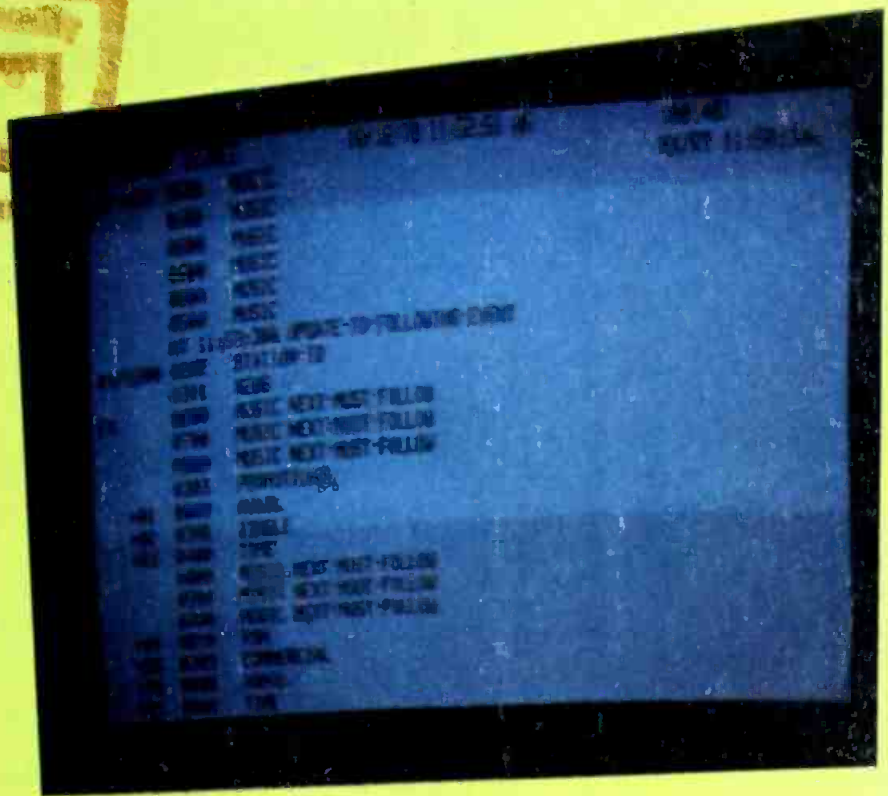
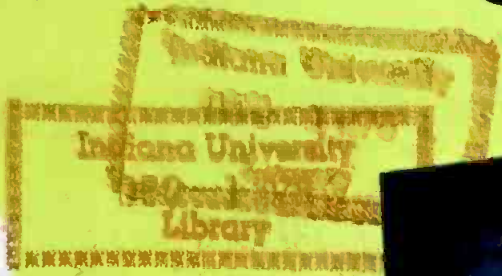


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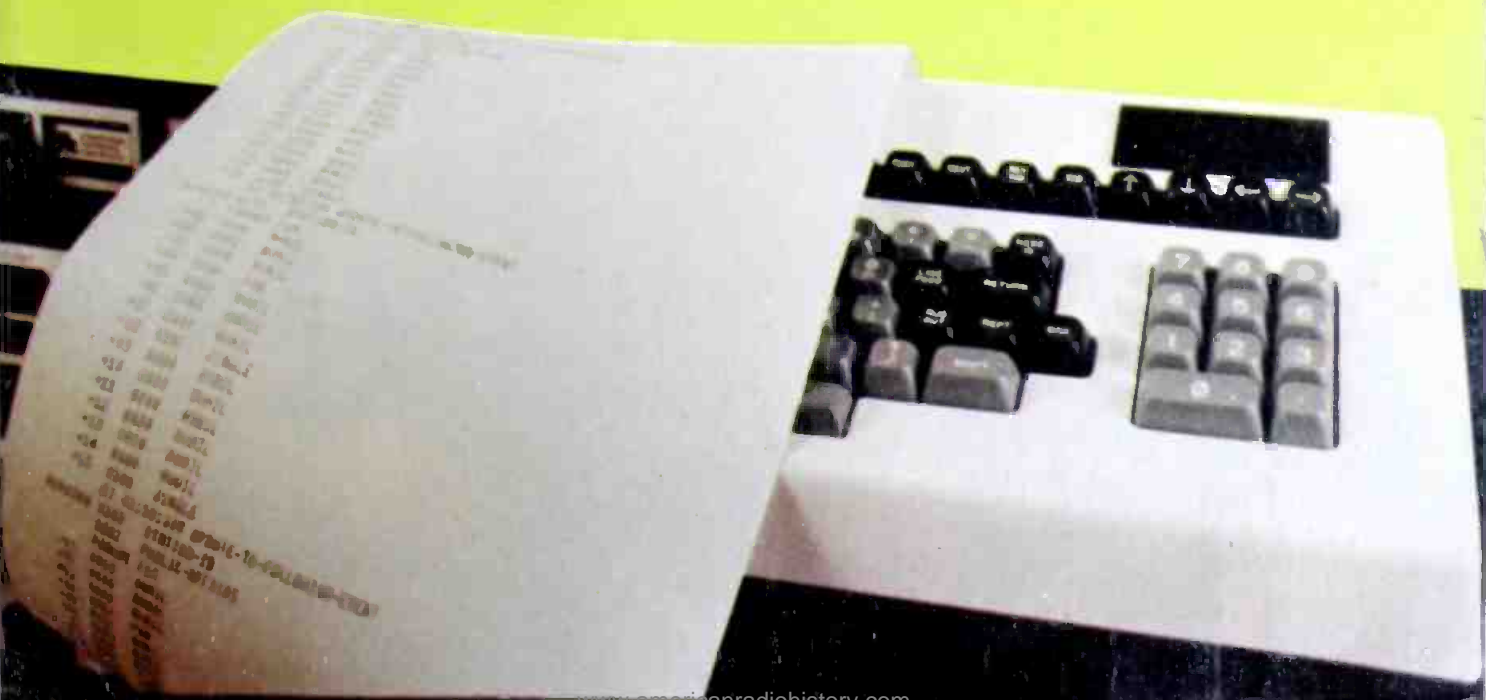
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Analysis

Radio Automation



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BROADCAST[®] engineering

The journal of the broadcast-communications industry

November, 1978 □ Volume 20 □ No. 11

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36 1978 Overview of radio automation

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38 Automation: Designing a new controller

Nick Solberg and Charles Minzel of IGM/NTI in Bellingham, WA discuss the design program of BASIC A, an English language programming control/switcher.

60 Automation at NRBA

The NRBA convention in San Francisco featured many new radio automation products and ideas. Coverage will continue in the December Issue.

