc.
Maury Microwave Corp.
Micro Communications, Inc.
Neutrik Electronics
Paladin Corp.
Philip's Dodge Communications Co.

Consolas, Audio Portable
ADM Technology, Inc.

DAT-Audio Technologies Inc.
Acoustigum
After Lansing Int'l.
Amco Engineering Co.
Amek Systems & Controls Ltd.
Arrakis Systems Inc.
Audio Developments
Audio-Technica U.S., Inc.

Datacom, Inc.

Datacom, Inc.

Datatron, Inc.

DFT Inc./Formerly Time & Frequency Technology Inc.

Digitron Communications, Inc.

Dynamagnetic Corp.

Dynad两大, Inc.

Dynaudio, Inc.

Dynasonic, Inc.

"Red Listings guide you to products advertised"
RCA FM power tubes. 15 to 55kW outputs at high efficiency.

RCA is now in the FM power tube business with a series of four tubes and cavities designed specifically for high-gain, high-efficiency broadcast service:

<table>
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<tr>
<th>Tube Type</th>
<th>Output</th>
<th>Gain</th>
<th>Efficiency</th>
<th>Cavity Model</th>
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</thead>
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<tr>
<td>8986</td>
<td>15kW</td>
<td>20db</td>
<td>80%</td>
<td>Y1393D-V1</td>
</tr>
<tr>
<td>8985</td>
<td>25kW</td>
<td>20db</td>
<td>80%</td>
<td>Y1393D-V2</td>
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<tr>
<td>9011</td>
<td>30kW</td>
<td>21db</td>
<td>80%</td>
<td>Y1393D-V3</td>
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<tr>
<td>8984</td>
<td>55kW</td>
<td>16db</td>
<td>78%</td>
<td>Y1369</td>
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</table>

There's a very persuasive reason for using a tube with high efficiency: lower operating costs. Over the lifetime of a transmitter this can mean considerable savings.

And RCA tubes are designed for long life.

Our cavities complement our tubes. They provide high-gain, grid-driven circuits which take full advantage of the tubes' high Gm electron optics, high efficiency, ease of neutralization and ease of cooling.

Along with our power tubes, and the cavities that bring out their best performance, we also supply service and application engineering. Find out more today. Contact RCA Power Tube Marketing, New Holland Avenue, Lancaster, PA 17604. Call (717) 397-7661. Or get in touch with RCA, Brussels, Belgium, Sao Paulo, Brazil, Sunbury-on-Thames, Middlesex, England, Paris, France, Munich, West Germany, Mexico 16 D.F., Mexico. Hong Kong.

Circle (125) on Reply Card

RCA
Controllers, Equipment, Network 
Tone Activated

Cetec Broadcast Group
Channelmatic, Inc.
Control Video Corp.
Harris Corp. Broadcast Div.
Krautkramer Corp.
KAVCO, Inc.

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California Microwave 
Carter-Redman Technologies 
Cetel Div. United Scientific Instruments 
LNR Communications, Inc. 
Magnavox CATV Systems, Inc. 
Marcon Electronics, Inc. 
Broadcast & Communication Div.
Motorola Semiconductor Products Inc. 
Mu-Dale Electronics, Inc. 
Oak Communications Inc. 
RHM Electronics Laboratory, Inc. 
The Sonim Corp.

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BG Engineering 
Broadcast Aids, Inc.
Cosin Electronics

Crystals, Quartz

Edison Electronic Co.
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tronics Inc.

Custom Control Systems
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AVL Digital Ltd.
American Data Corp., A Div. of Central 
Dynamics Corp. See also Central 
Dynamics & Philips Broadcast 
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B&W Lighting Systems (formerly Pa- 
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Don Brinton Enterprises 
CAE Inc.

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Micro Communications, Inc.
Monroe Microwave, Inc.
The Narda Microwave Corp.
North Hills Electronics, Inc.
Philco-Dodge Communications 
Co., Inc.

EDA Laboratories, Inc.
John Fluke Mfg. Co.

Tandon Associates, Inc.
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Philips Test & Measuring Instruments, 
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B&W Lighting Systems (formerly Pa- 
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CAE Inc.

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Co., Inc.

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John Fluke Mfg. Co.

Tandon Associates, Inc.
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Leasametric, Inc.
Motorola Communications and Elec-
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North American Soar Corp.
Philips Test & Measuring Instruments, 
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Leasametric, Inc.
Motorola Communications and Elec-
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North American Soar Corp.
Philips Test & Measuring Instruments, 
Inc.
Scientific-Atlanta, Inc.
Tektronix Inc.
Viz Mfg. Co.
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<td>Detectors, Microwave Alfred Mfg. Co. Avantek Inc. EEE Canada Ltd. Grafex Industries Harris Corp. PRD Electronics Div. Leasametric, Inc. Maury Microwave Corp. The Narda Microwave Corp.</td>
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<td><strong>Detectors, Standing Wave</strong></td>
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<td>Detectors, Transmitter Quadrature Distortion Teleon Div. A Geotel, Co.</td>
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<td>Diagnostic Systems, Digital Logic Apert-Herzog Corp. Global Specialties Corp. Microwave Assoc. Communications Ponnze Communications Products Inc. Rohde &amp; Schwarz Sales Co.</td>
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Motorola Semiconductor Products Inc. Pinzone Communications Products Inc. QSI Systems Inc. Scientific-Atlanta, Inc. Tektronix Inc. 
Texscan/MSI Corp. Video Data Systems

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Gientronix (1977 Ltd. Javelin Electronics A Subs. of Kiddie, Inc. 
Torpey Controls & Eng. Ltd. Video Data Systems

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Bird Electronic Corp. Cetec Antennas 
Comark Industries Inc. Dielectric Communications A Unit of General Signal 
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DYMA Engineering, Inc. Integrated Technology, Inc. 
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RIP, Inc. Formerly Time & Frequency Technology Inc. 
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Lenco Inc. Electronics Div. Link Electronics Ltd. 
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Cetec Vega 
Chanaelemic, Inc. 
Comex Systems 
Deltamed Corp. 
Di-Tech Inc. 
Gorman-Redlich Mfg. Co. 
Johnson Electronics Inc. 
Lexed Inc.
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PROFESSIONAL CONSOLE SERIES By ARRAKIS systems inc.

2000SC

FEATURES
- 12 Channels
- 24 Balanced Inputs
- VCA Level Controls
- Reed Relay Switching
- Program, Audition Output
- Active or Transformer Circuitry
- Remote Start Standard
- External Regulated Power Supply

DESCRIPTION
The 2000SC is designed for uncompromising performance & long life. VCA's (Voltage Controlled Amplifiers) mean that there is no audio on the slide fader & assure excellent stereo tracking. The program-audition switches are silent, momentary, & lighted. Remote start is standard. Gold plated miniature connectors make console wiring a joy. Cue is stereo.

The 2000SC will withstand 200 VDC & 5000 V transients on the active inputs. The console is available with any or all channels either active balanced or Jenson transformer balanced. The 2000SC is the ultimate in reliable performance.

$5650

ROUTING SWITCHER BREAKTHROUGH

FEATURES
- 16 in by 12 outputs mono
- 8 in by 12 outputs stereo
- Expandable
- Rack or table mounted
- Balanced crosspoints
- NE5532 Signetics IC's
- 1,000,000 operation thumbwheel select

INTRODUCTION
The 100RS represents a major price breakthrough in audio routing switchers. For the first time, electronic switchers are competitive with patch panels and other mechanical switches. Despite this dramatic improvement, the 100RS maintains professional specifications and construction throughout.

The 100RS audio routing switcher obviously has many possible applications in a broadcast or production studio. It replaces unwieldy patch panels, distribution amplifiers, and remote select mechanical switches. It can increase the total number of inputs at the control console and conveniently interconnect studios. It is ideal for switching satellite links to recorders, studios, or on the air. The possibilities are limited only by the imagination.

$1250

(303) 221-2918

ARRAKIS SYSTEMS 1713 WILLOX CT. FORT COLLINS, CO 80524

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Fujifilm Photo Film USA, Inc.
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YOUR EDITOR CAN CONTROL OUR PRODUCTION SWITCHERS AND GIVE YOU THE BEST OF BOTH WORLDS

POST-PRODUCTION

Highly sophisticated effects beyond the capability of your editor, yet timed to occur at the correct instant, triggered by the editor. The switcher can also be controlled directly from the editor keyboard, all transitions being entered on the edit list. But for those special occasions where the start and finish points of an effect or key is critical, full use can be made of our controllers, which allow accurate positioning using the color monitor as an interactive display. We even provide a choice of control; some parameters may be set up on the editor keyboard (such as duration times, input selection, etc.) while others (such as programmable start and finish points for partial wipes and keys) may be accurately set up on our controllers. The degree of sophistication is yours to choose. For most edits you have the convenience and the ability to operate from the editor keyboard alone.

We have a wide range of products, both for video and audio, to suit your requirements and needs. You may add programmable effects to the simplest editor, or elect to install a highly complex system with full computer control and many levels of storage. The 7200 AUTO DRIVE Controller is capable of storing the entire control panel status of the switchers, and producing smooth or abrupt transitions from one status to the next in a large number of programmable sequences. Transitions created by the 7200, (which are impossible to reproduce manually), can be triggered or controlled by editors.

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<td>6124</td>
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<td>7200</td>
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95 Progress St, Union, N.J. 07083
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EXPANDING YOUR SYSTEM

You can start with a switcher which meets your present requirements. Editor interfaces and audio may be added later as the need arises. Our products are fully plug compatible between one another and with editors. No modifications are necessary either to our products or editors in the expansion process.

We interface with most editors. Call us or your local dealer for details. Write or call for our very informative booklet "Video-Post Production". It will be sent to you free.

CROSSPOINT LATCH CORP.
Introducing The Image Maker® For Editors, Engineers, Animators, Producers, Special Effects Specialists, Station Managers, Training and News Directors.

In the beginning, all was stillness. A dark and cumbersome, costly and inefficient sort of stillness accentuated by the kachunka-kachunka of the slide chain machinery. Then came Echo's Electronic Frame-Stor®. And suddenly, all was stillness – and light.

But what excited the engineers at Echo wasn't stillness at all, but movement and, yes, re-movement. These were the challenging chapters to be written in the Still Story. How to make all of those electronically stored stills move around in all manner of ways. For this Still Story, a hero was needed. Thus was born The Image Maker.

The Image Maker. A Brief Definition.
Here's what The Image Maker is: A high-band color disc recording system that uses state-of-the-art electronics and an exclusive Discassette® recording medium to perform a versatile number of professional television production tasks from still frame storage to special animated effects.

Programmable Loops, Sequences, Special Effects.
The joy of The Image Maker – and the key to its success as a productivity tool – isn't just in its storage of still frames, but also in the manipulation of those stills to serve a variety of needs. In this regard, The Image Maker is a marvel of special effects wizardry, with variable speed operation all the way from freeze frame to real time, random access of as many as 512 frames on line and the ability to preset 64 locations. The convenient fingertip touch panel makes it just that much easier for the operator to do animation sequences, generate backgrounds, superimpose effects or pre-program motion loops.

From Cold Fronts To Hot Switches: The Plot Thickens.
Because The Image Maker boasts variable speed in both directions, weather motion – or motion analysis of any kind is well, a breeze. And because it also features two independent heads, the operator can preview upcoming video images then "hot switch" to the next one without going to black.

Between the cold fronts and the hot switches are a full range of other capabilities. Instant replays. Logo and ID flashes. These are capabilities enhanced by the fact that The Image Maker will conveniently interface with today's modern character generators and titters.

The Discassette. The Removing Part Of The Story.
Not all of The Image Maker's innovations are located exclusively within the confines of the machine itself. In fact, one of the key innovations – and one unique to Echo products – is our patented Discassette, the removable recording medium that provides both operational and storage convenience. In this day and age, when space is at such a premium and ease of storage and retrievability are very real assets, a library of Discassettes sure beats drawers full of slides or closets stacked with disc packs.

Going Mobile With The Image Maker.
Because we deal with some mighty tough customers, we build The Image Maker to be a mighty tough television production tool on the move. The combination of the recording technology (one that eliminates the possibility of head crash). Echo craftsmanship, and a compact, road-rugged design makes The Image Maker as versatile on remote shoots as it is in the studio.

A Moving Conclusion. Buy One.
Perhaps the most moving part of The Image Maker story is the one you read on the bottom line. Because, ultimately, it's the cost efficiency of The Image Maker that will move you to take a closer look. Clearly, it doesn't make a lot of sense to tie up a 1-inch VTR to do routine or special effects work when the feature-rich but modestly priced Image Maker can do that – and more. There's a happy ending to our Very Moving Still Story. Call us today and we'll write it together.
The "Studio Optimod"

The Orban 424A
Gated Compressor/Limiter/De-Esser

There are lots of production limiters out there. Old favorites. Pretenders to the throne. The competition is fierce. So, when Orban set out to design a new production limiter, we knew it had better be superior.

The result of our research is the "Studio Optimod"—a Gated Compressor/Limiter/De-Esser with versatile controls, simple set-up, and a natural, transparent sound that must be heard to be appreciated.

Try one and A/B it against your current favorite. You’ll notice the sound—remarkably smooth and natural over a wide range of control settings—even at high compression ratios where apparent loudness and punch are significantly enhanced. It’s no accident: The unit is a direct descendent of our super-popular, second-generation OPTIMOD-FM broadcast limiter. So it exploits our years of experience in making an AGC device sound natural on diverse program material without critical re-adjustments. Yet full versatility exists for special effects in production.

A bonus is a smooth, natural de-esser. It’s independent of the compressor/limiter section so you can simultaneously compress and de-ess vocal material without compromise. You can even de-ess sibilant vocals which have been mixed with other program.

The icing on the cake is unique gating and “idle gain” functions which prevent unnatural noise-producing gain variations during pauses and abrupt gain changes when the unit is switched in.

Our new Model 424A (dual channel) and 422A (single channel) are destined to become the new industry standards in dynamic range control. Prove it to yourself. Contact your Orban dealer today.

Orban Associates Inc.
645 Bryant Street
San Francisco, CA 94107
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Telex: 17-1480

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IF YOU'RE THE CHIEF ENGINEER, HERE'S GOOD NEWS.

Now there's a computer system that will give you a hand with your on-air operations. If you're using a Grass Valley 1600-4S, Vital VIX 115 Series, or CDL MC-990 it's perfect for you. It's called BIAS® Master Control Automation. Because that's exactly what it does. Makes master control automatic.

BIAS has developed the industry's first fully-integrated system to automate your station from order entry through billing. MCA automatically receives the daily log and allows operations personnel to program on-air switching, machine assignments, and delegation interface. That means you'll enjoy fewer switching errors and a cleaner on-air image. And you'll gain time for monitoring audio levels and video output. Master Control Automation can work independently or with other BIAS systems to coordinate traffic, sales, accounting, administration, and much more.

We would like to put this system to work for you. You simply can't buy a better one. Or one that's easier to operate. So mail the coupon today. Or call us at 901-345-3544. And let us give you a hand with your on-air operations.

TELL ME HOW TO GET A BETTER ON-AIR IMAGE.

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Circle (133) on Reply Card
The Model 82 condenser wireless microphone has been added to Cetec Vega's professional hand-held line. The Model 82 incorporates the popular Shure SM85 condenser element and attractive black windscreen to provide:

- Minimal handling noise, reduced mechanical vibration, and virtually no "boominess" (by means of controlled low-frequency rolloff).
- Clean reproduction of close-up vocals with moderate proximity effect.
- "Crispness" and presence with high-definition midrange.
- Clear, scintillating highs with crisp upper register.
- Cardioid pickup pattern for effective rejection of off-axis sounds.

All Cetec Vega hand-held wireless microphones (including the Model 80 with the Electro-Voice EV-671 dynamic element and the Model 81 with the Shure SM58 dynamic element) have an attractively contoured black case with internal antenna.

Used with Cetec Vega professional wireless receivers, the FM systems operate on any crystal-controlled frequency between 150 to 216 MHz, at a range up to 1000 feet or more. Transmit-to-receive frequency response is almost perfectly flat from 100 Hz to 12 kHz with gentle rollooffs to 40 Hz and 15 kHz. Total harmonic distortion is typically 1/2 percent. System dynamic range is 90 dB when "Dynex" (transmit compression and receive expansion) is incorporated, with a resulting low noise floor.

Cetec Vega hand-held wireless microphones are newly redesigned for 20 to 30 percent additional battery life, using a commonly available 9-volt alkaline battery (Duracell recommended). Microphone sensitivity is easily adjustable with an audio gain control on the bottom, with an adjacent LED indicator to verify optimum setup. Power and audio on/off switches are also conveniently located on the bottom.

Write or call for further information and location of your nearest dealer: Cetec Vega, P.O. Box 5348, El Monte, CA 91731. (213) 442-0782 TWX: 910-587-3539

In Canada: A.C. Simmonds & Sons Ltd.
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The Dolby® Cat. No. 221 or 226 module allows you to plug the benefits of a Dolby A-type noise reduction directly into your Sony BVH-1000/1100 or Ampex VPR-2 1" VTR*. Operation is fully automatic. And at long last the audio performance of your VTR will rival that of professional audio tape recorders.

Dolby A-type noise reduction has been accepted for years throughout the world for high-quality tape recording and other audio transmission and storage media. It provides 10 dB of noise reduction from 30 Hz upwards, increasing to 15 dB at 9 kHz and above, without the audible side effects (such as noise modulation and overshoot distortion) associated with more conventional techniques. Dolby noise reduction can also lead to lower distortion, as it permits more conservative recording levels to reduce the risk of tape saturation.

Today wide audio bandwidth and low noise are becoming commonplace in many parts of the television origination/transmission chain. Contact us to find out how Dolby noise reduction can prevent the VTR audio track from being one of the weak links.

*Outboard Dolby noise reduction units are available for use with virtually any other video or audio recorder.
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Manufacturers and Distributors of Broadcast Equipment since 1960
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- Century 21 Programming Inc.
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**Slow Scan TV Systems**

- American Laser Systems, Inc.
- Colorado Video Inc.
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- Javelin Electronics A SUBS. OF KIDDE, INC.

**Sound Effect Systems**

- Advanced Music Systems
- Altus Lansing Int'l.
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- Eventide Clockworks, Inc.
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- KLARK-TEKN IkN.
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- Bode Sound Co.
- Bogen Div.
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- Brabury Group
- Broadcast Electronics, Inc.
- CFA-Media Specialties
- CETE ELECTRONICS GROUP
- CETEC BROADCAST GROUP
- Delta Electronics (N.C.)  

- Deltacomp Corp.
- DYMA Engineering, Inc.

**East Coast Sound Inc.**

- Eastern Acoustic Works Inc.
- Electro-Voice Inc.
- Electrocotact Consultants Ltd.
- G. A. Gilebrand Associates Inc.
- Gotham Audio Inc.
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- Hoppman Corp.
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- Autumn Laboratories & Co.
- Aurotone Corp.
- BGS Systems Inc.
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- Community Light & Sound
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- Ercorona Corp.
- Festex Electro Acoustics
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- Hughes Aircraft Co. Microwave Com-
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- International Microwave Corp.
- Lang Video Systems Corp.
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- Local Microwave Communications Ter-
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- Marti Electronics
- Micro Control Associates Corp.
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- Rohde & Schwarz Sales Co.

**Static Suppressors**

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- Rocal-Decca Canada Inc. Insulators Div.

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**Glentronics (1977) Ltd.**

- High Country Engineering
- Pacific Recorders & Eng. Corp.
- Phase Audio, Inc.
- OSI Systems Inc.
- Jules Racine & Co., Inc.
- Sharepoint Systems Inc.
- Torrey Controls & Eng. Ltd.

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- Allied Broadcast Equipment
- Aristocrat Div. Western Broadcasting, Ltd.
- Audio Magnetics Corp.
- Brentford Mfg. Co.
- Calzone Case
- Comprehensive Video Supply Corp.
- DYMA Engineering, Inc.
- Equipto
- Fillpac Corp.  

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**RCA CAMERA TUBES**

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<td>BC4922</td>
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<th>TYPE</th>
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<tr>
<td>4CX3500C</td>
<td>250.00</td>
</tr>
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Circle (140) on Reply Card

September 1982 Broadcast Engineering 183
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<td>Broadcast Aids, Inc.</td>
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<td>Fidelipac Corp.</td>
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<td>Marconi Instruments Div. of Marconi Electronics Inc.</td>
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<td>Neal Ferrograph U.S.A., Inc.</td>
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<td>Pinzone Communications Products Inc.</td>
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<td>United Recording Electronics Industries</td>
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<td>Foundation Elec. Instruments Inc.</td>
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<td>Hallkainen &amp; Friends, Inc.</td>
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<td>IGM Communications</td>
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<td>Portac Inc.</td>
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<td>Sono-Mag Corp.</td>
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<td>Stancil Corp.</td>
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<td>Tape-Athon Corp. Cavox Stereo Productions</td>
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<tr>
<td>Electro Systems Corp.</td>
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<td>True Time Instruments</td>
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<td>Ampex Corp.</td>
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<td>Automation Techniques, Inc.</td>
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<td>Digital Video Systems Inc.</td>
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<td>Edutron, Inc.</td>
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<td>Marconi Electronics Systems Ltd.</td>
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<td>Marconi Electronics Inc. Broadcast &amp; Communication Div.</td>
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<td>Microtime, Inc.</td>
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<td>Crouse-Hinds Co.</td>
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<td>EEV Canada Ltd.</td>
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<td>EG&amp;G Inc.</td>
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<td>Elcom-Bauer</td>
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<td>Hughey &amp; Phillips Inc.</td>
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<td>LeBlanc &amp; Royle Communications Inc.</td>
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<td>UNR-Rohn, UNR, Inc.</td>
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<td>Atlas Sound</td>
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<td>Audio-Technica U.S., Inc.</td>
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<td>Audisar</td>
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<tr>
<td>Bogen Div. Llear Siegler, Inc.</td>
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<td>Crown International, Inc.</td>
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<tr>
<td>Datatronix, Inc.</td>
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<td>Design Line Inc.</td>
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<td>Gotham Audio Corp.</td>
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<td>ILC Data Devices Corp.</td>
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<td>Jensen Transformers Inc.</td>
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<td>Kappa Networks, Inc.</td>
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<td>Laurus Corp.</td>
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<td>Microtran Co., Inc.</td>
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<td>Modular Audio Products Unit of</td>
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<td>Radio Technology Intl.</td>
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<td>United States Tower Co.</td>
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<table>
<thead>
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<th>Company Name</th>
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<td>Altel Lansing Int'l. Audisar</td>
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<tr>
<td>Crown International, Inc.</td>
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<td>Datatronix, Inc.</td>
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<td>Microtran Co., Inc.</td>
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<td>ProTech Audio Corp.</td>
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<td>Sescom, Inc.</td>
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<td>The Superior Electric Co.</td>
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<th>Company Name</th>
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<td>Hughey &amp; Phillips Inc.</td>
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<td>KCA Canada Canada Inc.</td>
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<tr>
<td>Magna Towers Corp.</td>
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<tr>
<td>Marconi Communications Systems Ltd.</td>
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<td>Microflex Corp., Inc.</td>
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<td>Motorola Communications and Electronics Inc.</td>
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<td>Fred A. Nudd Corp.</td>
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<td>Allen Osborne Associates</td>
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<td>Stainless, Inc.</td>
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<td>Swager Tower Corp.</td>
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<td>Telex Communications, Inc.</td>
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<td>UNR-Rohn, UNR, Inc.</td>
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<td>United States Tower Co.</td>
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<td>Up-Right Scaffolds Div. Up-Right, Inc.</td>
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<td>Utility Tower Corp.</td>
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<td>The Will-Burt Co. TMD Div.</td>
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<td>World Tower Co.</td>
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#### Transformers, Power

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<th>Company Name</th>
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<td>Microtran Co., Inc.</td>
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<th>Company Name</th>
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<td>CSP Inc.</td>
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<td>Delta Electronics Inc. (VA)</td>
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<td>ILC Data Devices Corp.</td>
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<td>North Hills Electronics Inc.</td>
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<td>T T E, Inc.</td>
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<td>Acrodyne Industries Inc.</td>
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<td>Carkhall Communications Inc.</td>
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<td>Contel Mfg. Div. of Continental Elec. Wholesale Corp.</td>
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<td>DYMA Engineering, Inc.</td>
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<td>EMCEE Broadcast Products</td>
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<td>Howe-Yin Research Co. Inc.</td>
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<td>Lanarc Communications Equip. Inc.</td>
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<td>D. N. Latus &amp; Co., Inc.</td>
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<td>M/A-Com Microwave Power Devices Marconi Electronics Inc. Broadcast &amp;</td>
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<td>Communication Div.</td>
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<td>Scientific-Atlanta, Inc.</td>
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<td>Tekno Corp.</td>
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<td>Versa Count Engineering</td>
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<td>M/A-Com Microwave Power Devices Marconi Electronics Inc.</td>
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<td>Television Technology Corp.</td>
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<td>Tecpo Corp.</td>
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<td>United States Tower Co.</td>
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Rockwell Int'l's Commercial Elec. Operations
E. Smallfing III Consulting Engineer
Soll, Inc.
Tangent Systems, Inc.
Tayburn Electronics, Inc.
Tele-Measurements Inc.
Theatrical Services Inc.
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English Electric Valve Co. Ltd.
R.F. Gain, Ltd.
M/A-Com Microwave Power Devices

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Atlantic Research Corp.
Robert Bosch GmbH
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The Real World Tech. Group, Inc.
Rockwell Int'l's Commercial Elec. Operations
E. Smallfing III Consulting Engineer
Soll, Inc.
Tangent Systems, Inc.
Tayburn Electronics, Inc.
Tele-Measurements Inc.
Theatrical Services Inc.
Townsend Associates, Inc.
Videomedia, Inc.
World Tower Co. Inc.

Turntable Speed Controls -- See Tape Deck and Turntable Speed Controls

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Bang & Olufsen of America
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Cetec Broadcast Group
EMT-FRANZ GmbH
Electrohome Ltd.
Harris Corp. Broadcast Div.
Kustom Kraft, Inc.
LPB Inc.
McCurdy Radio Ind. Inc. .........IBC
Micro-Track Corp.
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Amperex Electronic Corp.
Avtel Electronics Inc. (formerly
Team Electronics)
E.F. V. Canada Ltd.
Electrical Devices, Inc.
English Electric Valve Co. Ltd.
R.F. Gain, Ltd.
M/A-Com Microwave Power Devices

Wold Electronics, Inc.
Vacuum Tubes, Cathode Ray Oscilloscope

Amperex Electronic Corp.
Avtech Electronics Inc. (formerly Team Electronics)
EEV, Inc.
EEV Canada Ltd.
EMAC Div. of Varian
English Electric Valve Co. Ltd.
R. F. Gain, Ltd.
RCA Distributor & Special Products Div.
Thomson-CSF Electron Tube Div.

Vacuum Tubes, Cathode Ray TV Color/Monochrome

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Avtech Electronics Inc. (formerly Team Electronics)
Conrac Div. Conrac Corp. See Adv. Page
EEV, Inc.
EEV Canada Ltd.
RCA Distributor & Special Products Div.

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Amperex Electronic Corp.
Avtech Electronics Inc. (formerly Team Electronics)
EEV, Inc.
EEV Canada Ltd.
EMAC Div. of Varian
English Electric Valve Co. Ltd.
R. F. Gain, Ltd.
RCA Distributor & Special Products Div.
Varian Associates Electron Device Group
Westinghouse Electric Corp. Ind. & Gov't Tube Div.
Wilkinson Electronics, Inc.

Vacuum Tubes, Transmitting

Amperex Electronic Corp.
Avtech Electronics Inc. (formerly Team Electronics)
EEV, Inc.
EEV Canada Ltd.
Ecoron Broadcast Service Inc.
EMAC Div. of Varian
English Electric Valve Co. Ltd.
Freesland Products Co. Ltd.
R. F. Gain, Ltd.
RCA Distributor & Special Products Div.

Vacuum Tubes, Rectifier

Brabury Group
Centre Corp.
Commerce Airborne Div. IFR Avionics, Inc.
Compact Video Sales, Inc.
DYMA Engineering, Inc.
E-Q-Corp. Electronic News Group
The Gerstenslager Co.
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Link Electronics
Midwest Corp. Mobile Unit Group
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RCA Broadcast Systems
The Real World Tech. Group, Inc.
Shok Electronic Enterprises, Inc.
Tele-Measurements Inc.
Video Tele Com
Wold Communications
Wolf Coach Inc.

Vectorscopes

All Mobile Video Broadcast Video Systems, Ltd. See Adv. Page
Electronic Visuals Ltd.
Leader Instruments Corp. 232
Leasametric, Inc.
Lectrotech Inc.
Leasametric, Inc.
Lead Structures
Leasametric, Inc.
Philips' Test & Measuring Instruments, Inc.
Tektronix Inc.
Ultra Audio Pictex
Video Aids of Colorado
Videolek, Inc.

Video Equipment, Underwater

Ocean Realm Video Div. of Ocean Realm Corp.
Thermodyne International Ltd.
Westinghouse Electric Corp. Ind. & Gov't Tube Div.

Video Libraries, Stock Footage, Programs

Ocean Realm Video Div. of Ocean Realm Corp.
Thomas Valenti Inc.

Voltmeters, AC

B & K Precision Dynascan Corp.
Boonton Electronics Corp.
Bruce & Kjaer Instruments, Inc.
John Fluke Mfg. Co., Inc.
Gralex Industries
HF Signalling Inc.
High Country Engineering
Leader Instruments Corp.
Leasametric, Inc.
North American Soar Corp.
Rohde & Schwarz Sales Co.
Rycom Instruments
Tektronix Inc.
VIZ Mfg. Co.

Voltmeters, DC

B & K Precision Dynascan Corp.
Bruce & Kjaer Instruments, Inc.
John Fluke Mfg. Co., Inc.
Gralex Industries
Leader Instruments Corp.
Leasametric, Inc.
North American Soar Corp.
Rohde & Schwarz Sales Co.
Rycom Instruments
Tektronix Inc.
VIZ Mfg. Co.

Voltmeters, EFT

B & K Precision Dynascan Corp.
John Fluke Mfg. Co., Inc.
Leader Instruments Corp.
Leasametric, Inc.
VIZ Mfg. Co.

Voltmeters, VOM

B & K Precision Dynascan Corp.
John Fluke Mfg. Co., Inc.
G C Electronics Div. Wallace Murray
Leader Instruments Corp.
Leasametric, Inc.
Motorola Communications and Electronics Inc.
North American Soar Corp.
Vidaire Electronics Mfg. Corp.
VIZ Mfg. Co.

Voltmeters, VTVM

B & K Precision Dynascan Corp.
Boonton Electronics Corp.
ITT Jennings
Leasametric, Inc.
VIZ Mfg. Co.

Wattmeters

Audio Technology
Bird Electronic Corp.
Boonton Electronics Corp.
Dielectric Communications A Unit of General Signal
Electro impulse, Inc.
Leasametric, Inc.
Micro Communications, Inc.
Rohde & Schwarz Sales Co.
VIZ Mfg. Co.

Waveform/Vector Monitors

Electronic Visuals Ltd.
Tektronix Inc.

Waveguides and Supports

Andrew Corp.

Broadcast Product Manufacturers' Addresses begin on page 188
The brightness you need to show it big

General Electric Professional Large Screen Video Projection

With General Electric's exclusive sealed light valve and sealed Xenon lamp system, in both color and monochrome General Electric Professional Large Screen Video Projectors, you can depend on sharp pictures from 2 to 25 feet wide. New high brightness models allow the room lighting viewers need to take notes and refer to written material.

The color projectors reproduce every color accurately, with the convenience of inherent color registration. General Electric's exclusive single gun, single optical path light valve system eliminates the need for manual color convergence.

Portable and flexible, the projectors are being used for a wide variety of applications, including front and rear projection. Our applications experts will tell you whether yours can be added to the growing list, which includes:

**Education:** Medical, dental, engineering, computer science instruction.

**Business:** Sales meetings, industrial training, product presentations, real-time display of computer-generated data, teleconferences.

**Aerospace and Defense:** Situation displays, simulator training.

**Entertainment:** Theatre television, closed-circuit TV events, overflow crowds, special effects.

**Television Production:** Backgrounds for news programs, special effects, data display, program previewing.

Call or write: General Electric Company, Video Display Equipment Operation, Electronics Park 6-206, Syracuse, NY 13221. Phone: (315) 456-2152.