62 Synchronous detection beats quadrature distortion in demodulator

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84 Using a pulse-cross monitor to check blanking parameters

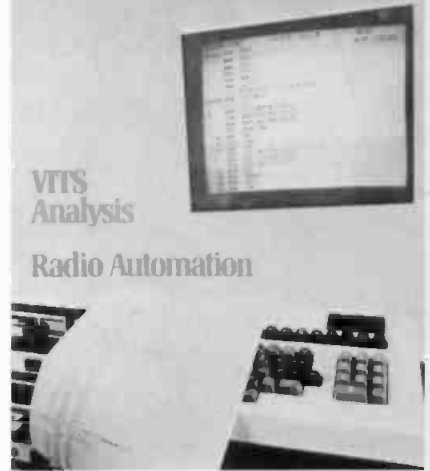
By Wray Dudley, engineer, WWBT-TV, Richmond, VA

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BROADCAST[®] engineering



THE COVER

Two important components of an automation system for broadcasting, the input keyboard and the CRT monitor, are depicted. Draped across the keyboard is a typical hard copy printout of the status of the system. The photographs are courtesy of Ann, Northwest Photographics in Eugene, OR and station KUGN, also in Eugene, OR.

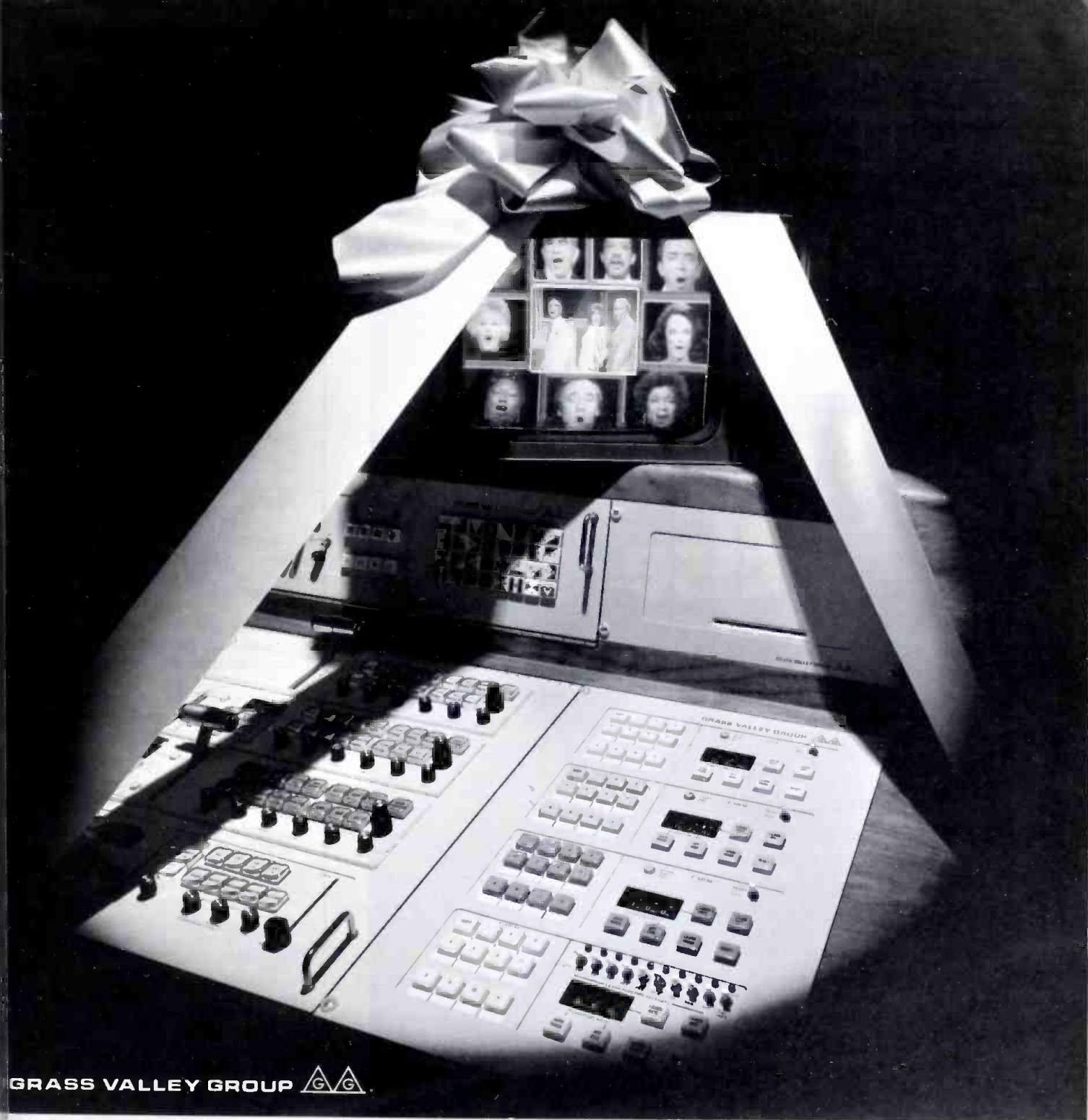
Coverage of automation in radio begins on page 36 and will continue in the December issue.

NEXT MONTH

The December issue will be devoted to the "What's Ahead" in broadcasting technology. A number of short articles prepared by leaders in various sectors of broadcasting will discuss the future as they see it from their corporate positions.

Also, we will continue coverage of radio automation with additional material gleaned at the NRBA Convention in San Francisco.

We are standing by to cover AM Stereo should there be any new developments by the time we go to press.



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back and forth on the head so that you can find the precise center of gravity for whatever particular gear you're using at any given moment, such as heavy lenses, large magazines, etc.

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dramatically increase the holding power with far less effort needed to secure it in position. This Claw Ball design can also be adjusted $\pm 15^\circ$ to the horizontal plane within the top casting of the tripod to correct or alter your panning plane.

O'CONNOR COUNTERBALANCE DEFIES GRAVITY.

Three counterbalance spring options are available for the Model 50. It is important that you use the proper method to determine which spring is correct for your needs. If you're not sure, consult an O'Connor dealer or talk to us direct.

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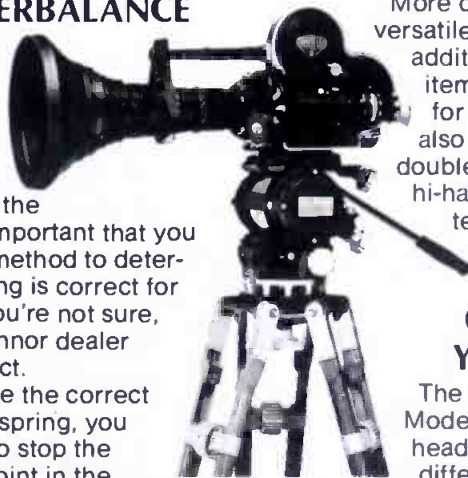
Like all O'Connor heads, the Model 50 is designed to provide maximum versatility. Separate controls for the pan drag, pan lock, tilt drag lock—all improve the flexibility and repeatability of camera movement.