**NEWS BACKGROUND** at WTMJ-TV, Milwaukee, is displayed rear screen by General Electric projector.

**SELL-OUT CROWDS** at Fiske Planetarium, Boulder, watched live NASA transmission presented by General Electric projector.

---

**GE Professional Large Screen Television Projector Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>Light Output in Lumens</th>
<th>Resolution* in TV Lines per Picture Height</th>
<th>Input Power Req.</th>
<th>Scan Standards***</th>
<th>Video Input**</th>
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<tr>
<td>PJ 5000</td>
<td>550</td>
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<td>1250</td>
<td>500</td>
<td>650</td>
<td>750</td>
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</table>

**MONOCHROME PROJECTORS**

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<tr>
<th>Model</th>
<th>Light Output in Lumens</th>
<th>Resolution* in TV Lines per Picture Height</th>
<th>Input Power Req.</th>
<th>Scan Standards***</th>
<th>Video Input**</th>
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<td>PJ 7850</td>
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<td>PJ 7855</td>
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<td>PJ 7155</td>
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<td>2400</td>
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<td>750</td>
</tr>
</tbody>
</table>

*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.

---

Circle (141) on Reply Card
Broadcast product manufacturers
Do you expect to believe that if they are in New Jersey, or Miami, or Chicago (or advertise under an assumed name) that they buy for less? WRONG! All major dealers have the same cost! And at OUR special prices to you, we can’t even afford an 800 number! Read on...find what you need and call 312/433-6010-ask for the Industrial Video Dept. that sells so cheaply they can’t afford an 800 number.

Color Cameras

Sony

KY 1900CH 3-Tube Saticon Head 2756.
KY 1900CHL 6 as above w/6:1 zoom lens 3580.
KY 1900CHL 10 as above w/10:1 zoom lens 4160.
KY 2700 ACH 3-Tube Saticon Head 4680.
KY 2700AP 3-Tube Sat. for KY 2700 ACH 3-Tube Saticon Head 5390.

JVC

VHS Recorders, Players

WV -3160 Newvicon; 12:1 Power zoom 810.
WV -777X 3-Saticon, prism optics 935.
WV -3990 As above w/12:1 Lens 2165.
WV-777XU 3-T-Cam, prism optics w/o Lens 485.
PK-751 Vidicon; 6:1 Motorized zoom w/macro 649.
PK-756 As above with Auto-focus 775.
PK-771 Vidicon, 12:1 Motorized zoom w/macro 790.
PK-802 Saticon, 6:1 Motorized zoom; 5.1 lbs. 810.
PK-956 Newvicon, 6:1 Motorized zoom Auto focus 960.

Panasonic

NV -8500 1/ NV -A500 8660.
NV -9600 1/ NV -A500 8660.

Sony Betamax Recorders, Players & Tape

SLP-303 Player 935.
SL-5000 Record Beta 2 & 3; PB all speeds; front load 698.
SL-2500 Front load; program TT, wireless remote 1145.
SL-333 Records Beta 1; 2 chan. audio 1150.
SL-383 Recorder/ Editor 1925.
SL-2000 Portable recorder only 900.
SL-340 Portable recorder w/A.C. & charger 1045.
L-500 Tape 8.60
L-750 Tape 10.95
L-830 Tape 13.45
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4 Rue Semard
75009 Paris, France

Sydney
Magna-Techtronics (Aust.)
PO Box 150
Crows Nest NSW 2064
Australia – Telex 24655

Johannesburg
General Optical Co., Ltd.
15 Hubert Road
Johannesburg 2001,
South Africa

Rome
Alberto Sciaretta
Via Siria 24
Rome 00179
Telephone 7943619

Brussels
A.R.C.
Rue de Boisde Lintzout 45
1200 Brussels Belgium

Hong Kong
Paul Yang and Associates
901 Star House
3 Salisbury Road
Kowloon, Hong Kong

Bombay
Capt. P.K. Vishwanath
2344/4 Rama Baug,
Deodhar Road
Bombay 400 019, India

Kehl West Germany
Zenon GMBH
Postfach 1743
Hauptstrasse 128
Kehl am Rhein
Tel: 07851/2991
Telex: 753557

London
Branch & Appleby
42 High Street
Harrow-on-the-Hill
Middlesex HA1 3LL,
England

Kuala Lumpur
Kinematronika Sdn. Bhd.
2852, Jalan Selangor/P.
Persekutuan,
Federal Hill
Kuala Lumpur, Malaysia

Caracas
Cine Materiales srl
Apartado Postal 61.096
Caracas 100 Venezuela

MAGNA-TECH ELECTRONIC CO., INC.
630 Ninth Avenue, New York, N.Y. 10036
Telephone (212) 586-7240
Telex 126191
Cables "Magtech"

Circle (143) on Reply Card

September 1982  Broadcast Engineering  191
Before you invest in new studio monitors, consider all the angles.

No one has to tell you how important flat frequency response is in a studio monitor. But if you judge a monitor’s performance by its on-axis response curve, you’re only getting part of the story.

Most conventional monitors tend to narrow their dispersion as frequency increases. So while their on-axis response may be flat, their off-axis response can roll off dramatically, literally locking you into the on-axis “sweet spot.” Even worse, drastic changes in the horn’s directivity contribute significantly to horn colorations.

Introducing the JBL Bi-Radial Studio Monitors.

At JBL, we’ve been investigating the relationship between on and off-axis frequency response for several years. The result is a new generation of studio monitors that provide flat response over an exceptionally wide range of horizontal and vertical angles. The sweet spot and its traditional restrictions are essentially eliminated.

The key to this improved performance lies in the unique geometry of the monitors’ Bi-Radial horn. Developed with the aid of the latest computer design and analysis techniques, the horn provides constant coverage from its crossover point of 1kHz to beyond 16kHz. The Bi-Radial compound flare configuration maintains precise control of the horn’s wide 100° x 100° coverage angle.

And the Bi-Radial horn’s performance advantages aren’t limited to just beamwidth control. The horn’s rapid flare rate, for instance, dramatically reduces second harmonic distortion and its shallow depth allows for optimal acoustic alignment of the drivers. This alignment lets the monitors fall well below the Blauert and Laws criteria for minimum audible time delay discrepancies.

But while the Bi-Radial horn offers outstanding performance, it’s only part of the total package. The new monitors also incorporate JBL’s most advanced high and low frequency transducers and dividing networks. Working together, these components provide exceptionally smooth response, high power capacity, extended bandwidth, and extremely low distortion.

Judge For Yourself

Of course, the only way to really judge a studio monitor is to listen for yourself. So before you invest in new monitors, ask your local JBL professional products dealer for a Bi-Radial monitor demonstration. And consider all the angles.

James B. Lansing Sound, Inc.
8500 Balboa Boulevard
P.O. Box 2200
Northridge, California 91329 U.S.A.

JBL Professional Products Division

Available in Canada through Gould Marketing, Montreal, Quebec.

Circle (144) on Reply Card
A System of Engineered Components which combines Simplicity, Reliability and Stability for Superior Sound Quality and Unexcelled Control.

Any broadcaster dedicated to improving the station's sound with the right combination of audio processing knows that the desired results are difficult to achieve and often harder to control. A sensible solution for the sound and control you need is to select from Elcom/Bauer's full range of audio signal processing components.

An Elcom/Bauer system is engineered with a versatile common sense design approach that delivers a smooth range of inaudible level control. Whether your application is AM or FM, the right combination of Elcom/Bauer audio processing will make your sound more competitive — without the problems of excessive compression and loss of dynamic range.

**The AGC Level Guard™**

Is an advanced automatic level controller. It utilizes a switchable time constant optical attenuator for unnoticeable, wide-range level control and low distortion. The AGC Level Guard meets the FCC requirements for automatic transmitter systems and incorporates a unique electronic servo which continuously maintains precise, legal modulation levels.

Two front panel controls — gain and gain reduction — makes installation and adjustment simple and reliable; a prerequisite for automated stations.

**The AP-50 Insta-Peak II**

Incorporates a dual-spectrum, audio processing technique to achieve a smooth, full-range control of peak levels. The split-spectrum processing employs independent gain control of upper and lower portions of the spectrum and eliminates audible "pumping" effects. Positive and negative "fast spikes" are controlled by a circuitry which augments the optical attenuator response. A proprietary "anti-ring" circuit (which operates only during hard limiting) prevents overshoot and ringing.

Adjustments are straightforward with LED's indicating peak ceilings.

**The MP-12 Modulation Processor**

Increases the positive modulation from an AM transmitter by means of controlled negative feedback which yields low distortion, asymmetrical modulation. Negative modulation peaks are held below 100%, eliminating the need for peak clipping. The MP-12 also includes a switchable audio equalizer which assures maximum utilization of the assigned channel and provides superior sound quality. High levels of modulation can be obtained with less transmitter overload and sideband splatter.

**The WBL Composite Limiter**

Can be adjusted to provide continuous 100% modulation with any existing transmitter combination and eliminates all filler and preemphasis overshoot. It provides long term stability and complete agreement between the modulation meter and peak flasher while increasing FM modulation up to 40%.

With the combination of the Insta-Peak II and the WBL Composite Limiter, it's now possible to sound competitively louder without excessive compression level and loss of dynamic range.

With over 1,000 Elcom/Bauer audio signal processing components in operation, the broadcaster can be assured of an engineering commitment to reliability and performance.

Contact Elcom/Bauer today for complete technical information on a system of components that will guarantee superior sound quality and control.

**THE HERITAGE OF THE FUTURE**

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Sacramento, California 95826
Tel: (916) 381-3750
Telex: 377-331
HOW DO YOU GET PRECISE POWER CONVERSION WITHOUT FRUSTRATING BACKORDER DELAYS?

Answer: With Topaz Sine Wave Inverters and Frequency Converters — available off the shelf.

When you have a power conversion problem, you need an immediate solution. That's why Topaz Sine Wave Inverters and Frequency Converters are always in stock, ready for same-day shipment.

Topaz Inverters are available in 50 Hz and 60 Hz models with input voltages of 12/24, 28, 48, 125 or 250 VDC. They offer primary-to-secondary isolation, current limiting, a high degree of noise attenuation, excellent waveform shaping and output voltage regulation.

Topaz Frequency Converters offer fixed output frequencies of 50 Hz, 60 Hz or 400 Hz with input voltages of 115 or 230 VAC. Standard models also offer excellent noise attenuation plus voltage step-up, voltage step-down or direct one-to-one voltage conversion.

Topaz Inverters and Converters are available in power ratings ranging from 200 VA to 10 kVA and with output voltages of 115 VAC or 115/230 VAC. All models feature precise 0.5% frequency stability, overload and short-circuit protection, automatic/manual restart selection, low harmonic distortion and design simplicity for maximum reliability.

Don't let frustrating backorder delays prolong your power conversion problems. Get the solution from Topaz today.

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San Diego, CA 92123
(714) 565-8363
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AV Routing Switcher, 7934 is the latest in the state of the art circuitry. Both manual or computer control options available.

Envelope Delay Measurement Set, 3705 measures the envelope delay of video frequencies for compliance with FCC requirements.

Sideband Analyzer, 3706 shows with a calibrated response curve if sideband attenuation and frequency response meet FCC requirements. (model 3709, for deeper resolution and spectrum analysis).

Broadcast Demodulator, 4501 accurately demodulates the transmitted signal to show the true video signal being broadcast.

Demod Tester, 4503-A1 quickly checks the broadcast signal demodulator for flatness of frequency response.

Modulator, 4420 is a state of the art cable TV modulator with VSB saw filter, digital display, very low noise and FCC TV transmitter specs.

Broadcast Demodulator, 3710 is a comprehensive demodulator with both synchronous and envelope detection; built-in self tester, digital display, multiplexed outputs and other convenience features.

Video and Pulse Distribution System, (3300 series). Features Video DA's with frequency equalization; Pulse DA's with variable delay.

Clamper Amplifier, 3203-F clamps high levels of hum on balanced and unbalanced lines. Equalizes for cable loss up to 10 dB.

Fiber Optics Video Transmission System, 4210 has audio subcarrier. Provides interference free video and aural transmissions for STL and ENG applications.

Modular Test Set, 3538 provides up to 8 EIA standard video test signals. Special purpose modules also available.

Audio DA System, 6910. Each DA card provides 6 balanced, or 12 unbalanced 600 ohm outputs. 10 cards per frame with power supply.

NTSC Chroma Keyer Decoder, 4706-A1 decodes the NTSC signal with no apparent H delay for RGB keying.

Isolation Amplifier, 5300. An active device that negates hum caused by ground loops on unbalanced video transmission cable.

Over 175 products and accessories available
TIRED OF BROADCASTING FROM A PRESSURE COOKER?

THE BROADCASTING SYSTEM DESIGNED TO TAKE THE PRESSURE OFF.

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SOL-6800

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For further information on the SOL-6800 system, call, write or telex:

H. A. Solutec Ltd.
4360 Iberville Street,
Montreal, Quebec,
Canada H2H 2L8
Tel. (514) 524-6893,
Telex: 055-62139

Circle (148) on Reply Card
MOVING?

If you’re planning a move in the near future, don’t risk missing an issue of Broadcast Engineering. Please give us 6-8 weeks notice if you’re planning on changing your address. Just write in your new address below and mail this coupon, WITH YOUR SUBSCRIPTION MAILING LABEL, to:

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Address
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For your reference, Broadcast Engineering has designed this Broadcast Product Dealer/Distributors section to provide close-to-home purchasing assistance. Use it, with other sections in the Buyers' Guide, to plan new facilities and equipment expansion or upgrading. This directory identifies addresses and telephone numbers, products handled, and territory served for broadcast product dealer/distributors.

Typical listing

(1) Jones Broadcast Sales, 2912 W. 10 St.,
(2) Kansas City, Mo. 64105
(3) IA, KS, MO, OK, 1, 2, 5, 7, 9

(1) firm name, street address
(2) city, state, zip code, telephone
(3) geographic area served and products handled (see code keys)

This firm covers Iowa, Kansas, Missouri and Oklahoma, and sells audio equipment, video equipment, tape, film equipment, and does service and repair work.

Listings are arranged alphabetically by state. Companies listed do not comprise all dealers/distributors serving an area, but only those that returned BE's listing form.

An example of a typical dealer/distributor listing, the geographic area and product classification code keys, are included on this page to assist you. We think you will find that this section, along with the updated Product Directory and Broadcast Product Manufacturers' Addresses sections, make this issue the most useful and comprehensive purchasing aid for the broadcast industry.

Key to product numerical code

1 AUDIO EQUIPMENT (including recorders, microphones, mixers, consoles, cart machines, turntables, processing devices, etc.)