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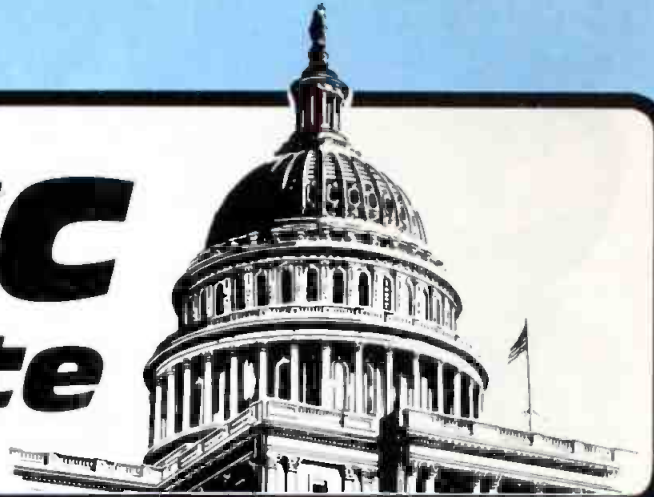
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Circle (5) on Reply Card

FCC update



November, 1978/by Howard T. Head & Harold L. Kassens

Television scanning problems

Both the television broadcasting industry and the FCC are currently in an uproar over the increasing failure of many tapes, especially those produced using ENG or other simple equipment, to meet the waveform requirements of the commission's rules. The most common manifestations of the problem are the failure during vertical scanning to begin the active picture on lines 21 or 22 as required, and the display of excessively wide horizontal synchronizing and blanking pulses. This results in black bars at the top and left of the picture and the commission has announced that the practice has got to stop.

The answer, however, is not nearly so simple as the question. Many broadcasters are simply declining to air any tapes not meeting the standards, and complain that this situation is costing them thousands of dollars. The FCC has announced that broadcasters are not obliged to carry political announcements not meeting the standards, so long as the same practice is followed with commercial material. At least one laboratory is advertising a service guaranteed to clean up non-standard tapes, which is bound to involve considerable expense and sophistication. In the meantime, the best solution for future tapes appears to be simply adequate attention to recording equipment performance.

Commission continues to grapple with processing backlog

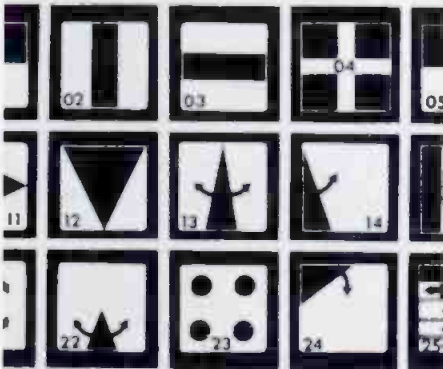
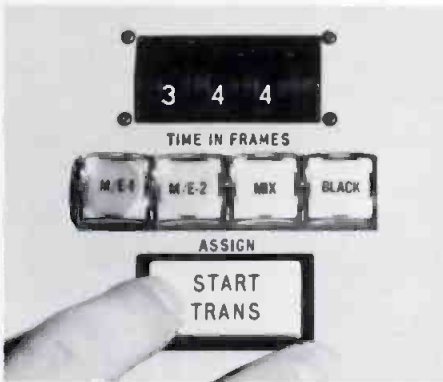
For as long as we can remember, the commission has waged a losing battle to become current in processing radio applications, and to stay that way. At times, delays of two years or more have been commonplace in even getting around to AM applications, especially the more complicated ones. Now the FCC has announced the "acceptance for filing" of the last of a great batch of AM applications which were dropped in the hopper to beat the freeze deadline of June 30, 1976. This beats by almost six months our prediction in the column for August, 1976.

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American Data

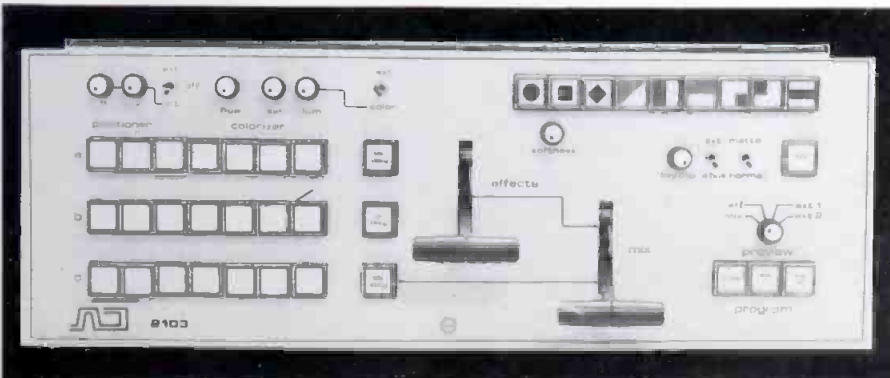
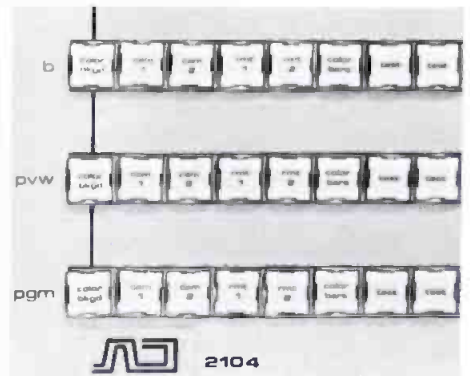
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FCC update

continued from page 6

To accomplish this herculean feat, however, the commission has found it necessary to divert most of the engineers from processing FM applications, and the FM line is beginning to bog down, although not nearly so badly, with about six months delay on an FM application being par. This has resulted in an increasing number of requests for expedited consideration, which in plain language means being put at the head of the line.

In two such recent requests, the commission granted expedited action on a non-commercial application for Lorton Reformatory (just outside of Washington, D.C.) on the grounds of needed service to and by minority inmates; but at the same time rejected a similar request by a commercial applicant who had asked for the special favor because he was physically handicapped—he was legally blind in one eye.

New procedures on fines and forfeitures

The commission has adopted new rules to reflect the passage of legislation authorizing the FCC to proceed directly against persons other than commission licensees who are charged with illegal operations. Previously, the FCC had no jurisdiction against unlicensed operators, or persons marketing illegal radio equipment; such cases had to be referred to the U.S. attorney for prosecution. The new rules also reflect several other new provisions, such as increases in maximum amounts of fines, extension of the statute of limitations, and other provisions.

Short circuits

The commission's December schedule includes consideration of proposals to drop in new VHF TV channel assignments to short spacings, and to break down some of the AM clear channels...Future cable carriage and non-duplication rights will be based on the commission's new propagation curves, but existing rights based on the old curves will be grandfathered...The commission's staff has proposed that future Citizens Band operations be shifted to frequencies around 900 MHz...The commission has begun an inquiry into the refund of fees collected between 1970 and 1977 and the adoption of new fee schedules to replace those struck down by the court in 1976; there's already a yelp of protest over the commission's proposal to start with refunds over \$20...The commission declined to assign TV channel 17 to Florida on the basis of protest from a proposed land mobile operator supplying radio telephone service to offshore oil drilling operators in the Gulf of Mexico, using frequencies in the TV channel...The FCC is working on a new variation of Part 73 of the rules, which would consolidate all rules dealing with broadcasting in a single place.

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And, of course, there are all the additional features that assure sharp, crisp pictures and true colors: built-in 2H contour enhancer with comb filter...standard I & Q encoder...switchable color bar generator...automatic white balance...automatic iris...and a built-in Genlock circuit using black burst to lock your SK-90 to other cameras.

Options include a built-in linear matrix masking amplifier for high fidelity color rendition and a complete remote operating unit which lets the camera range up to 1000 feet away on standard camera cable. For an even greater working range of over 3000 feet, a Digital Command Unit/Triaxial Cable System is also available.

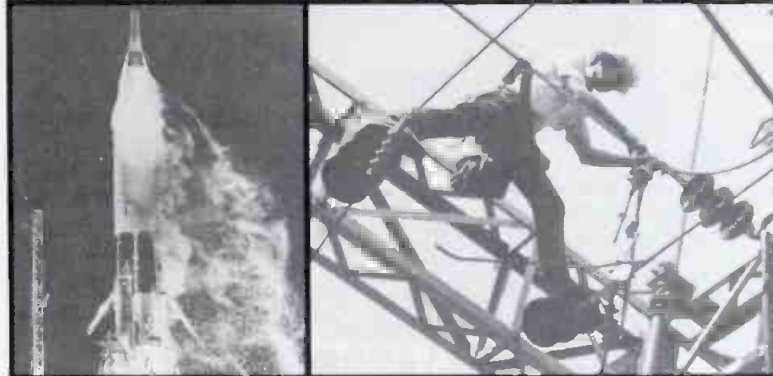
Remarkably, the Hitachi SK-90 may be the first affordable, self-contained portable that doesn't compromise. Contact your Hitachi dealer for more details.



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Circle (6) on Reply Card

New Aspen Music Institute program teaches live-recording

A new program, the Aspen Audio-Recording Institute, was created at the Aspen Music Institute in order to fill the shortage of trained audio technicians in the U.S.

"There is a lack of programs all over the country that train audio students," said Harold Boxer, music director for Voice of America and founder of the program. "The great need today is in public institutions, where audio technicians are re-



quired to record live performances. The institutions don't know where they are going to find these people."

Boxer designed the Audio-Recording Institute as a 2-week workshop for those interested in learning basic recording techniques. Students get their training recording some of the world's leading musicians with professional recording equipment.

FCC rulemaking begins on uses of vertical blanking interval

The FCC has begun a rulemaking to consider permitting the transmission of program related signals during the Vertical Blanking Interval (VBI) of standard television signals.

The National Broadcasting Company (NBC) asked for the rulemaking, and statements supporting the NBC petition were filed by the Public Broadcasting Service (PBS), American Broadcasting Companies

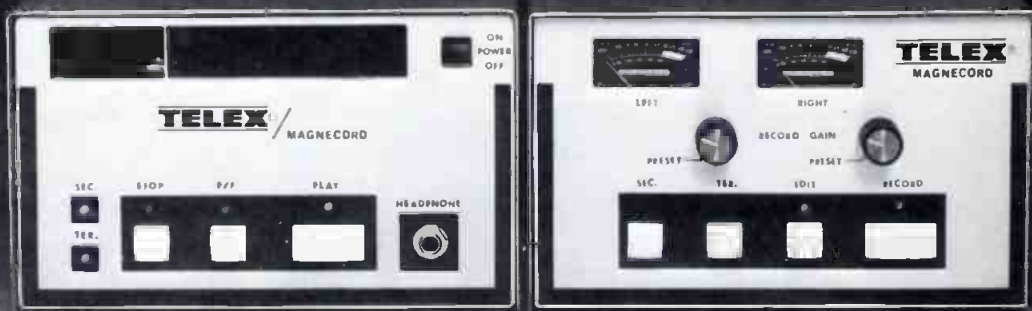
(ABC), CBS, the Joint committee on intersociety coordination, ad hoc committee on television broadcast ancillary signals and Daniel L. Rapak, a television station broadcast engineer.

NBC proposed that Section 73.682 (a) (21) of the rules be amended to allow the transmission of a digital source identification (SID) signal on line 20 of the VBI. NBC proposed to use the SID signal to identify the

originating network, the city of origination and the date and time of origination. It stated that potential use of the proposed signal would be for verification of network service transmitted; faster and more accurate program ratings; automatic logging; and automatic operation of cable television non-duplication switching equipment.

continued on page 12

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NAB committee and FCC discuss children's TV programming

The Hundred Plus Market Television Committee of the National Association of Broadcasters (NAB), and the FCC recently met to discuss children's TV programming. Following the meeting, Bill Bengtson, committee chairman and vice presi-

dent and general manager of KOAM-TV, Pittsburg, KS, said he "appreciates the staff's sensitivity in realizing the difficulty of running a television station in the public interest while keeping up with the paperwork required by govern-

ment." But the committee still is distressed over mixed messages broadcasters are receiving from the FCC.

Bengtson noted that while the commission talks in terms of zero-based regulation it also has opened up several old proceedings and proposed new regulations and more paperwork. He cited additional paperwork on public service announcements and children's television programming, more extensive instructions on employment forms, new categories for ascertainment forms and inclusion of the handicapped under its equal employment opportunity rules.

The FCC has opened a new inquiry into children's television programming and advertising practices to revisit voluntary compliance by television broadcasters with the guidelines in its children's television report and policy statement, adopted in 1974.

Specific questions designed to assess licensee compliance with the guidelines of the 1974 children's report, include:

- Overall amount of programming aired for children;
- Amount of educational and information programming aired for children;
- Age-specific programming;
- Scheduling;
- Overcommercialization;
- Separation of program matter from commercial matter;
- Host selling; and
- Tie-ins.