2 VIDEO EQUIPMENT (including cameras, videotape recorders, production switches, monitors, lights, etc.)

3 TEST AND MEASUREMENT EQUIPMENT (audio and video)

4 TRANSMITTERS, ANTENNAS AND TRANSMISSION SYSTEMS (including towers, ATS, STL, MDS, etc.)

5 TAPE (including video and audio recording tape, etc.)

6 VACUUM TUBES (including video camera, transmitter, TWT, etc.)

7 FILM EQUIPMENT (including cine cameras, processing equipment, film projectors, etc.)

8 VANS AND ACCESSORIES

9 SERVICE AND REPAIR

10 SYSTEM DESIGN (including studio installation, etc.)

11 USED EQUIPMENT (including leasing, rent, etc.)

Key to geographical area code

AK Alaska
AL Alabama
AR Arkansas
AZ Arizona
CA California
CO Colorado
CT Connecticut
DE District of Columbia
FL Florida
GA Georgia
HI Hawaii
ID Idaho
IL Illinois
IN Indiana
KS Kansas
KY Kentucky
LA Louisiana
MA Massachusetts
MD Maryland
ME Maine
MI Michigan
MN Minnesota
MO Missouri
MS Mississippi
MT Montana
NC North Carolina
ND North Dakota
NE Nebraska
NH New Hampshire
NJ New Jersey
NM New Mexico
NV Nevada
NY New York
OH Ohio
OK Oklahoma
OR Oregon
PA Pennsylvania
RI Rhode Island
SC South Carolina
SD South Dakota
TN Tennessee
TX Texas
UT Utah
VA Virginia
VI Virgin Islands
VT Vermont
WA Washington
WI Wisconsin
WV West Virginia
WY Wyoming

(Abbreviations for Canadian provinces)

ALTA Alberta
BC British Columbia
MAN Manitoba
NB New Brunswick
NF Newfoundland
NS Nova Scotia
PEI Prince Edward Island
QUE Quebec
SASK Saskatchewan
YUK Yukon Territory

September 1982 Broadcast Engineering 211
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
M. P. Video, Inc., 3 Huron Dr., Natick, MA 01760 (617-965-5405) CT, ME, MA, NH, RI 1, 2, 3, 5, 9, 10, 11
Lake Systems Corp., 55 Chapel St., Newton, MA 02160 (617-244-6881) CT, ME, MA, NH, RI 1, 2, 3, 5, 8, 9, 10, 11
Victor Duncan, Inc., 32380 Howard St., Madison Hgts., MI 48071 U.S.A. and Canada 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

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, MI, MN, MO, OH 1, 2, 3, 4, 5, 10
See advertisement on page 244
Audio Broadcast Group, Inc., 2342 S. Division Ave., Grand Rapids, MI 49507 (616-452-1596) U.S.A. 1, 3, 4, 5, 8, 9, 10

MISSISSIPPI
Central School Supply, 310 Airport Rd., Jackson, MS 39208 (601-932-1901) AL, AR, LA, MS, TN 1, 2, 4, 5, 6, 7, 9, 10, 11
Futec Engineering Services, 4672 Nisqually Rd., Jackson, MS 39206 (601-362-2697) AL, AR, DC, FL, GA, KY, LA, MD, MS, MO, NC, OK, SC, TN, TX, WA, WV, 9, 10, 11

MISSOURI
Television Engineering Corp., 580 Goddard Ave., Chesterfield, MO 63017 (314-532-4700) IL, IA, KS, MS, MO, NE, OH, TN 1, 2, 3, 5, 6, 7, 8, 9, 10, 11
Dyer/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 Grissom, St. Louis, MO 63141 (314-432-1164) Continental U.S. 2, 3, 5, 8, 9, 10

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, 11

NEVADA
Nevada Service, 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 5211, Manchester, NH 03108 (603-472-2297) 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, MA, NH, VT 1, 2, 5, 9, 10, 11
See advertisement on page 181
Thor Electronics Corp., 321 Pennsylvania Ave., Linden, NJ 07036 (201-486-3300) Worldwide 6

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 5211, Manchester, NH 03108 (603-472-2297) 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, MA, NH, VT 1, 2, 5, 9, 10, 11
See advertisement on page 181
Thor Electronics Corp., 321 Pennsylvania Ave., Linden, NJ 07036 (201-486-3300) Worldwide 6
TEXAS
Midcom, Inc., 2231 E. Division, Arlington, TX 76011 A2, KS, LA, NM, OK. TX 1, 4, 5, 9, 10
Broadcast Systems Inc., 8222 James- town Dr., Austin, TX 78758 (214-531-5232) U.S.A. 1, 2, 3, 4, 7, 8, 9, 10
Gene Sudduth Co., Inc., 5657 Road - runner Lane, Beaumont, TX 77708 (713/899-1341) AR, LA, OK, TX 1, 2, 3

SAVCO, Box 427, Richardson, TX 75080 (214-234-1841) AL, AR, KS, LA, MI, MO, OK, TX 1, 2, 3, 4, 5, 9, 10
Abadan/Sun., Inc., Box 6520, San Antonio, TX 78209 (512-824-9781) U.S.A. Mexico 1, 2, 3, 5, 9, 10
CFA-Media Specialties, Inc., Box 34567, San Antonio, TX 78233 San Antonio 512-657-5997; Dal - las-214-644-6479; Houston-713-528-6012 LA, NM, OK, TX 1, 2, 9, 10, 11
Linrose Electronics Corp., 202 W. Nakoma, San Antonio, TX 78216 (512/342-8849) Worldwide 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

RHODE ISLAND
WRH Productions, 6 Industrial Way, White Haven, PA 18661 (717-443-9575) Worldwide 4
EMCEE Broadcast Products, Box 68, Nashville, TN 37204 (615-883-9175) TN, 2, 5, 8, 9, 10

UTAH
RIA, Inc., 500 E. Malvern, Salt Lake City, UT 84115 (801-486-8822 or 484-1701) AR, CA, CO, ID, LA, MS, MO, MT, NV, OK, TX, UT, WY 1, 2, 3, 4, 5, 7, 8, 9, 10, 11

VIRGINIA
Broadcast Equipment Exchange, Box 1238, Arlington, VA 22205 (703-525-0400) U.S.A. and Intl 11
Hoppmann, Box 601, Chantilly, VA 22021 22151 (703-631-2700) U.S.A. 1, 2, 7, 10
David Green Broadcast Consultants Corp., Box 590, Leesburg, VA 20075 (703-777-8660) North America 1, 3, 4, 5, 6, 9, 10, 11
Alpha Audio, 2049 W. Broad Street, Richmond, VA 23220 (804-358-3582) DC. MD, NC, VA, WY 1, 5, 10
Old Dominion Broadcast Eng., 1101 Front St., Richmond, VA 23222 (804-321-4506) Worldwide 1, 3, 4, 5, 6, 9, 10, 11
Midwest Corp., Communications Sys - tems Div., 1395 Air Rail Ave., Virginia Beach, VA 23455 (804-464-5266) ALE, DE, DC, GA, MD, NC, SC, VA 1, 2, 4, 5, 8, 9, 10

WASHINGON
IGM Communications, 4041 Home Rd., Belington, WV 26206 (206-733-4557) U.S.A. 1
Allied Broadcast Equipment, 1112 South 344th St., Suite 312, Federal Way, WA 98003 (206-927-4337) Worldwide 1, 3, 4, 5, 6, 9, 10
Custom Video Systems, Inc., 17521 15th Ave. N.E., Seattle, WA 98155 (206-365-5400) AK, WA 1, 2, 3, 5, 8, 9, 10, 11
MARCOM, 216 Westlake Ave. N., Seattle, WA 98109 (206-621-9633) AK, AZ, CA, HI, NV, OR, WA 1, 2, 3, 4, 6, 10, 11
Northwest Broadcast Systems, 1718 NE 98th St., Seattle, WA 98115 (206-525-6974) AK, ID, MT, OR, WA 1, 4, 10

WISCONSIN
Full Compass Systems, Ltd., 6729 Seybold Rd., Madison, WI 53719 (608/271-1100; Outside Wi - 800/356-5844; WI-800-362-5445) U.S.A. 1, 3, 5, 9, 10, 11
Electronic Industries Inc., 19 E. Irving Ave., Oakshock, WI 54901 (414-235-8930; 800-558-0222) U.S.A. 1, 3, 4, 5, 6, 9, 11
Video Images, 12200 W. Adie Lane, West Allis, WI 53214 (414-475-0111) WI 1, 2, 5, 7, 9, 10, 11

CANADA
Dilor Industries Ltd., 37749 2nd Ave.; Box 2169, Squamish, B.C., Canada V0N 3G0 (604-892-9301) Canada 2
Interlake Audio Inc./Fostex Electro Acoustics Systems, 620 King Edward St., Winnipeg, Man., Canada R3H 0Z2 (204-775-8513) North America 1, 10
Comad Communications, 91 Kelfield St., Unit 5, Rexdale, Ont., Canada M9W 5A3 (416-245-1734) Canada 1, 2, 4, 5, 9, 10
Caveco Equipment Ltd., 1121 Bellamy Rd. N., Unit 10, Scarborough, Ont., Canada M1H 2Z5 (416-438-6230) Canada 1, 2, 3, 4, 5, 6, 9, 10
Black & McDonald, 101 Parliament St., Toronto, Ont., Canada M5A 2Y7 (416-366-2541) Canada 4
Lumitrol, Ltd., 5 Walker Ave., Toronto, Ont., Canada M4V 1G3 (416-921-6606 or 921-6688) Canada 2, 10
Studio Systems, Inc., Box 67, Snowdon, Montreal, Que., Canada H3X 3T3 (514-861-7448) AR, CT, DE, DC, FL, GA, IL, IN, KS, KY, ME, MD, MA, MI, MS, MO, NH, NJ, NY, NC, ND, OH, PA, SC, TN, TX, UT, VA, WV, and all Canada 1, 2, 4, 5, 8, 10
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**Customized Serial Interfaces**—
Optionally available for many editing controllers, including the Videomedia Z6000, Convergence 103, 104 Series, United Media Commander II and Sony BVE 800. An ECHOlab serial interface gives your editor complete functional control of the switcher — not just basic functions such as pattern types, crosspoints and wipe durations. This means that even your most complex edit can be set up, frame accurate, entirely from the editor keyboard.

For example, a simple animation sequence might involve moving a bordered square across the screen in 67 frames while at the same time dissolving in a colorized key, then rotating the bordered square into a diamond as it wipes back across the screen. This sequence can easily be set up from the edit list and executed from the editor with no manual adjustment of the switcher.

For more advanced edits, complex multiple transitions can be pre-programmed into the SE/3's 5000 steps of programmable memory and remotely sequenced or randomly accessed from the editor. The serial-editing interfaces are fully self-contained in the switcher electronics package, and require no external computer equipment. The typical setup requires only a 5-wire interconnecting cable between the switcher and edit controller.

**External Computer Interface**—
In addition to the editing interfaces, a general-purpose serial interface protocol is available for full remote control of the SE/3 by an external computer.

**Future Interfacing Capabilities**—
ECHOlab is rapidly expanding its line of editing interfaces and is dedicated to supporting the full SMPTE editing standard when it becomes available in the final form.

For details, write or call:

The ECHOlab SE/3 SEG fully complies with the new FCC regulations concerning radiation and interference for CLASS A commercial equipment, as described in the FCC rules and regulations Part 15, Subpart J of Docket 20780.
Ampex adopts Matsushita's video format

Ampex Corporation recently announced that it has adopted the 1/2-inch M-format video recording format for professional broadcast ENG applications, and will begin marketing worldwide a 1/2-inch integrated camera/VTR system this fall.

The M-format, developed by Matsushita Electric Industrial Company of Japan and adopted by Ampex, uses the 1/2-inch VHS videotape cassette in the single camera/VTR combination.

"Ampex has been evaluating systems and, as a manufacturer of both the VHF and Beta format cassettes, has determined that VHS is the superior cassette for the professional market," said Donald V. Kieffman, vice president/general manager, Ampex Audio-Video Systems Division.

Ampex will initially market the VTR system produced by Matsushita. However, Ampex intends to begin manufacturing its own version of the 1/2-inch system using the M-format in the future. Ampex exhibited the new integrated camera/VTR system in Brighton, England, at the International Broadcasters Conference in September.

The Ampex unit is designed to interface with existing studio equipment and can produce broadcast quality signals superior to that currently realized on 1/4-inch VTRs. The Ampex system is comprised of an in-camera VTR, studio editing VTR and electronic editing control system.

The VTR and camera lock together to form a self-contained system allowing the operator to cover news action without need for connecting cables, shoulder straps or pack frames. The Ampex unit is compact and weighs less than 22 pounds.

In addition to the VHS cassette advantages, Ampex has selected the VHF format because of its superior capabilities in picture quality. The M-format recording system delivers broadcast quality video, two high quality audio tracks, plus control track and a SMPTE time code track, all on 1/2-inch tape.

The Ampex camera/VTR is capable of recording up to 20 minutes on one VHS cassette, and uses four video recording heads to produce high quality pictures. The new 2-track system records Y, I and Q information on separate video tracks and the I and Q signals are multiplexed for freedom from intermodulation, one of the common problems of color under ENG recorders. The system is complete with a built-in SMPTE time code generator.

The Ampex system uses microprocessor-based circuitry to provide automatic functions. Controls on the camera/VTR lens start and stop the record function. The 3-tube camera provides the choice of 2/3-inch Saticon or Plumbicon tubes. Special features of the camera include automatic beam control, 2-line vertical aperture correction, black stretch and corner registration circuitry.

The M-format studio VTR provides fast and accurate program

---

**Handy as a pocket on a shirt!**

The Model 12AV1 routing system has been designed with new electrical and mechanical techniques to provide high quality signal distribution in video only, audio only, or AFV configurations. The system accommodates 12 inputs, with 1 output bus providing 2 video and 1 audio output. Units can be stacked as systems expand up to 15 outputs without external DA's. All switching is vertical interval. Switching reverts automatically to random upon loss of vertical drive for minimum down time.

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CMX 340X installed at Turner Broadcasting

Turner Broadcasting Systems has completed installation of a CMX 340X videotape editing system at its production center in Atlanta for use with Super Station WTBs and the Cable News Network.

In addition to interfacing with a Grass Valley 300 switcher, the 340X will be used with the station’s VPR-2s, and with the CMX general purpose interface, the Quantel DPE-5000, Chyron character generators, and audiotape machines.

Via Video opens for business

Via Video of Cupertino, CA, features a blend of video and computer technologies. One product offered is the System One videographic computer design system, which features fonts, keyed backgrounds, electronic slides and illustrated storyboards, in more than 4000 colors.

JVC announces name change

US JVC Corporation has recently restructured its sales and service division by consolidating the marketing and support services under the new name of JVC Company of America. Greater flexibility in meeting the company’s goals is the stated intent of the move.

JVC Company of America markets audio and video equipment to the public and professionals. The product line, manufactured by Victor Company of Japan Ltd., ranges from individual components to complete systems and includes stereo receivers, turntables, speakers, video cameras and recorders, TV monitors, accessories and recording tape. Stereo sound systems for cars and vans were...
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Asaca/ShibaSoku relocates corporate headquarters

Asaca/ShibaSoku Corporation of America has opened its new corporate headquarters in Los Angeles. The entire company, including the sales, engineering and management staff, is located at one site instead of maintaining separate offices in Des Plaines, IL, and New York.

The 10,000-square-foot facility houses a complete engineering design department, a customer service department where orders are received and billed, and a warehouse from which all shipments are made.

The office of Takashi Shigezaki, company president, is located at the new facility along with the offices of Kazuo Ezue, director of engineering, and Alan R. Davis, director of marketing.

In addition to establishing its warehouse and new corporate sales and marketing offices in Los Angeles, Asaca/ShibaSoku plans to establish regional spare parts and service facilities at various locations across the United States.

The new address is 12509 Beatrice St., Los Angeles, CA 90066; 1-213-827-7144.

Swedish broadcasters purchase MCI consoles

Sveriges Radio A B has become a major customer of MCI, a division of the Sony Corporation of America. Two years ago, Swedish broadcasters approached the south Florida manufacturer for specialized consoles to be used by both radio and television. The MCI JH-600 series of audio mixing desks met their needs. The Swedish engineers' requirements included high sonic performance and human-engineered control layouts.

With close cooperation between MCI engineers and Swedish Broadcasting's technical staff, the desks incorporate modifications especially suited to European broadcast requirements. Among the special features on these boards are special monitoring facilities with tally lamps, tape returns expanded to nine stereo pairs, and auxiliary inputs expanded to eight stereo pairs. An NTP/PPM program meter and a Goniometer (xy scope display) have been provided in addition to the JH-600's standard VU metering on mix and channel outputs. These auxiliary meters can be used to monitor any of a number of console outputs via a wink-eye switch located in the meter housing. A digital clock/timer is also built into the meter housing right above the PFL speaker, and MCI's standard broadcast option provides true PFL functions, special
ASACA/SHIBASOKU TG-7 TV test signal generator is a main frame which accommodates interchangeable modules, and by using it together with these modules, it generates TV test signals which are used for the adjustment, testing and measurement of video equipment.

Features
- The sync signal generator contained in the main frame allows color lock and gen-lock with the VBS or sync with color burst.
- The model contains a built-in dual axis balanced modulator and this allows the chroma phase to be varied from 0-360°.
- The subcarrier oscillator is incorporated into an oven and its frequency stability is within ±5Hz.

- Independent output terminals provide video component, sync signal, color burst level signals to be connected to an external programmable attenuator, each output level can control with external signals independently.
- The main frame and plug-in modules are coupled with DC circuit and so there is no bounce from the signal selection.
- Switches provided on the front panel enable selection horizontal or vertical drive for a trigger pulse output.
- The maximum variety of test signals can be generated with the minimum number of modules.
- Optional IEEE-488 Bus unit provides automated program control.