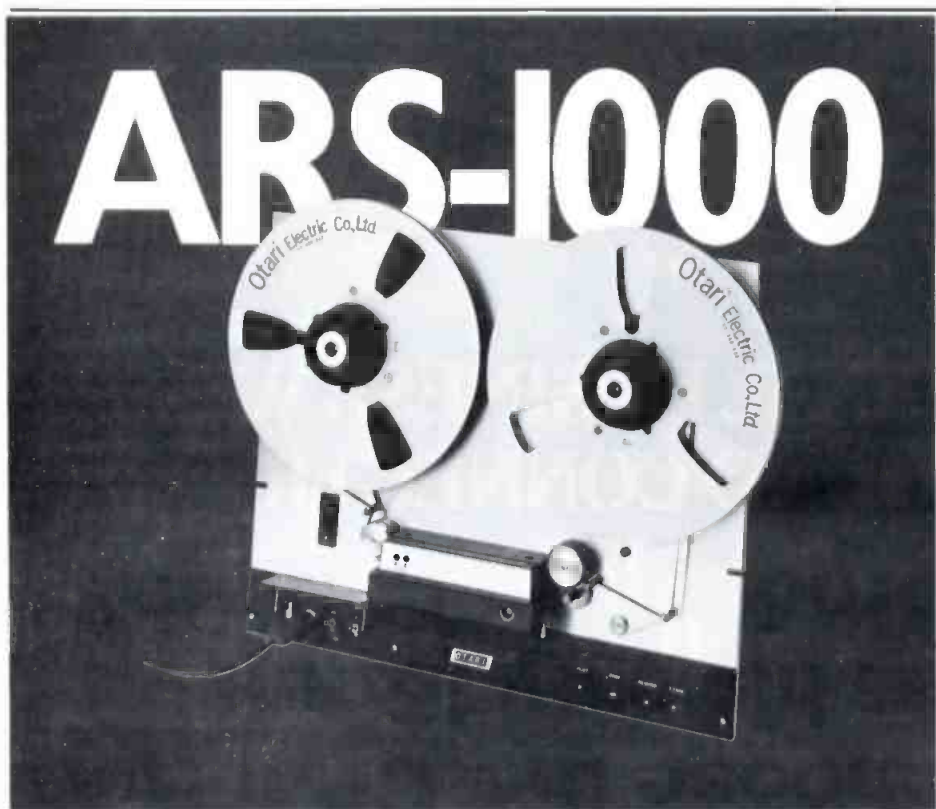
The committee also discussed the Communication Act rewrite, and heard reports on congressional actions and research.

Smith joins EEOC

J. Clay Smith, Jr., FCC associate general counsel, has been nominated a member of the Equal Employment Opportunity Commission for a term expiring July 1, 1982. FCC chairman, Charles D. Ferris, has endorsed the nomination.

Smith was deputy chief of the FCC cable television bureau from 1974 to 1976 and named FCC Associate General Counsel in 1976.

continued on page 14



Specifically designed for automated systems

Otari, Japan's leading producer of professional recorders, announces the ARS-1000 Automated Radio Station Reproducer. This new machine is based on the successful MX-5050 professional recorder, with several components modified to meet the special needs of the automated broadcaster for consistent quality and greater reliability under heavy duty continuous operating conditions.

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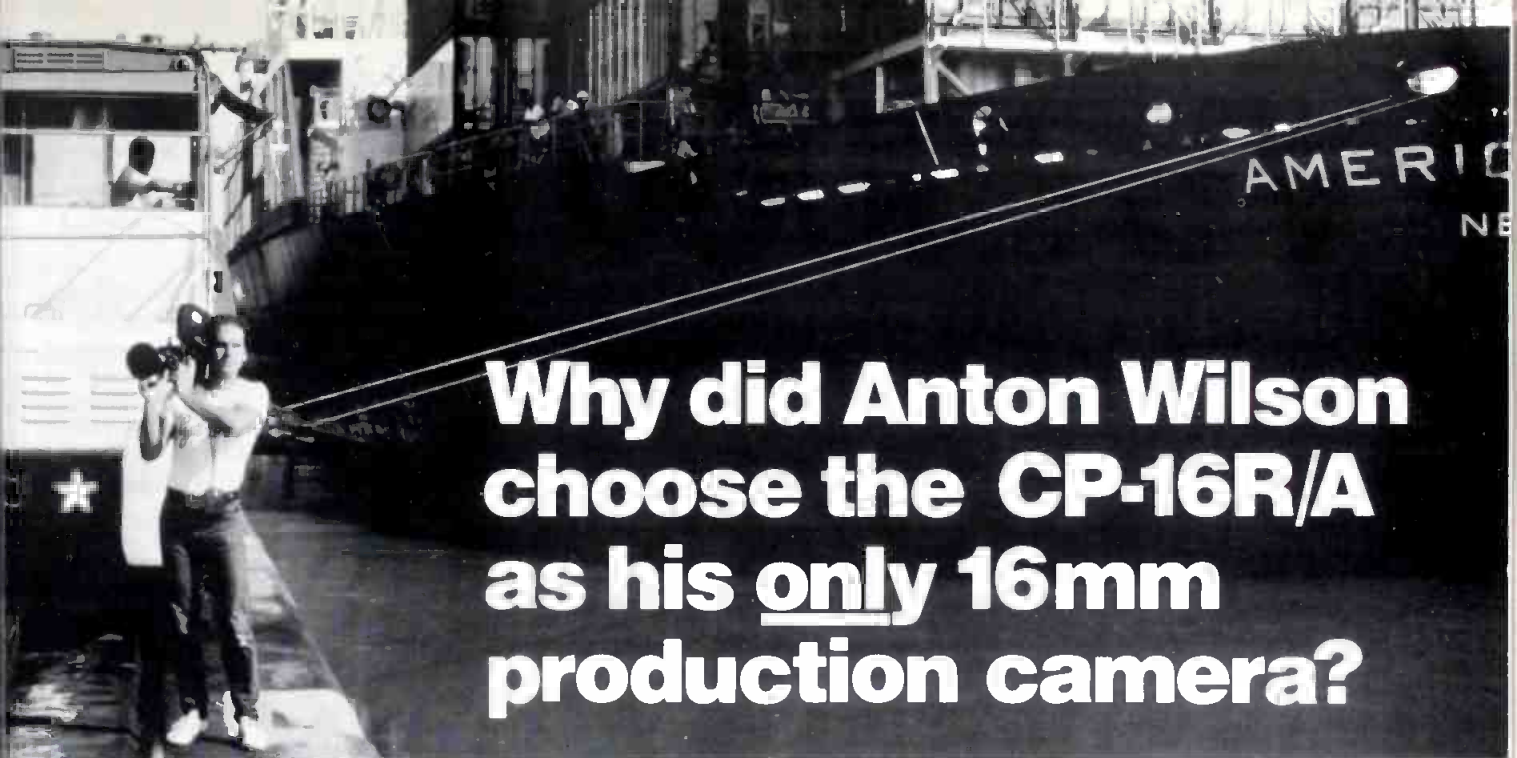
head assembly for minimum RFI and improved S/N; optional 25 Hz sensor; improved low frequency response for reliable 25 Hz sensing; +4dB 600 ohm output; improved flutter performance; plug-in boards with gold-plated contacts; nationwide parts and service from Otari MX-5050 service centers (mechanical parts are interchangeable); one year parts and labor warranty.

If you're considering automation, ask your automated system supplier for full details on the ARS-1000 or call Otari.

OTARI

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Why did Anton Wilson choose the CP-16R/A as his only 16mm production camera?

Known for his daring and inventive camera work, independent producer/cinematographer Anton Wilson has done it all: documentaries, special feature stories for television, industrials ... most notably for ABC-TV's *Good Morning, America* and for industrial giants like AT&T, among others.

A former technical director for Arriflex, with a background in mechanical engineering, Wilson is also an authority on motion picture production techniques and equipment design. He is vice-president of Anton-Bauer, manufacturers of power supplies for film and video use, and a contributing editor to the *American Cinematographer* magazine.



"The quietest 16mm camera I've ever owned!"

"I first started out with an Arri 16BL, followed by an Eclair ACL," says Wilson. "Eventually I gave them both up. For various reasons, they just failed to satisfy my particular filming requirements.

"My assignments are so diversified and challenging, I need a versatile production camera that can do just about *everything!* And I find that the CP-16R/A is the only camera in existence versatile enough to do

everything I want — and need — it to do. Best of all ... it is the quietest 16mm camera I've ever owned."

"CP-16R/A is the only game in town!"

"The studio-silent CP-16R/A is ideal for all double system work. Yet it is lightweight, compact, and has all the sophisticated features and accessories I consider indispensable: variable speeds, behind-the-lens metering, orientable viewfinder... you name it.

"Most important, the CP-16R/A also has a high-quality single system sound capability that is integral to its original design — not a modification, or an afterthought.

"When I add it all up: CP-16R/A is the only game in town!"

Modern production techniques require high-quality single and double system sound.

Says Wilson: "Single system capability is essential these days for most documentary, industrial and PR films, as well as TV commercials. Because modern production techniques frequently call for the editing to be done on videotape, and single system sound

(Above) Anton Wilson at the Panama Canal. "Filming an in-depth feature story about the upcoming canal treaty and its implications, we were able to move fast and reliably with the CP-16R/A, covering what would normally take two months in just ten days!

"The camera functioned flawlessly, even in the torrential rain that overtook us when we followed General Torrijos into the Panamanian jungles.

"This documentary was so successful it aired both as a two-part series on *Good Morning, America* and as a five-part series on the *ABC Evening News*."

makes video transfer real easy.

"That's why my CP-16R/A is frequently used much like a remote video camera ... but with far greater flexibility and superior results. Production costs in the field are cut dramatically, and we are far less conspicuous and obtrusive than any EFP crew would be.

"Occasionally, we want the quality of double system sound as well as single system sound backup and editing ease. So we shoot both ways *simultaneously*, running an additional feed from the mixer into the CP-16R/A built-in amplifier, and recording single system sound on striped film. Incidentally, on a recent documentary shot this way, the single system sound quality was so outstanding that we never even used the sound from the Nagra tape!"



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continued from page 12

New film-processing technique shortens developing time in half

A new process tested by four television stations has nearly halved dry-to-dry time for film while leading to some cost-savings in chemicals. The process is a modification of the process VNF-1 used with Eastman Ektachrome video news films. A faster acting formulation of persulfate bleach and bleach accel-

erator replaces ferricyanide bleach and a second-stop bath.

WGR-TV, Buffalo; WIXT-TV, Syracuse; WTAR-TV, Norfolk; and WTEV-TV, New Bedford-Providence, have used process RVNP (Rapid Video News Process) with a variety of processing machines.

The ability to run film almost

twice as fast with the new process has made a significant impact at WTAR-TV where the lab manager, Phil Trahadias, has seen an increase in the number of assignments covered with film. "We are getting some film as late as 5:40 PM, processing and editing it and making the 6 PM news."

WTAR-TV processes as much as 3,000 feet of film a day. Process RVNP has resulted in processing time being trimmed from 32 to 17 minutes.

WGR-TV color lab technician, Norm Fisher, has seen a slight saving in the cost of chemistry with process RVNP. WGR-TV processes approximately 1,200 feet of video news film each week in a Houston Fearless process, operating at a speed of 30 feet per minute. Film is processed, dry and ready for editing in about 15 minutes.

Lee Tanner, WTEV-TV manager of operations and engineering was negotiating for a new Allen processor when Kodak proposed the trade test. The Allen processor is handling about 3,000 feet of film a day and running at 82 feet a minute. Now once a photographer walks in the door, it is a matter of 10 minutes before the film is ready to be shown, compared previously to more than half an hour.

Six minutes may not seem like much, but to Rock Carbone, photo manager at WIXT-TV, it's a lot. The time saved with process RVNP at the Syracuse station means a great deal when it comes to editing, he notes.



MONOMAX BY AMPRO
When you go
AM Stereo,
don't make your
mono listeners turn
to someone else.

AM Stereo is coming and FM Stereo is here. Your rich, clear stereophonic sound can lose a lot of its punch when heard on a monaural receiver. Phase cancellation, response holes and peaks can make it sound downright dull and lifeless. And that turns off listeners. That's bad business for you because the majority of your prime time audience consists of mono receivers.

To give your mono listeners the sound quality they demand, you need Monomax... the new stereo tape matrixing system from Ampro. Monomax helps your signal come across strong and clear because it totally prevents phase cancellation problems. Now your mono as well as stereo listeners can enjoy the full lively sound you transmit.

Don't settle for less than Ampro perfection.

Take a closer look for yourself. Send for our FREE brochure on MONOMAX.



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Circle (11) on Reply Card

NAB requests delay

The National Association of Broadcasters (NAB) has requested a federal court to stay the effective date of a FCC ruling permitting cable television systems to carry network programs already being shown over local TV stations.

In this filing, NAB said "because the loss of network non-duplication protection resulting from the commission's action will be substantial and widespread, numerous broadcast television stations, and particularly those most vulnerable to harm, would suffer irreparable injury in the absence of a stay."

continued on page 16

Think you've heard everything?

The world thought so, too. Then Thomas Edison invented a little thing called a phonograph.

Suddenly sounds could not only be produced. They could be reproduced. And for 100 years, we've been reproducing sounds just about the way Tom did when his music went round and round.

But not any more.

Sony has perfected a new kind of audio recording system for professional use. It's called PCM, which stands for Pulse Code Modulation. And it's part of the digital audio revolution—such a great improvement over conventional analog recording techniques, it's been called the best thing since night baseball.

It's here right now

We've taken those last important steps toward making digital audio a practical reality. And the 2-track PCM-1600 we're exhibiting at this fall's AES conference isn't just the most advanced professional digital equipment to come to the mar-

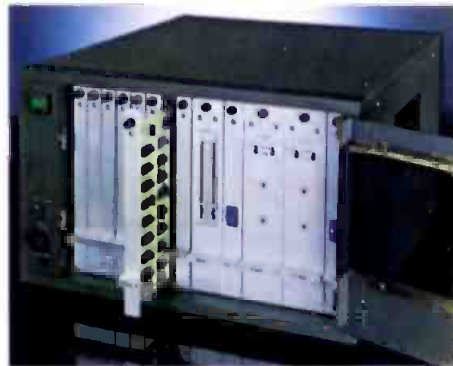
ketplace. It's an idea whose time has come.

The perfect master

Used as a Studio Master, the Sony PCM-1600 gives you true digital mastery of audio. Substantially better audio quality than is possible through even the best analog technology. It lets you record separate takes and assemble them. Make generation after generation of laquers with no sound degeneration. And distribute any number of digital masters to, say, foreign affiliates... giving France the same quality you gave England.

And you still haven't heard the best about the PCM-1600.