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signal routing and monitoring.
The wood trim has been changed from MCI’s standard South American rosewood to red oak to match the decor of Swedish Broadcasting’s control rooms.
MCI has delivered more than 20 consoles to the Swedish Broadcasters so far, and more are on order, including a customized version of MCI’s JH-652.

Pioneer to provide BC-2000s for Vision Cable
Pioneer Communications of America has signed a 17,500-unit contract with Vision Cable Communica- tions. Vision, headquartered in New York City, purchased Pioneer’s BC-2000, 36-channel set-top converter for use in its Pineville, LA, cable TV system. Shipment of converters by Pioneer will be completed this month.

Otari sets up new R&D division
Otari Corporation has established a new research and development divi- sion. The new research facility, which features the latest test equipment and listening environments, is being con- structed adjacent to Otari’s US head- quarters in Belmont, CA.
Steve Krampf will be general manager and Tom Sharples will be engineering manager.

Radio networks sign up for RCA’s distribution service
RCA American Communications has recently announced that ABC, CBS and NBC radio have signed con- tracts to use its satellite-transmitted Audio Digital Distribution Service (ADDS) for radio program distribution to affiliates. The collective value of the three contracts totals $46.5 million over eight years.

Through the use of ADDS, a single network can distribute any number of high quality radio programs simul- taneously on a nationwide or regional basis. Receiving stations may select alternate channels of programming, as desired, or stations may receive two or more programs simultaneously. Network expansion is achieved by adding more channel units to existing stations, while new stations can become part of the network by install- ing small, inexpensive, 3m receive- only antennas.

ADDS service is configured in units of 15kHz or 7.5kHz audio channels for program distribution, and 30kbit/s data channels for network coordina- tion and hard-copy transmission. Generally, the 15kHz channels are used for stereo music programming while the 7.5kHz channels are used for news services.

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NBC will begin in the first quarter of 1983, and CBS will begin in the third quarter of 1983. Service will be initially carried over Satcom I, moving to Satcom I-R later in the contract period. RCA American estimates that about 4500 earth stations will be receiving ADDS programming by the mid-1980s.

Hoffman Video expands
As part of a major expansion now under way, Hoffman Video Systems has announced plans to establish a branch sales office in Irvine, CA.

The 4000-square-foot complex, located in the new industrial complex on 17752 Mitchell St., will house a full video sales staff and complete servicing, rental and demonstration facilities.

The telephone number for the new Hoffman Orange County facility is 1-714-660-1066.

ALCOA-NEC formed
Aluminum Company of America and Nippon Electric Company Ltd. of Japan recently formed a new corporation to assemble and market TV receiver systems that will make it possible for individual homes and apartments to obtain TV programming directly from broadcast satellites.

The new company, ALCOA-NEC Communications Corporation, is owned 51% by Alcoa and 49% by NEC. The new company will draw upon the resources of Alcoa in the manufacture of aluminum and NEC in the manufacture of telecommunications equipment, computers and semiconductors.

The home TV receiving systems are designed to receive signals from a new generation of direct broadcast satellites to be launched in the mid-1980s. Each unit will contain three basic pieces of equipment: a 0.75m-1.8m aluminum parabolic dish to receive the 12GHz satellite signal; a low noise converter (LNC) that changes the signal to a lower frequency for transmission over coaxial cable; and a receiver/demodulator that enables the signal to be received on a home TV screen.

Until the new direct broadcast satellites are operational, ALCOA-NEC Communications Corporation will work closely with broadcasters and others who are preparing to enter the field to supply equipment for early entry systems receiving programming from conventional satellites. The company will have headquarters in Elk Grove Village, IL, and will assemble, test and ship the antennas/receiver systems at an existing facility in Sidney, OH.

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Advanced electronic design and innovative packaging make it all possible. Our routing switcher—even the smallest 10 x 10 version—has an integral 100 x 100 digital control system with unique packaging and bussing to permit simple expansion without the need for recabling or retiming the existing system.

Good specs that stay good

The TVS/TAS-1000 has excellent performance specifications. Crosstalk, for example, is rated at -60dB under worst possible conditions.

And we've designed it to stay that way by confining sources of crosstalk to individual boards. Complexities of installation or aging of components won't affect it. You can expect performance to be consistent. From switcher to switcher. From year to year.

And unlike most switchers, crosstalk in the TVS/TAS-1000 does not increase as matrix size increases. This means you can expand your system—in your facility—without decreasing performance.

We check our specs with the industry's most precise automatic testing system. We test all possible signal paths for each measurement. In the case of crosstalk, we measure twice—using two possible worst case selection patterns—and we record the poorer reading.

You get a complete copy of all test data. We keep a copy on file at the factory.

Controls for all requirements

We can offer you more than a dozen different rackmount and desktop control panels for your TVS/TAS-1000 so you can operate the system your way. The CP-1500, for example, offers full-matrix control with alpha-numeric displays for quick identification of all sources and destinations. It connects to the switcher matrix via a single coax "party line."

Machine control, too

Want to expand your system even further? You can add dynamic machine selection with our Fernseh TCS-1 machine control system and control up to 100 VTRs, film chains, and related units.

Or you can fully automate your operation with our Automax system. It provides programmable, real-time clock control of machines and program distribution.

So start small and grow. Or start big right away. Our modular TVS/TAS-1000 gives you the best available choice. Your local Fernseh office is anxious to give you all the details. Call them. Or get in touch with Fernseh Inc., P.O. Box 31816, Salt Lake City, Utah 84131, (801) 972-8000.

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The NAB extends its congratulations to the American Bar Association on the decision of its House of Delegates to repeal a 45-year-old attempt to prevent radio, TV and still photographic coverage in courtrooms.

The Executive Committee of the NAB has asked its staff to file an appeal with the US Court of Appeals of the FCC's June 23 decision authorizing DBS.

William Stakelin, executive vice president, Blue Grass Broadcasting Corporation, Orlando, FL, was recently elected chairman of the NAB Joint Board of Directors. He will complete the term of Edward O. Fritts, who was recently elected president of the association.

A significant victory for the NAB occurred recently with the court decision prohibiting AT&T's entry into the electronic publishing and advertising business. It was argued that AT&T's entry would create grave First Amendment and anti-competitive abuses. The decision blocks AT&T's entry into electronic publishing for at least seven years, and then only after "the risk of its domination of that field has abated."

The FTC has been asked by the NAB to temporarily suspend enforcement of its rule that prevents food and gasoline retailers from using radio and television to advertise games and sweepstakes promotions. The request states that the rule unfairly discriminates against radio and TV licensees who compete with print media for the advertising of these retailers.

Fritts elected president
Edward O. Fritts, president, Fritts Broadcasting, Indianola, MS, was recently elected president of the NAB. Fritts succeeds Vincent T. Wasilewski, who earlier this year had announced his intention to retire upon the naming of a successor. At press time, a starting date for Fritts' term had not been announced.

Fritts, who will be the association's 19th president, was in his second term as chairman of NAB's Joint Board. Elected to the Radio Board of Directors in 1977, he was its 1979-80 vice chairman and 1980-81 chairman. Fritts is a former chairman of NAB's Small Market Radio Committee. He was a member of the association's Radio Code Board and an advisory trustee of the Television and Radio Political Action Committee. He also is a former president of the Mississippi Broadcasters Association.

Fritts comes from a broadcasting family. He started his career as a part-time announcer for WENK, Union City, TN. His broadcasting group includes WNLA AM/FM, Indianola, MS; WELQ and WZLQ, Tupelo, MS; KMAR AM/FM, Winnsboro, LA; KCRI, West Helena, AR; and KCRIFM, Helena, AR. He is affiliated with his father, Edward B. Fritts, in ownership of WPAD and WDDJ, Paducah, KY.

Auxiliary facility changes favored
The NAB recently expressed qualified support for proposed rule changes that would produce greater flexibility in the use of broadcast auxiliary equipment and frequencies. The Federal Communications Commission is considering changes in three categories that govern TV auxiliary broadcast stations: studio transmitter

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ty relays second; TV pickups and translator relays third; and fixed links outside the service area fourth. It said the rules should provide flexibility in the application of the priority system by local coordinating committees and the FCC.

TV financial survey shows healthy growth

The annual financial survey conducted by the NAB of the US TV stations shows that in 1981 the typical station had a pre-tax profit of $1,064,000, a 12.6% increase over the previous year. The survey was based on replies from 436 stations and showed an increase in all categories.

Gross time sales increased 15.7% to $5,739,100, and net revenues were up 16.7% to $5,066,300. National and regional spots accounted for $2,634,200, an 18.75% climb, and local advertising increased by 13.9% to $2,605,600. For the first time since 1970, the typical station received more advertising dollars from national/regional spots than from local advertising. Network compensation came in at $499,300, a 9.35% jump.

Non-broadcast revenue hit $117,200 (15.70%) and $129,100 (33.09%) for trade-outs and barter transactions.

Operating expenses rose 17.8% to $4,012,100 with programming costs the leader at $1,484,500, up 22.75%.

Behind that was general and administrative ($1,500,500, 14.72%), selling ($576,200, 16.7%) and technical ($442,200, 14.6%).

The survey also shows that the typical station spent $33,800 on outside news service, $81,900 on music license fees and $384,000 on film and tape. There were 78 full-time employees at the average station, up from 71 in 1980.

Appeals court asked to reverse Copyright Tribunal decisions

The NAB has asked an appellate court to direct the Copyright Royalty Tribunal to award additional copyright fees to TV stations for sports broadcasts and to require the tribunal to award funds to commercial radio broadcasters.

At issue is the Tribunal’s refusal to award 1979 cable royalties for stations’ copyright interests in telecasts of sports events and no royalties whatsoever for commercial radio broadcasters. The NAB said that TV broadcasters should be awarded an additional 5.5% of the royalty fund as authors and copyright owners of 36.5% of sports telecasts or at least 2.75% of the royalty fund as joint authors of the telecasts. Also, the association said the court should reverse the Tribunal’s refusal to award commercial radio broadcasters any
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For more information on the newest and finest BCTV lenses, and why they are the best performance investment for your new or existing cameras, contact Fujinon. Large format zoom lenses are another reason why the world sees itself more clearly through the eyes of Fujinon.

Specifications:

<table>
<thead>
<tr>
<th>Focal Length</th>
<th>1&quot; Format</th>
<th>1/3&quot; Format</th>
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<tr>
<td>P28x15 ESM</td>
<td>15 - 420mm</td>
<td>15.5 - 280mm</td>
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<td>16.5 - 280mm</td>
<td>20 - 620mm</td>
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<td>P30x20 ESM</td>
<td>20 - 620mm</td>
<td>20 - 620mm</td>
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<tr>
<th>Max. Aperture</th>
<th>M.O.D.</th>
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<tr>
<td>F/2.2</td>
<td>.95m</td>
<td>1.7X</td>
</tr>
<tr>
<td>F/2.1</td>
<td>1.5X</td>
<td>1.5X, 2X</td>
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<td>F/2.2</td>
<td>2.5m</td>
<td>2X</td>
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<td>F/1.6</td>
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<td>F/1.8</td>
<td>2.5m</td>
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Kaplan writes open letter to broadcasters
Dear radio broadcaster:

There has been a great deal of publicity recently concerning radio’s prospects for legislative deregulation, and specifically about NRBA’s supposed pursuit of a plan that would give broadcasters long-term license contracts in exchange for financial support of public and non-commercial radio. An NAB spokesman was recently quoted as characterizing this idea as a “pipe dream that holds commercial broadcasters hostage.” I want to set forth some simple facts about NRBA’s efforts toward securing real legislative deregulation, about the so-called public radio trade-off and about who is really pursuing a pipe dream.

- The NRBA favors legislative deregulation including the Cannon Bill (S-1629) already passed by the Senate and various bills on the House side, including the Collins Bill (H.R. 5242) and the Broyhill Bills (H.R. 5584-5585).
- The Cannon Bill includes license fees that can be raised by the Congress as time goes along.
- Congressman Tim Wirth, chairman of the House Energy and Communications Subcommittee on Telecommunications, has made it clear that he opposes Cannon’s Bill and the aforementioned House bills. Rep. John Dingell, chairman of the Energy and Commerce Committee, supports Wirth’s position on the subject of radio deregulation. Without Wirth’s and Dingell’s support, the passage of a deregulation bill in the House is extremely unlikely.
- Congressman Wirth has indicated possible support for a plan to extend license periods for 40 to 50 years, on a contractual basis, in exchange for a fixed 1% of the gross revenues with such revenues targeted to support public radio and non-commercial radio. Such a contract fee could not be
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<table>
<thead>
<tr>
<th>KTRK TEST DATA BREAKDOWN</th>
<th>Worst</th>
<th>Mean</th>
<th>95th Percentile</th>
<th>Published Spec</th>
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</thead>
<tbody>
<tr>
<td>VIDEO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crosstalk @ 3.58 MHz</td>
<td>-63</td>
<td>7.11</td>
<td>65</td>
<td>-60 dB</td>
</tr>
<tr>
<td>Diff Gain</td>
<td>0.05</td>
<td>0.042</td>
<td>0.05</td>
<td>0.1%</td>
</tr>
<tr>
<td>Diff Phase</td>
<td>0.1</td>
<td>0.056</td>
<td>0.08</td>
<td>0.2°</td>
</tr>
<tr>
<td>Diff Delay</td>
<td>1.0</td>
<td>0.89</td>
<td>0.95</td>
<td>± 1°</td>
</tr>
<tr>
<td>Freq Response</td>
<td>0.05</td>
<td>0.02</td>
<td>0.05</td>
<td>± 12 dB</td>
</tr>
<tr>
<td>Hum &amp; Noise</td>
<td>-79</td>
<td>-84.6</td>
<td>-80</td>
<td>-75 dB</td>
</tr>
<tr>
<td>Gain Uniformity, All Paths</td>
<td>0.017</td>
<td>0.006</td>
<td>0.017</td>
<td>± 07 dB</td>
</tr>
<tr>
<td>Input Return Loss</td>
<td>46</td>
<td>51.2</td>
<td>46</td>
<td>40 dB</td>
</tr>
<tr>
<td>Output Return Loss</td>
<td>45</td>
<td>48.8</td>
<td>46</td>
<td>40 dB</td>
</tr>
</tbody>
</table>

| AUDIO                    |       |      |                 |                |
| Crosstalk @ 20 KHz       | -80   | -84.7| -81             | -75 dB         |
| Hum & Noise              | -88   | -9.18| -90             | -85 dBm        |
| THD 30 Hz - 20 KHz       |       |      |                 |                |
| @ 0 dBm                  | 0.017 | 0.011| 0.015           | 0.1%           |
| @ +24 dBm                | 0.24  | 0.13 | 0.17            | 0.5%           |
| Gain Uniformity, All Paths | 0.1  | 0.044| 0.09            | 0.2 dB         |
| Common Mode Rejection    | 80    | 88.3 | 83              | 70 dB          |

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raised by Congress during the life of the contract.
• This plan would encompass a far greater degree of radio deregulation than the Cannon Bill (S—1629).
• The NRBA does not endorse this plan to the exclusion of other possible avenues of legislative relief, but maintains that it would be irresponsible not to pursue any meaningful proposal for obtaining the radio broadcasters' common goal.
• Given the political realities, rejecting this plan out of hand, while relying instead on bills that may be unattainable would be in our view "chasing a pipe dream."
• The opportunity to achieve legislation will never be better, but the hour is growing late, and if we do not seize the opportunity, we may not get it again in the foreseeable future.
• The FCC deregulation of today could be changed by the courts and/or the next administration. One-and-a-half years ago, we had a very different FCC. That FCC of old, or an even more oppressive FCC, could return.

As president of NRBA, I intend to continue our discussions of the various proposals with all of the key people involved. We will, in short, continue to work diligently on your behalf and hope that when we have found our way through the maze, we will find genuine legislative rewards awaiting us.

Sis Kaplan
NRBA president

SMPTE working group reviews standards
The SMPTE Working Group on Standards for 1/2-inch VCRs for Broadcast Applications held its sixth meeting in May in Chicago. The initial submission for a format standard from RCA, Matsushita, Ikegami and Hitachi was reviewed by the group. Results of the review were that the initial proposed format should be capable of meeting the user requirements.

For more information, contact A. Alden at the SMPTE headquarters.

Chairmen named for NY conference
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SMPTE Conference, to be held Nov. 7-12, 1982, at the New York Hilton in New York City, have been appointed. Alvin J. Siegler, CBS, was named local arrangements chairman and will be responsible for overall arrangements of the conference not relating to the program.