First, it uses a standard videotape recorder. The same kind of recorder already familiar to broadcasters across the nation. To edit, or to perform a digital-to-digital dub, you use a standard Sony video editing console—and do it all electronically.



Second, some very impressive numbers. Dynamic range greater than 90 dB. Harmonic distortion less than 0.05%. Wow and flutter so low it can't be measured. And absolutely no hint of hiss.

Third, we've solved the problem of dropouts. By introducing an error-correcting code technique originally developed for computers, we've given our PCM-1600 fail-safe signal reproduction. The kind computer applications take for granted.

And finally, Sony PCM equipment is ready to live up to the Sony name. It's rugged. Reliable. Designed to take anything professionals dish out. And once producers and artists hear the difference, conventional analog recording systems just don't sound good enough.

Now you've heard everything

Unless, of course, you haven't heard our PCM-1600 in action. In that case, we'll be glad to demonstrate...and even take your order now for fall and winter deliveries.

If you think you can wait, see our PCM exhibit at the 61st AES Convention, Waldorf Astoria, New York, November 3-6. Have a good look around.

Then have a good listen.

SONY

DIGITAL AUDIO



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Circle (12) on Reply Card

.....
continued from page 14

Number



in design, performance
and features

Spotmaster[®]

5300A

MULTI - DECK

The cart machine with features competitors can't match...

FEATURES

	Spotmaster [®] 5300A	ITC 3D	HARRIS CC-III
Nortronics [®] Duracore [™] Heads	YES	YES	No
Single Connector Plug-In Decks	YES	No	No
Companion Record Amplifier	YES	YES	No
Low-Voltage Solenoid	YES	No	No
Independent Azimuth Adjustment	YES	No	No
Shielding Above & Below the Head	YES	No	No
LED Service Aids	YES	No	No
Tapered Cartridge Guides	YES	No	No
Companion Audio Switcher	YES	YES	No
Do the decks lock in place to a bulkhead permitting operation with the front panel down?	YES	No	YES



Plug-in removable decks and superb electronics make this the most up-to-date monaural or stereo three deck cart machine available. Rugged machined deck, quiet air-damped solenoid, unique cartridge guidance system, drop down front panel and run lights next to each deck.

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Action Line organizes

Action Line writers and broadcasters at the final session of the journalists' conference in Corning, NY, formed a national association called The Action Line Reporter Association.

The attendees of the conference, sponsored by Corning Glass Works, chose a steering committee of 10 to coordinate the initial plans and objectives of the new association.

The planning committee, in a meeting immediately following the final formal session, discussed plans to continue an annual conference. They discussed possible locations for the second conference and means of funding the association.

ASC demonstrates communication services

A direct, two-way satellite communications link has been placed in operation by American Satellite Corporation for Sperry Univac, a division of Sperry Rand Corporation. The demonstration at Blue Bell, PA, marked the first time small commercial earth stations located on the user's own property have been used to send and receive computer data, printed material and business video information simultaneously by satellite.

A request for a license to provide by the 1980s, domestic satellite communication services somewhat similar to that being provided in Blue Bell was returned to the FCC last week. Asking for further study, the court said the FCC should have given more consideration to anti-trust questions before granting the license to the company, a joint venture of Aetna Casualty & Surety Company, Communications Satellite Corporation, and International Business Machines Corporation.

Mutual uses satellites

Mutual has applied to the FCC for permission to transmit its network programs to earth stations installed at Mutual affiliates from coast to coast. Mutual news and sports programs originating at the network's Washington headquarters was received via satellite at the RTNDA meeting.

Circle (13) on Reply Card



**For you,
the new breed of
video professional,
the new breed of
professional video from
JVC.**



If you're a video professional today, you're a tougher customer than ever.

So JVC's rugged professional line delivers the quality and features you demand at prices you want to pay.

We know you've got a lean new attitude about the video equipment you buy, no matter how long you've been in the business. Or whether you're in broadcasting... a sophisticated corporate A/V operation... a top production house... or building your first video capability.

And that attitude is, with all the people vying for your video dollar, you want more state-of-the-art technology in equipment

that costs you less to own and maintain.

JVC's attitude is basic too. We build in engineering innovations—we don't add them on later. And we do it first. Which means you enjoy better picture and sound quality, easier operation, and sophisticated features you may not even find in equipment selling for twice the price.

For instance:

You wanted faster performance and greater accuracy in 3/4-Inch video editing.

And JVC's new CR-8500LU Recorder/Editor System offers bi-directional fast/slow search from approximately 10 times to 1/20 time, with editing accuracy to ± 2 frames.

It's a new generation of 3/4-Inch VCR editing—the fastest, surest way to get the frame-by-frame accuracy you need.

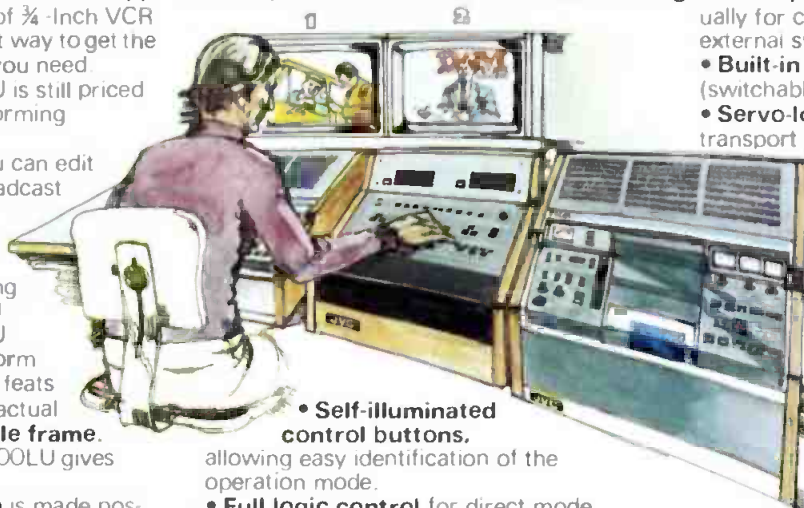
But JVC's CR-8500LU is still priced well below its closest performing competition.

With a single unit, you can edit with full functions and broadcast quality. Even if you don't happen to have special technical knowledge.

With a complete editing system of two CR-8500LU units and the new RM-85U Control Unit, you can perform the most advanced editing feats at approximately 10 times actual speed, then stop on a single frame.

Here's how the CR-8500LU gives you that kind of precision:

- **Frame to frame editing** is made possible with the capstan servo/built-in rotary erase head/blanking switcher frame servo design. A design that also ensures true assemble and insert editing with no distortion at the edit points. Plus horizontal sync phase compensation to minimize timing error at the editing points.
- **Variable speed auto-search** lets you perform both high speed and low speed search. You can search at approximately 10 times in fast forward or reverse to find edit points faster. Or slow speed search at 2 times, 1 time, 1/5 time and 1/20 time. Or use the special auto-speed shift feature to automatically slow you down from 2 times, real time, 1/5 time, 1/20 time.
- **Automatic pre-roll** enables you to pre-roll tape between edits, with an automatic on/off switch. Which can come in especially handy during successive assemble edits using camera signals.