The specific arrangement committees and their respective chairmen are: Hotel Arrangements, Edward J. Burns, Eastman Kodak Company; Registration, Irving Rosenberg, CBS TV Network; Membership, Martin Bunnel, United Nations; Entertainment, Albert Arbeeny, Hazeltine Corporation; Hospitality, Neal Pilzer, Motion Picture Enterprises; Security, Robert M. Smith, Du Art Film Labs.; Administrative Assistants, William L. Cooper, Jr., William L. Cooper, Inc.; and Carmine Melignano, Price Waterhouse & Company.

Other chairmen are: Luncheons, Philip Godfrey, ABC Television Network; Audiovisual – TV, Alan J. Zauzmer, Zitronic Enterprises, Ltd.; PA and Recording, Earl F. Arbuckle, III, WPIX; Display, Arthur P. Willis, Eastman Kodak Company; Transportation, John B. Low, Motion Picture Enterprises; Finances, James Hananafin, Technicolor, East Coast Division; Banquet, Seymour Yusem, CBS-TV; and Banquet vice chairman, Jamie Ellis, Independent Producer.

The SMPTE conference will have five days of sessions on the technical aspects of motion pictures and television. Also, there will be a 300-booth exhibit featuring the latest motion picture and TV equipment.

Arendall re-elected president
Ron Arendall of Indianapolis, IN, has been re-elected president of the Society of Broadcast Engineers for the 1982-83 term. Arendall is manager of engineering at WTHR-TV in Indianapolis.

Other officers gaining re-election include: Doyle Thompson of Atlanta, GA, director of engineering of The Weather Channel, vice president; Brad Dick of Lawrence, KS director of engineering at KANU/KFKU, secretary; and Ed Karl of Manchester, MO, engineer in charge of KMOX-TV in St. Louis.

Board members re-elected to their positions include Len Ballard, director of engineering, Swanson Broadcasting, Tulsa, OK; Ray Benedict, engineering manager, WHIO-TV, Dayton, OH; Hugh Cleland, chief engineer, WCNY-TV/FM, Syracuse, NY; and Roger Johnson, chief engineer, KOY Radio, Phoenix, AZ.

New board members elected to serve for the 1982-83 term are Robert Klein, director of engineering, Kentucky Educational Television, Lexington, KY; and Jack McKain, director of engineering, KCNO-TV/AM-FM, Kansas City, MO.

National frequency coordinating committee formed
The Society of Broadcast Engineers has announced the formation of a national SBE frequency coordinating committee chaired by Richard Rudman, engineering manager of KFWB in Los Angeles, who currently serves as chairman of the Southern California frequency coordinating committee.

Committee members include: Jack McKain, director of engineering, KCMO, Kansas City, MO; Ross Kauffman, operations and engineering director, WCVB, Boston; and Robert Van Buhler, chief engineer, KDKB, Phoenix, AZ.

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---

New products

**Battery belts**
Portable Energy Products' new two-on-one sealed lead-acid battery belts can simultaneously power a video camera and a 100W sun-gun-type light. The belts are available for 12V and 14V video cameras.

Circle (452) on Reply Card

**Earth stations**
The Microwave General Star Trac line of earth station hardware includes the 4m antenna (shown) for video reception; the 5m and 6m versions; the RCP-1644 remote control panel for antenna orientation; and the remote control command center for satellite/channel selection, odd/even channel polarization selection and optimization, and fine tune/audio channel selection. Customer options include trailer mounting or fixed-base mounting.

Circle (464) on Reply Card

**Microwave transmitter**
Twelve-hour operation from a 9V battery at 7GHz or 13GHz is claimed for the Household Data Services FX-T1 microminiature microwave transmitter. The 2-ounce unit offers 10mW output RF power from the 2.1"x1.1"x0.325" package. Compatible receivers (the HDS GD series) complete an ENG link that does not require licensing.

Circle (454) on Reply Card

**DA system, intercoms**
Up to 10 model 2510 cards plug into the System 2500 audio distribution amplifier for 1-in, 6-out capability. The RTS Systems unit is a 19-inch rack-mount card cage with power supplies. It features balanced input and outputs. Also from RTS Systems is a...
24-channel intercom system, which can accommodate up to 100 RTS model RMS324 rack-mount speaker stations. Each unit provides switching and amplifying with interconnection by 25-pair cable.

Another product group, the series 17 user stations, forms a low cost conference line intercom system. The single-channel units interconnect on a 3-wire system and are compatible with the RTS TW equipment. The HND17 handset, HST17 single earphone headset and HCA17 amplifier assembly complete the system.

Rack-mount timers
Chrontrol timers provide time-programmed control of up to 16 independent circuits used to operate devices such as tape or chart recorders, program switching, lights, sound distribution equipment, fans and compressors. They feature 40 optional programs.

Identifier unit
The Lang Video Systems VAX-700 automatic video/audio changeover/identifier is an electronic 2x1 switcher that incorporates an NTSC color bar generator and a character generator. Features include a visual indication plus a resettable audible alarm warning to the operator when a fault is sensed.

Vocal microphones
The Philips model 7401 dynamic cardioid microphone has an internal, locking on/off switch. It is available with a detachable cable in one of these variations: as the 7401E with XLR-XLR cable, 7401P with XLR-to-phone plug or the 7401T with XLR-to-H1-Z phone plug.

Audio accessory system
The 1100 series system from Audirronics provides housing for a wide variety of accessories and is constructed to mount in a standard 19-inch equipment rack. Currently available are the DA-6 and DA-6LC audio distribution amplifiers, each providing six balanced outputs from one balanced input. The DA-6LC features wide frequency response to allow for the passage of SMPTE and EBU time code.

Sound mixer

Broadcast cart machine
Telex's Magnecord MC-II comes in separate modules with the cart transport in one housing and the record electronics in another. The modules may be stacked for space savings. NAB and IEC equalization circuitry are featured.

Standby and LPTV antennas
The TRASAR® series antennas from Andrew Corporation are enclosed in a pressurized fiber glass radome for en-
environmental protection and low windload. The first antenna in the series is side-mounted with a skull azimuth pattern.

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TV color analyzer
Minolta's TV Color Analyzer II is a microcomputer-based unit featuring a chroma mode that shows chromaticity coordinates and luminance in candelas or foot-lamberts. Four white standard/reference color memory channels and four CRT-matrix-characteristic memory channels enable white-balance adjustment of a variety of monitors for different markets.

Circle (463) on Reply Card

Editor interface
From Industrial Sciences Inc. comes the 920, which features an operator-selectable editor control or a 3-digit thumbwheel switch. Controls are arranged in four independently controllable sections.

Circle (465) on Reply Card

Custom modular consoles
Finntek Ltd.'s SX series consoles feature 8, 10, 16, 24, 28 and 32 mainframes. The consoles may be customized for films, radio, television, multimedia and cable. The SX 8 and 10 are audio generation mixers.

Circle (469) on Reply Card

Floppy disc drives
The FD-55 series from TEAC Corporation of America are 5¼-inch disc drives with band drive positioning using a direct drive dc brushless spindle motor in one enclosure. The series includes single-sided and double-sided, single- and double-density drives in 48- and 96-track-per-inch configurations.

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Repair system
The Pace PRC-151 standard system performs the following functions: temperature-controlled desoldering; abrading, milling, drilling and grinding for general PCB repair; removal of conformal coatings; high strength reflow soldering; thermal wire stripping and resistance heating capability. The system also features zero power switching.

Circle (471) on Reply Card

Media management system
The AMI microcomputer-based system from Research Technology International features reservation programs integrated with an accounts receivable/general ledger package. Also standard are programs for advance booking, special order entry and invoicing.

Circle (472) on Reply Card

Electronic crossover
The Loft model 403-M is a mono, 2-way, 18dB per octave electronic crossover. The 19-inch rack-mount unit offers continuously variable crossover frequencies from 40Hz to 12kHz.

Circle (473) on Reply Card

VCR, videocassette
The JVC Company of America HR-C3U compact lightweight recorder is about 60% smaller than previous portable videocassette recorders from the company. It weighs 4.4 pounds without battery pack. Twenty minutes of continuous recording is possible. The TC-20 VHS videocassette is used with the HR-C3U recorder. The TC-20 is less than one-third the size of a regular VHS videocassette. However, the C-P1U adapter allows the TC-20 to be used in a regular VHS VCR.

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End-of-tape alarm

Robert Yankowitz
Chief engineer
WNYS-FM/WNBH-AM
New Bedford, MA

At WMYS, our automation runs unattended for a good part of the day. We have found that an end-of-tape alarm system helps avoid dead air, keeps the AM operator from making unnecessary trips to the automation, and makes sure that the music tapes run completely out before they are changed.

The circuit senses a tape-out condition by way of the 25Hz end-of-message tones. When a new tape arrives at the station, the WMYS production personnel process it (remove excess tape, add leader, etc.). As part of this processing they add a 10-second tone to the existing tone at the end of the last song. The end-of-tape circuit ignores the shorter EOM tones, but recognizes the long tone after the last song.

The unit installed in the automation works as follows. The tone sensors provide a normally high TTL level signal to the 7430, 8-input NAND gate. Under no-tone conditions (all inputs high), transistor Q1 is turned on, clamping pins 2 and 6 of the 555 to ground. This keeps the output of the 555 (pin 3) high. When a tone is sensed, the tone sensor output goes low and Q1 is turned off. With the clamp removed, the 555 becomes astable. Should the tone last long enough, the 555 output will go low, triggering the 7400 latch. If the tone is a normal EOM (2-4 seconds), Q1 will re-establish the clamp on pins 2 and 6, resetting the circuit. When the 7400 latch is set, Q2 is turned on, pulling in the relay and turning the "tape out" LED on.

The studio section uses a snooze-button-type circuit. When the relay contacts (from the automation unit) close, the tape out LED lights. A 555, set up as a monostable multivibrator, provides a normally grounded output, which allows the Sonalert to be activated. The operator can push his reset button, which sets the 555's output high for 42 seconds (in our case), turning off the Sonalert. At the end of the 42-second period, the alarm sounds again. The Sonalert is muted by the studio muting system. We have
found that this grace period is valuable to the AM operators, particularly if they are caught running a commercial cluster or otherwise cannot leave the studio. When they can, they will change the tape and press the reset button on the automation unit.

**Timer checks on automation**

By Ken Blake  
Chief engineer  
KJOY-AM/KJAX-FM, Stockton, CA

The appeal of an automated programming system is that most of the time it runs without people. The minimum number of people are involved in programming and production, and rarely is anyone assigned to monitor every function so that errors can be corrected immediately. We had to solve a problem that is experienced only by users of automation systems. The announcer on duty in our live AM operation is also responsible for loading the Ampex reproducers in the FM system. Many times the press of on-air duties causes a hurrying of tape loading calisthenics resulting in the malfunction for which the following solution was devised.

On the music reels, a 25Hz stop/transfer tone is recorded on only the left track following each selection. A hurried loading of the playback occasionally results in a half-twist of the tape as it comes from the supply reel. Two objectionable results are obtained; not only does the tape pass over the reproduce head upside down, causing a loss of high frequencies in the program being aired, but the 25Hz tone sails by undetected, because it passes over the right reproduce head. The tone is not fed to circuitry to use it for stopping at the end of selection and for starting the next event. The result is the airing of 90 minutes of continuous music from that reel without normal high frequency content and with no breaks for commercials or station IDs.

The automation system is not equipped to sense this extreme length of time consumed by one event as a malfunction. When the reel is finally empty, the system will silence-sense and start the events that are inserted by the pre-programmed memory causing to be aired in succession all the commercials, time signals and IDs that were missed during the previous 90 minutes of uninterrupted music. Depending upon commercial load, there could be at least 10 to 15 minutes of talk events in one continuous grouping.

The solution involves the use of the timer diagrammed in Figure 1. When
To the Chief Engineer, Communications Director or General Manager who is pondering the problem of expanding his video system's capabilities...

When you look at the incredible variety of state-of-the-art equipment out there it's no wonder the mind boggles when you try to marry the best hardware to your objectives.

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a pre-set time elapses without a transfer tone having been sensed, the warning light is turned on. The 250Ω pot provides a means to vary the time length over a 10-minute period. A red "bull's-eye" (illuminated by the #47 bulb) and the push-to-test switch were connected to the unit by cable and mounted on a front panel for maximum visibility. The test switch assures that the bulb is OK. At the start of the next event, it is extinguished, when a new timing countdown is started. The 24V relay on the timer is activated by the auto-pulse occurring in the Schafer 903 each time a function is started. As our longest separate event is the 5-minute network newscast, the time was set for approximately four minutes. This provides an automatic self-test for the timing cycle, as the light can be observed to come on before the news ends. At the close of the news segment, the auto-pulse should extinguish the light. If the light is on during a period that a music tape is being aired, one can refer to the log to find the starting time of the operating deck. If an unreasonable amount of time is indicated, then the tape that is playing is the culprit and correction can be made. Alternatively, after having been warned by the light, one can note whether the tape institutes a transfer operation at the end of the selection being played, because a single composition may require more than four minutes.

The unit, in operation for two years, uses an FET and other discrete components as shown. Alternate timing approaches are available.
Professional intercommunication and audio products with the advantage of innovative designs tailored to fit your everyday operations. TW INTERCOM SYSTEM Our high performance conference-line intercom allows an almost infinite variety of system configurations from a choice of over 30 individual components. Unique patented circuitry provides clear and clean two-way communication for up to 75 stations. The system is designed for teleproduction and broadcast applications as well as industrial and commercial installations. SERIES 800 Multi-function master stations designed to augment the TW Intercom System. Our Model 801 provides six conference-line intercom channels with separate talk and listen switches, four IFB/SA circuits, and many other features. The new, microprocessor assisted, Model 802 provides broad spectrum operational capabilities with front panel programming for varying production requirements. An impressive array of functions are available, including intercom, squawk, IFB/SA, station-iso, signaling, etc. SERIES 4000 IFB SYSTEM This program interrupt system is widely used to cue "ON-AIR" talent from up to four control stations, each with dedicated priority levels. A modular format allows for custom configuration and easy expansion for up to twelve IFB outputs. SYSTEM 2500 CARD CAGE AMPLIFIER SYSTEM Our high density packaging system allows for up to ten circuit cards in only 3½" of rack space. Initially available is the Model 2510 1 x 6 Audio Distribution Amplifier with fully balanced transformer outputs and top rated performance specifications. SERIES 1000 INTERCOM Our ten by ten dedicated line all master "squawk" system provides direct point-to-point voice communication, with tally between stations. SERIES 400 A versatile line of amplifiers designed to meet professional audio needs: Phono Preamp, Mic Preamp, Buffer Amp, 1 x 4 Audio DA, 1 x 6 Audio DA, and Monitor Amp. Each unit offers top performance in a low profile portable or rack mount package. HPM—41 MICROPHONE MIXER This is no ordinary mic mixer. It's a familiar looking package with extraordinary performance features, super spec's, and great sound. Equally impressive, our rugged, battery powered Model 1400 In-Line Microphone Preamplifier boosts any mic signal to line level.
**feedback**

Fight for freedom

I read and re-read "Broadcasting Freedom: The Battle Must be Won," in the June issue of BE. I can only say, "What a wonderful thing it must be to live and work in the United States." How I wish I had been born in this last bastion of freedom—rather than in the socialist hell that is quickly becoming the personification of Canada.

In July, our Canadian Radio—television and Telecommunications Commission (read: Thought Police) announced that it would hold hearings this month to see if a cultural pay-channel would be introduced on all our cable systems—the viewer would have to pay whether the service was wanted or not. Doubtless, an added feature of this horror will be its adaptability to watch the viewer, on behalf of our socialist government and its oppressive and repressive agencies.

For heaven's sake, please don't ever stop your fight to keep the United States free. Keep it a heaven of individual freedom and free enterprise, and don't (as we did here) let passivity and indifference allow it to become a collectivist hell, governed by, and at the whim of, socialist pseudo-intellectuals.

At 45, with 28 years in broadcasting, my only prayer is that someday soon, the United States will open its doors to all of us who would, in a moment, flee this socialist cancer to become productive and thankful citizens of a free country.

Bruce Anderson
Program manager
CHEX Television
Peterborough, Ontario
Canada

---

**AM stereo/ local programming**

The July issue editorial, "AM Stereo: A Shot in the Arm," expressed something that I have long felt. In fact, at the recent Ohio State University WOSU Broadcast Engineers Seminar, I discussed this topic at length with speakers and attendees.

One session concerned broadcast audio, but the discussion centered on AM stereo. My point was that arguing over improving the technology was putting the cart before the horse. Without improving program content, an improved signal will be form without substance, and a farce.

Before AM stereo becomes the hot thing, I agree with BE, we should see an improvement in receivers, education of the public about what they should look for in a good receiver, and a drastic change in the quality of broadcast programming. As the NAB Radio Code states: "Radio is a creative medium and is always striving for improved and repressive agencies."

Without improving program content, over improving the technology was audio, but the discussion centered on AM stereo. My point was that arguing over improving the technology was putting the cart before the horse. Without improving program content, an improved signal will be form without substance, and a farce.

Before AM stereo becomes the hot thing, I agree with BE, we should see an improvement in receivers, education of the public about what they should look for in a good receiver, and a drastic change in the quality of broadcast programming. As the NAB Radio Code states: "Radio is a creative medium and is always striving for improved and repressive agencies."

However, radio can also be an intimate medium for production of local events. Think of this...for the cost of a single ENG van for television, a radio station could put an arm of engineer/producers in the field to cover local events. However, no one has come up with a portable audio mixer/recorder. Although I can go to my local cable access channel and take out a decent quality portable video.
Industry leading technical performance. For example, maximum audio output is +30dBm without requiring transformers and noise is over 105dB below maximum output.

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Closely following the MRC-2 in performance, Moseley's MRC-1 is the leading Microprocessor Control System in the industry today. Up to 64 command outputs at each of up to nine remote terminals gives the user outstanding system flexibility. System setup is tailored by the individual user. Telemetry channels may be keyboard-calibrated for linear, indirect power, or direct power scaling. The MRC-1 features modular design, upper and lower telemetry limits, automatic telemetry muting; and a set of 32 LEDs that display all status inputs from any site simultaneously. In case of extended shutdown, the Moseley Memory Option stores setup data for up to ten years. Optional CRT and Logging terminals simplify operator interface with the MRC-1. The Multiple Direct Command options offers ten preselected command functions to give the operator quick control of critical parameters at any site.

For further information please contact our Marketing Department.

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Closely following the MRC-2 in performance, Moseley's MRC-1 is the leading Microprocessor Control System in the industry today. Up to 64 command outputs at each of up to nine remote terminals gives the user outstanding system flexibility. System setup is tailored by the individual user. Telemetry channels may be keyboard-calibrated for linear, indirect power, or direct power scaling. The MRC-1 features modular design, upper and lower telemetry limits, automatic telemetry muting; and a set of 32 LEDs that display all status inputs from any site simultaneously. In case of extended shutdown, the Moseley Memory Option stores setup data for up to ten years. Optional CRT and Logging terminals simplify operator interface with the MRC-1. The Multiple Direct Command options offers ten preselected command functions to give the operator quick control of critical parameters at any site.

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111 Castilian Drive Goleta, California 93117
(805) 968-9621 Telex: 658-448 Cable: MOSELEY

You seem to be correct in stating that there is no portable audio mixer/ recorder combo unit available that uses reel-to-reel recording and offers six inputs. In fact, the reel-to-reel portable recorder format has not been particularly popular because of its size. Such a machine does exist, however, with limited inputs. The well-known Nagra recording system, originally developed for the Hillary and Norgay conquest of Mount Everest (1953), is widely used for remote recording in film-making. Sony and Stellavox also market portable reel-to-reel machines. Line and mic inputs are provided. One Stellavox system offers phantom mic powering. A wide variety of battery-powered audio mixers are available from Audio Developments, EELA Audio, Electro-
Voice, HME Electronics, Interface Electronics, Logitek, Micro-Trak, Neve, Panasonic/RAMSA, Ramko, RTS Systems, Russco, SATT Electronics, Sennheiser, Shure, Sony, Stellavox and Studer, among others. Mixers from these companies, all available through Studer, among others. Mixers from

- Panasonic/RAMSA
- Ramko
- RTS Electronics
- Logitek
- Micro-Trak
- Neve
- Voice
- HME Electronics
- Manhattan, KS.

Brinkley/KFKB

I am seeking information from your readers about the two attempts to win the Kansas governorship in 1930 and 1932 by the late Dr. John R. Brinkley, then of Milford, KS, which is west of Manhattan, KS. He entered late in 1930 as an Independent write-in candidate. In 1932, he was listed on the ballot as an Independent and he ran a strong race. He used his radio station (KFKB, Milford) talent, a truck wired for sound with a microphone, and a speaker's platform. (KFKB was referred to as Kansas First, Kansas Best.)

Francis W. Schruben
Professor of history
Pierce College

Kenneth Davis, in his book, Kansas--A Bicentennial History (W. W. Norton, New York, 1978), records that Brinkley was a quack doctor who turned to politics and was strongly opposed by the Kansas City Star. As noted, he founded the second broadcast station in Kansas and used its communications power extensively. Readers interested in history and broadcasting may write to Professor Schruben at 6201 Winnetka Ave., Woodland Hills, CA 91371.

The first station

For many years now, I have heard remarks at technical gatherings and have seen articles in technical publications about radio station KDKA, Pittsburgh, being the first station. In the past I have ignored the statements, but I must be getting crotchety in my old age because I want to see justice done.

Continued on page 259
A New FM Transmitter with a Big Difference!

The new 695T3.5KW provides a full 3.5 KW from a single grounded grid triode. But to really see The Difference look at that control panel.

- ATS built-in
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- Dial-a-point diagnostics
- Visual indicators that give total status at a glance

QEI has put together their expertise in FM measurements, RF power and Automatic Transmission Systems to provide the first really new 3.5KW FM transmitter in over a decade. This time different means better!!

For more information, write, or call.... Bill Hoelzel, QEI Corporation, Route 73, Kresson, NJ 08053...609-767-8052. Telex 4761088 (International)

This device has not been approved by the FCC and is not offered for sale or lease, or sold or leased until the approval has been obtained.

John M. Sherman, director of engineering for WCCO, Minneapolis/St. Paul, from 1952 until his retirement in 1974, died recently after a lengthy illness. Before joining WCCO in 1936, Sherman was a field engineer for the Federal Radio Commission, later to become the FCC. He became district inspector-in-charge and remained with the FCC until 1936. Sherman received the Distinguished Service Award from the NAB in 1971.

Finntek Ltd. has announced the appointment of John W. Welland as president and director of engineering. Welland has formerly been associated with Spectra Computer Systems, Quanta Corporation and Convergence Corporation.

Jack Niebell has joined Dynair Electronics as vice president, engineering. He takes over this position from Hank Maynard, who has been promoted to vice president of operations. Niebell was previously with the 3M Company, where he held managerial positions in engineering and quality assurance since 1964.

Daniel D. Roberts has been named vice president of the Professional Video Division, US JVC Corporation. Roberts, who has been division manager since 1981, will continue to direct product development and marketing in addition to expanded administrative responsibilities.

Fred Zimmermann has been named president of Moseley Associates. Zimmermann joined the company in 1968 and, before being appointed vice president and general manager earlier this year, was vice president of customer services. The company also appointed Kinsley Jones as manager, US sales, and Harry Wareham as operations manager. Jones and his staff will be responsible for non-OEM sales. Wareham brings to the company more than 20 years of manufacturing and operations experience. He will work in the Goleta, CA, facility and be responsible for material control, fabrication, assembly and final testing.

Francois Olibet has been named president of Videodial, the US subsidiary of Telesystemes. Olibet was most recently director of the technical and business marketing department.

Rodney K. Madsen has joined Cetec Corporation as a corporate vice president. He accepted the Cetec position after two years as president of Gary Safe Company, and 14 years in engineering and management positions with Emerson Electric Company.

Donald F. Bogue has been appointed director of business management for Ampex Corporation's Magnetic Tape Division. Bogue will have responsibility for audio, video and instrumentation tape marketing and product line strategy, and for strengthening the business management of the company's magnetic tape business worldwide.

McMartin Industries has announced the appointment of Richard Moen as general sales manager. Moen will also continue his former responsibilities as Eastern regional sales manager. Other appointments include the following: Terry Sheffield, Western regional sales manager; Don Jones, Southern regional sales manager; and Don Denver, Central regional sales manager.
Broadcast TV filters
A 16-page catalog, BT/82, from Microwave Filter International Ltd., features filters, traps and channel combiners designed to eliminate interference in broadcast TV systems and to combine several transmitters into one antenna.

Circle (484) on Reply Card

Microminiature package
Signetics Corporation's new brochure, SO Microminiature Packages, details technical information and broad product availability of its Small Outline package. The brochure catalogs about 200 available products in the small packaging in three major lines: TTL Logic, Linear and LOCMOS 4000 series. Comparisons of the SO package to the standard DIP are included.

Circle (485) on Reply Card

TV resolution specs
A technical note from the Visual Information Institute, The Reality of TV Resolution Specifications, discusses vertical and horizontal resolution in displays, cameras and video processing equipment. Photographs, charts, graphs and schematics help illustrate the discussion.

Circle (486) on Reply Card

A High Quality
10 x 1 Self Contained
Broadcast Routing Switcher

• Video only, mono or stereo audio only, or AFV with mono or stereo audio
• Local or remote control
• Front panel access to plug-in modules in single rack unit
• All electronic switching
• Tally and automation interface available
• Bridging inputs
• Exceeds broadcast specs requirements $1,200 for AFV.

GET THE EDGE ON PERFORMANCE, RELIABILITY AND PRICE. CALL OR WRITE FOR MORE INFORMATION ON THE 6010.

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MAGNECORD
MC-II
Compare Quality at this Price

- Meets or exceeds NAB standards, with IEC equalization on request.
- DC servo, flutter-filter drive runs true regardless of line voltage fluctuation.
- Cool operation; no ventilation required.
- Full remote capability.
- Long life heads and phase locked tape guides.
- Mono or stereo play models field convertible to record.
- Automation cue tones (stop, secondary, tertiary) with LED's and external switching contacts.
- Cue track access for FSK logging.
- Universal mic/line input.
- Immune to RFI and EMI.
- Rugged design in the Magnecord tradition —made in USA.

*Suggested Pro Net Price

Quality Products for the Audio Professional

Circle (220) on Reply Card

September 1982
Broadcast Engineering
THE PESCHEL AUTOMATIC VOLTAGE REGULATOR USING THE PESCHEL VARIABLE TRANSFORMER FEATURES:

- No Wave Form Distortion
- No Phase Shift
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- Very Low Internal Impedance
- Small Lightweight Design
- Extremely Reliable
- No Ferro-Resonant Core
- No Oil Cooling
- No Forced Air Cooling
- No Impedance Changing
- No SCR's

STOP GROUND-LOOP HUM!

VIDEO HUM STOP COIL...HSC 1
Will ELIMINATE HUM and other INTERFERENCE in Video Lines caused by differences in Ground Potential.

- For Color and Black and White.
- FLAT-OC to 6.5 MHZ
- No Low-Freq. or Hi-Freq. Roll-off.
- No Differential Phase Distortion.
- No Differential Gain Distortion.
- No Envelope Delay.
- Passive Device - Failure Free-Low Price.
- Small Compact Package 4" x 4" x 2 1/4".

ELIMINATES HUM AND INTERFERENCE:

IN STUDIO
- Between Buildings
- On long runs in Buildings
- Between Studio and Transmitter
- On incoming Telco circuits
- On outgoing Telco circuits

IN FIELD
- Betw. Remote Truck and Telco
- Betw. Remote Truck and Microwave
- For Intertruck Hookup
- For VTR Units
- For Monitoring Lines

Power meter calibrator
A 12-page brochure from Weinschel Engineering describes the System II automatic power meter calibrator. The brochure presents a full introduction of automatic calibration of RF power meter/mount combinations operating in the 0.01 to 18 GHz range. Every unit of the system is described, and a block diagram of the system is presented.

Home satellites
The Home Satellite TV Book: How to Put The World in Your Backyard, by Anthony T. Easton, is a guide to buying, building and operating for profit your own home satellite TV receiving station. The book shows how to put together a receiving system for your home and how to operate it; where to buy equipment and what to look for; and what's up there on the "bird"—all in non-technical terms.

MROs
The Beckman Electronic Technologies 1982 MRO Short Form Catalog lists all standard electronic components and test instruments for MRO dealers. It features pictures, descriptions and specifications of the following component and test instruments: cermet trimming potentiometers, precision potentiometers, turns-counting dials, liquid crystal displays, planar gas discharge, thick film
resistor networks, thin film resistor networks and digital multimeters.
Circle (488) on Reply Card

**High power amp**

In a 14-page brochure, Varian Associates describes its Generation II VZJ-2700G series klystron high power amplifiers (KPAs). The literature discusses the major functional sections of the GEN II KPA, including the power supply, RF assembly and the controls/monitors/logic section. In addition to a complete list of specifications, the brochure describes optional features, such as the computer interface card, which provides unattended computer control of the GEN II KPA.
Circle (489) on Reply Card

**Spectrum analyzer**

A 52-page technical brochure on its network/spectrum analyzer, model MS420A for audio, video and HF bands, is available from Anritsu America. In addition to general background and conclusion information, the literature includes data on basic measurement functions and measurement examples, personal test automation, bubble memory, GP-IB and application examples. Diagrams, charts and tables are contained in the material.
Circle (490) on Reply Card

**Fiber-optic graphics**

Artel Communications Corporation has produced a technical bulletin that describes the LS-100 fiber-optic computer graphics modem. This 3-color bulletin shows how fiber-optics are used to directly interconnect IBM 3250 graphics display control units over long distances with total noise immunity. The bulletin also shows how fiber-optics increases work station separation, enhances communications security and eliminates noise and grounding problems. System block diagram details plug compatible coaxial-to-fiber modem interconnection, showing location of IBM 3250 and IBM 3255 control units. The bulletin also lists modem features such as remote loopback testing and online optical power level readings.
Circle (491) on Reply Card

**Test instruments**

The 48-page BK-83 full-line test instrument catalog from the B&K-Precision Product Group of Dynascan Corporation describes oscilloscopes, signature analyzers, logic analyzers, lab-power supplies, DMMs, analog multimeters, digital logic and pulser probes, a temperature probe, a semiconductor curve tracer and accessory items. Product descriptions include detailed specification sections and suggested popular applications.
Circle (492) on Reply Card

**Cables and connectors**

Belden Corporation's Electronic Division has published an illustrated 28-page flat cable and connector systems catalog. Construction details, such as physical specifications and electrical characteristics, are provided for each cable and connector in conventional and metric units. The catalog indicates compliance with applicable UL, CSA and related requirements.
Circle (493) on Reply Card

**Additional Information**

- **Audio Aids** from VIDEO AIDS
- **PARTY LINE SYSTEM**
  - PLS-1...$100
  - PL-1...$55
  - PL-1BC...$68
  Our popular intercom system features individual volume controls, small cabinet for mounting near camera, or... unique active hybrid circuitry connects into most systems' headphone jack. No modifications or access to back panel of outside system required.

- **PARTY LINE COUPLER**
  - PLC-1...$100
  Extends camera/CCU intercom systems by coupling into VAC's popular Party Line Systems. Unique active hybrid circuitry connects into most systems' headphone jack. No modifications or access to back panel of outside system required.

- **STEREO HEADPHONE AMP**
  - HA-1X...$139
  Program audio where and when you need it. Amplifies low level stereo tuner to loud listening levels with 30 db maximum gain. Works with headphone impedances of 8 to 2000 ohms.

VIDEO AIDS OF COLORADO • 1930 Central Avenue • Boulder, CO 80301 • (303) 443-4950
Circle (222) on Reply Card

September 1982  Broadcast Engineering  257
The AMPFET 1, 5 and 10 Series of totally solid state medium wave broadcast transmitters.

- 74% OVERALL EFFICIENCY
- 100% SOLID STATE
- POWER FET PA's AND MODULATORS
- SWITCHING MODE PA's AND MODULATORS
- 10% RESERVE POWER CAPABILITY
- 125% POSITIVE PEAK CAPABILITY
- DUAL OSCILLATORS AND RF DRIVE
- DUAL AUDIO AND MODULATOR DRIVE
- FAILURE RESERVE FEATURES

audiomedia associates
P.O. Box 29264
New Orleans, La 70189
(504) 586-0140

Oscilloscope primer

The XYZs of Using a Scope is the title of a new primer on oscilloscope technology from Tektronix. The 36-page primer is divided into two parts. Part I includes chapters 1-5, covering scopes, controls and probes; Part II includes chapters 6-10, covering techniques of measurements with scopes.


Figures include 34 graphics and scope traces. One of these graphics is reproduced here to illustrate the type of graphic and caption included to communicate scope usage.

Figure 11.
TRIGGER HOLDOFF TIME ensures valid triggering. In the drawing only the labeled points after the display line reach the trigger — all others are ignored during the sweep or the retrace and holdoff period. The retrace and holdoff times are necessary because the electron beam must return to the left side of the screen after the sweep, and because the sweep generator needs reset time. The CRT Z axis is blanked between sweeps and unblanked during sweeps.

If you would like a free copy of this Tektronix scope primer, circle 494 on the reader service card, and we’ll pass your request along to Tektronix.

SAVE TIME

For fast, accurate service, please remove the Peel-Off Label (which is used to address your magazine) and affix it to the Reader Service Card, the Address Change Card, or to any correspondence you send us regarding your subscription.
Feedback
Continued from page 253

In an article by Mike Palmer on audio switching systems in your March 1982 issue it is stated, "The first station, KDKA of Pittsburgh, began broadcasting in late 1920." The statement is wrong because KDKA is not the first station. It was the first station to receive a license from the FCC, not the first station. It was the first station, KDKA of Pittsburgh, began broadcasting in late 1920." The statement is wrong because KDKA is not the first station, KDKA of Pittsburgh, began broadcasting in late 1920."

The first station, KDKA of Pittsburgh, began broadcasting in late 1920."

Continued from page 253
the first station to be licensed under the federal regulations in 1920. The regulations required the licensing of the stations by the federal government, and KDKA acquired the first federal license issued by the Dept. of Commerce. That is its claim to fame. But, as to which station actually was the first to go on the air and broadcast, it was Herrold's station in San Jose, CA (now KCBS, San Francisco), which was on the air so early there were no regulations to govern it."

Also, the then US Senator Thomas Kuchel, on March 20, 1959, entered into The Congressional Record a treatise supporting KCBS' claim as the first in the nation.

In 1968, KCBS became the first all-news station in Northern California. In 1973, the station was honored with the Golden Mike Award of the Broadcast Pioneers.

In November of 1976, the Native Sons of the Golden West presented KCBS with a bronze plaque honoring it as a Historical Landmark in California history.

Howie Immekus
Director of Technical and Broadcast Operations
KCBS
San Francisco, CA

Developing An Industry Standard
Quantum Audio Labs' newly designed concept of cost effectiveness within a modular broadcast production/on-air console now offers sophisticated simplicity, along with excelled engineering design.

If you've heard it on radio/TV, you've probably heard it through Quantum.

Please send me further details and full technical specifications

Name ____________________________ Position ____________________________
Studio/Company ____________________________
Address ____________________________
Phone ____________________________

Each year at the NAB convention we select a photo or two for our readers to caption—all for fun, of course. Here are this year's entries. Readers can mail their humorous captions to the Humor Editor, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. We'll select the most humorous captions from the entries, publish them in a future issue, and award something interesting to the winning contestants. (For last year's winner, see our March issue, page 18.)
The Sound Technology 1710A Professional Distortion Measurement System has established itself as the industry standard of the professional audio market.

Why?

The Sound Technology 1710A combines a pure sine wave generator, a high resolution total harmonic distortion analyzer, an accurate AC level meter and an intermodulation distortion analyzer in one instrument.

The Ultra Low Distortion oscillator outputs a pure sine wave signal from 10 Hz to 110 kHz with the output level being adjustable from +26 dBm down to -89.9 dBm in 0.1 dBm steps. That is a clean signal even at 24.8 µV.

Completely floating and balanced signal source circuits in the 1710 allow you to drive virtually any circuit - whether balanced, unbalanced, off ground, or whatever, with no loss of level and no ground loops.

RF Shielding built into and around the 1710 makes it immune to RFI. Referring to the 1710's 10 volt/meter RF rejection, one engineer labeled it 'Bulletproof'.

Nulling is automatic; punch up your test frequency and the 1710 simultaneously nulls the fundamental frequency.

Selectable RMS, Average and Peak responding meter circuits allow you to measure to accepted standards quickly.

With the 1710 you can measure THD down to .002% in less than five seconds, IMD down to .001%, Voltage from 100 µV to 100 V full scale, measure Power in dBm and measure 100 dB Signal-to-Noise ratios.

Push a button and reject hum and high frequency noise with the built in 18 dB/octave filters (400 Hz, 30 kHz and 80 kHz). Flip a switch to select either a 150 or 600 ohm source impedance. Terminate the output signal for fast S/N measurements with the push of a button. To check the 1710's output level, punch in the analyzer select button; it throws the output signal right into the analyzer, no cable switching, fast and easy.

See for yourself why the Sound Technology 1710A is the standard for the Audio Professional. Contact us for full information and the name of your factory representative.

SOUND TECHNOLOGY
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CAMPBELL, CALIFORNIA 95008
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Circle (243) on Reply Card

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BROADCAST ENGINEERING
263

September 1982
HELP WANTED

TELEMATION PRODUCTIONS Unit 4 is in need of a
Remote Maintenance Engineer with experience in
Ikegami cameras, Ampex & Sony 1" tape, Chyron,
Ross & Utah switching, and more. Must be a self-
starter. Contact: John Gebhard, Chief Engineer,
Teleimation Productions, 3210 W. Westlake Avenue,
Glencoe, Illinois 60025. 312/729-5215.

TELEMATION PRODUCTIONS, a full service produc-
tion company with offices in Chicago, Denver, and
Seattle needs an experienced Maintenance Engineer
at our Chicago facility. Equipment includes Ampex &
Sony VTR's, RCA & Ikegami cameras, Ampex ADO,
Vital, Squeezecon, Computer Editing, Vital & Ross
switching, and much more. Interested persons should
contact: John Gebhard, Chief Engineer, Teleimation
Productions, 3210 W. Westlake Avenue, Glencoe, Il-
inois 60025. 312/729-5215.

ENGINEERING POSITIONS
($15,000.00 - $60,000.00)

We specialize in the placement of TECHNICAL ENGINEERS with TV Stations, Groups, Networks, Satellite Programmers, Production Facilities, Corporate and Industrial TV, Mfrs and CATV. All levels and positions: Director, Chief, Asst. Chief, Studio Supervisor, Maintenance and Technical. (Our service does not include operational or program personnel). All locations nationwide. Employers pay all fees - Confidential, Professional. Over $4,000,000.00 in Salaried Positions Placed. Employe and Employer inquiries invited.

Phone/Resume - ALAN KORNISH (717) 287-9635

Key Systems
106 New Bridge Center-Kingston, Pa. 18704


3 OPPORTUNITY—FUTURE GROWTH: AGGRESSIVE MANUFACTURING COMPANY is seeking an experienced salesperson in the telecommunications in-
dustry. Our product line includes Simplisat, the most advanced multi-antenna line in the country today. Excellent salary and benefits package. Send resume to: Lord Sonner, Antenna Technology Corporation, 1042 East Camelback Road, Phoenix, Arizona 85014.

WNEV.TV IS SEEKING ENGINEERING PROFESSIONALS. ENGINEERING SUPERVISORS: Must be progressive manager and have knowledge of state-of-the-art ENG operations. Supervisory experience necessary. MAINTENANCE TECHNICIAN: For new ½ inch component format ENG/EFP maintenance experience desired. Send resume to WNEV-TV, 7 Bullfinch Place, Boston, MA 02114. An Equal Opportunity Employer.

STATE-OF-THE-ART AOR FM Radio engineer wanted to maintain new FM. Seeking engineer who demands best signal in town from his equipment! Hands on maintenance. Mature experienced engineers en-
couraged. Top Salary. Dept. 571, Broadcast Engineer-
ing, P.O. Box 12901, Overland Park, KS 66212.

HELP WANTED (CONT.)

ASSISTANT TO THE CHIEF ENGINEER—Telecommunications Division needs Assistant to the Chief Engineer with FCC 1st or General license. SBE classification a plus. Work with state-of-the-art radio, TV and satellite facility at West Windsor, N.J. campus, including public radio station WWFM, Mercer County Community College cable TV network, closed circuit TV and radio/TV academic programs. Requires maintenance and construction experience in radio and/or TV, BA or AA degree desirable. Salary depend-
tent upon experience. Excellent fringe benefits. Re-
spond with resume to: MERCER COUNTY COMMUNI-
TY COLLEGE, Personnel Services, Dept. GS, P.O. Box
B, Trenton, N.J. 08690. Equal Opportunity Employer M/F.

CMX 340X CERTIFIED EDITOR, 22 years creative videofilm experience. NBC, ABC, NASA. Brochure available from Don Canaan, 7295 Oakland Mills Road, Columbia, Maryland 21046.

CORPORATE VIDEO STUDIO TECHNICIAN. Major Northeast corporation seeks video technician to main-
tain fully equipped corporate T.V. studio. Must under-
stand Ikegami camera electronics and be able to repair Sony 1/2 inch recorders. Starting salary $18,000 or more depending on qualifications and experience. Excellent company benefits. Send resume of qualifi-
cations and salary requirements to American Can Company, American Lane, Greenwich, CT 06830. ATTN: W.F. Panza. An equal opportunity/affirmative action employer. M/F.

SYSTEM DESIGN ENGINEER—CCTV. Must be able to specify, design, supervise installation and de-bug top quality industrial and personal CCTV systems. Experience required. SYSTEM ENGINEER—AUDIO VISUAL and PROFES-
SIONAL AUDIO Hands on experience with audio/visual equipment a must. Digital knowledge helpful but not required. Responsibilities include complete job oversee and client interface. Both positions pro-
vide paid health, life insurance, vacation, etc. Please call collect 201-288-6130, Stylist Systems, Teterboro, N.J.

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Stamford, Connecticut 06904

An Equal Opportunity Employer m/f

A major U.S. manufacturer of audio broadcast equipment requires representatives for the New York and Los Angeles areas. Candidates must have solid experience in broadcast equipment sales, be self-
motivated and willing to spend some time on the road. Salary, expenses, and commission plus company benefits furnished.

Please reply in confidence.

September 1982 Broadcast Engineering 265
**HELP WANTED (CONT.)**

**CHIEF ENGINEER**  
**BOSTON FM/AM**  
WHUE has an opportunity for an experienced person with strong audio and transmitter background to take charge of technical operations of its Class B 50 kw FM and 5kw-D2 AM Beautiful Music stations. This is a "hands-on" position with plenty of opportunity and many exciting possibilities. If you can keep us the best sounding stations in Boston, you will receive strong management support, an excellent compensation package and the kind of atmosphere you need to do the job to your satisfaction.

Send resume, references, salary history, or call A. M. Tanger, President, during business hours at (617) 267-0123.

WHUE
200 Claremont Street
Boston, Massachusetts 02116
Equal Opportunity Employer

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**HELP WANTED (CONT.)**

**SOUTHEAST MICHIGAN AM-FM is seeking an assistant chief. Applicant must have a minimum of two years technical school plus three years of experience and valid FCC license, this certification a plus. EOE. Send resume & references to: Dept. 570, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212.**

**ELECTRONICS ENGINEER—NATIONAL PUBLIC RADIO** seeks electronics maintenance engineers with 3 years experience in servicing audio equipment. Selected applicants will be trained in the maintenance of our broadcast facilities. Opportunity for growth and experience. General or FCC 1st Class Radio-Telephone Operators License desirable. Excellent benefits—Salary negotiable. Send resumes and salary history to: National Public Radio, Personnel 2025 M Street, N.W., Washington, D.C. 20036. 9-82-11

**"HANDS-ON" CHIEF ENGINEER—Maintain transmission system (baseband processing, microwave, UHF TV transmitters, translator) in accord with FCC regulations and perform other duties required under Part 73.561. Some strong equipment maintenance. Participate in planning and construction of expanded production and master control facilities. Position requires a minimum of one year employment in operating, maintaining and repairing broadcast equipment including at least one year at a UHF facility. Experience with UHF transmitters essential. Some management experience preferred. Excellent growth and advancement opportunity. Contact: H. D. Lung, V.P., Resources Center, State University College, Oneonta, N.Y. 13820. An equal opportunity employer. 9-82-21

**PRODUCTION DIRECTOR:** With 3 to 5 years experience in television production facilities, offering best of all worlds for hard working, person interested in Opportunity and Development. Must have excellent systems knowledge, management ability, foresight, and a practical approach. Hands-on required. Location, climate and benefits are a big plus. Contact: Tom Bradford, Engineering Manager, WOWO, 1758, Des Moines, Iowa 50305. EOE M/F.

**ENGINEER:** TELEVISION MAINTENANCE for college CCTV and broadcast quality production facility. Requirements: B.S.E. or equivalent, 4-6 years experience. Send resume to Personnel Department, Rochester Institute of Technology, One Lomb Memorial Drive, P.O. Box 9867, Rochester, New York 14623. Equal Opportunity Employer. 9-82-21

**ASSISTANT CHIEF ENGINEER—Major Market. We are currently seeking a talented individual with a strong maintenance and supervisory background. We offer an excellent salary, good benefits, and room for advancement. Send resume to Earle Connors, Chief Engineer, WDSU-TV, 520 Royal Street, New Orleans, LA 70130.**

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**TELEVISION - SALES**

**TECHNICAL SALES REP:** A dynamic individual with T.V. Engineering and/or Production Experience and Sales Experience in the Southern California market area to join a success oriented SALES TEAM. Attractive salary, benefits and commission program. Send resume and salary history to: Dept. 572, Broadcast Engineering, P.O. Box 12601, Overland Park, Kansas 66212.

---

**HELP WANTED**

**BROADCAST GROUP SEEKING ENGINEER for AM and FM stations located in Central upstate New York. Applicant should be familiar with both A.F. and high power R.F. circuits. Should have first Class General License, broadcast experience and references. Respond to Rust Communications Group, Inc., P.O. Box 1371, Leesburg, Va. 22075. An Equal Opportunity Employer. 9-82-11


**TV ENGINEER: NEEDED FOR MAJOR UNIVERSITY production service. Responsible for the operation and maintenance of state-of-the-art broadcast quality equipment in new Telecommunications Center. Requires 2-year degree in electronics and at least two years relevant experience. Salary competitive, excellent fringe benefits. For complete job description write to: Marshall E. Allen, Educational Television Services, Oklahoma State University, Stillwater, Oklahoma 74079.**

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**POSITION WANTED**

**BROADCAST ENGINEERING GRADUATE with F.C.C. License seeks entry level position. Joe Donato, Box 20113, Phila., PA 19145, (215) 389-4367. 8-82-2

**HIGHLY MOTIVATED, SELF STARTER with FCC 2nd ticket seeks entry level operations position. Steve Thompson, 112 East St., Excelsior Springs, Mo. 64024, 816-637-8685 evenings. 9-81-11

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**REQUEST FOR PROPOSAL**

**Research/Design of New FM Broadcast Antenna**

KSOR-FM is soliciting proposals from firms experienced in research, design and construction in 88-108 MHz FM broadcast transmitting antennas. For specifications write: Ronald Kramer, KSOR Radio 1250 Siskiyou Blvd. Ashland, OR 97520

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**ASST. ENGINEERING MANAGER:** Group-owned television station, offering best of all worlds for hard-working, person interested in Opportunity and Development. Must have excellent systems knowledge, management ability, foresight, and a practical approach. Hands-on required. Location, climate and benefits are a big plus. Contact: Tom Bradford, Cosmos Broadcasting Corp (Will-TV), P.O. Box 367, Collepoppo, S.C. 29002, 803-799-1010. An Equal Opportunity Employer. 9-82-21

**TECHNICAL SUPERVISOR, 50K, AM DA. Looking for super tech, strong transmitter background, minimum 3 years broadcast maintenance experience. Must be self-starter, familiar with antenna, audio, and data systems. Good state-of-the-art digital equipment. Need first, 2nd, or General FCC License. Send detailed resume/history to Eric Culp, Engineering Manager, WOWO, 203 West Wayne Street, Fort Wayne, Ind. 46802. No calls. EOE. 9-82-11

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**Your 'equipment for sale' ad gets quick results. Advertise in Broadcast Engineering classifieds.**
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