• **Self-illuminated control buttons,**

allowing easy identification of the operation mode.

- **Full logic control** for direct mode change without pressing the stop button.
- **Remote control** of all operations, with the optional remote control unit RM-85U.
- **Audio level control with meters,** preventing over-level recording without audible distortion, with attenuator. Also, manual audio level controls let you adjust the audio recording level by checking the level meters.
- **Auto/Manual selection for video recording level control,** adjustable by the automatic gain control circuit or manually by referring to an independent video level meter.
- **RF output** to connect an external drop-out compensator.
- **Patented color dubbing switch** for stable color multi-generation dupes.
- **S.C./sync input connector** allows connection of time base corrector and allows for two second pre-roll.
- **Chroma level** can be controlled man-

ually for convenient connection to an external system.

- **Built-in comb-filter** for playback (switchable on-off).
- **Servo-lock indicator** to check the tape transport condition.

• **Counter search mechanism,** permitting Auto Search of a particular section of the tape.

• **Solid construction for easy maintenance:** both side panels, top and bottom panels are detachable for easy access to the inside.

• **Tracking control meter** for maximum

tracking adjustment.

• **Heavy fan motor** for better circulation.

All that with one editing unit. But when you combine two editing units with our new RM-85U automatic editing control unit, you'll enjoy all the benefits of a total-performance system.

Starting with the kind of control only JVC's RM-85U can give you:

- **Independent LED time counters** for player and recorder, read out edit points in minutes, seconds and frames.
- **Edit-in and edit-out automatic control.** Four built-in memories let you control edit-in and edit-out points of both the player and recorder. And once starting and ending points are determined, accurate editing is memory-controlled automatically.
- **Edit shift control** allows frame-to-frame edit point correction.

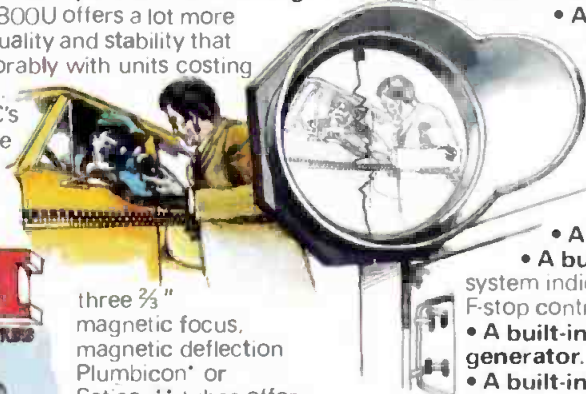


- **Lap time indicated** for each insert edit length by LED display.
- **Edit preview mode available**, for "rehearsals" of actual edits.
- **Edit-in point search mechanism.** After each edit, a Return button rewinds the tape automatically to the edit-in point, so it's easier to check edit conditions.
- **Auto-shift search mechanism** to step down the tape speed automatically, and ensure quick and accurate location of the editing point.
- **Tape safety guard circuit.** Because leaving the unit in the still-frame mode can eventually cause damage to tape or video heads, a tape safety guard circuit places the unit into the stop mode automatically.

You demanded more versatility in a moderate-priced, broadcast-quality camera.

And JVC's value-packed CY-8800U goes with you from studio to location.

Our CY-8800U offers a lot more than picture quality and stability that compares favorably with units costing twice as much. Thanks to JVC's technology, the CY-8800U camera, utilizing



three 2/3" magnetic focus, magnetic deflection Plumbicon* or Saticon** tubes offer total flexibility. And a rugged die cast chassis in front and back to hold up under the toughest conditions.



With the **Basic** configuration, it's a compact ENG/EFP camera that's completely self-contained—no CCU required. It's easy to operate, ready to plug into our CR-4400LU/CR-4400U portable recorder, with optional cables available up to 66 feet.

With the **Studio** configuration it's a hard-working studio camera. Just add the RS-8800U remote Synchronizing unit and the large screen, top mounted viewfinder.

And as for big-ticket features, we've built in what the others would let you add on later:

if it is left in the still-frame mode for more than 10 minutes.

- **Selective editing modes**—assemble editing, insert editing for audio channel-1, audio channel-2 or video.
- **Versatile editing capability** offering techniques like "edit-in/out," pre-roll, and automatic pre-roll.

You'll find that nothing in its price class performs anywhere near the CR-8500LU/RM-85U videocassette editing system. And that you'd have to spend a lot more on the competitive unit that offers many of the same features.

That's what we mean by giving video people more of what they want, for less than they expect to pay.

- **A built-in 1.5 Inch adjustable electronic viewfinder** for the convenience of the operator.

- **A built-in battery warning system.**
- **A built-in tally light.**
- **A built-in VSI—video**

system indicator for precision F-stop control.

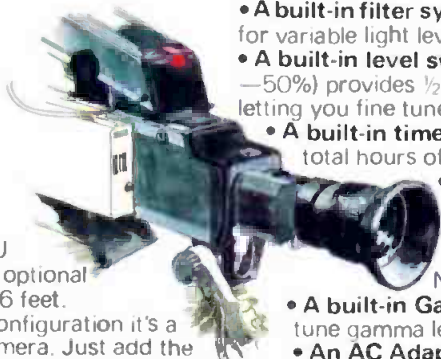
- **A built-in color bar generator.**
- **A built-in +6dB, +12dB sensitivity switch** for low

light level applications.

- **A built-in auto white balance.**
- **A built-in fast warm-up capability.**
- **A built-in electrical color temperature adjustment** for different applications (variable from 3000°K to 10,000°K).
- **A built-in filter system** (neutral density) for variable light levels.
- **A built-in level switch** (+50%, 0, -50%) provides 1/2 F-stop adjustment, letting you fine tune for added contrast.

- **A built-in time lapse meter** to show total hours of camera use.
- **A built-in intercom system** for studio applications.
- **An RGB output, and NTSC encoding** (Y, I, Q).

- **A built-in Gamma control** to fine tune gamma level.
- **An AC Adaptor**—standard.
- **Lightweight—17.4 lbs.—portability.**
- **Optional 12-to-1 zoom lens** with automatic iris and power zoom.



- **Built-in horizontal and vertical contour correction circuits.**
- **Signal-to-noise ratio of 49dB, F. 4/3000 lux.**
- **Resolution of 500 lines at center.**
- **Return video** in the viewfinder.
- **A built-in -G circuit** for registration.
- **Minimum illumination F 1.9/300 lux** (+6dB switch on).
- **A comfortable hand grip** to stop and start the recorder. With a switch to operate iris control and a switch for return video.
- **A built-in CCU.**

And that adds up to a lot more features than you'd find in similarly-priced cameras.



You needed studio quality recording in the field.

And JVC's field-tested CR-4400LU

Portable Videocassette Recorder with automatic editing lets you bring your recording/editing capability wherever you need to shoot.

If you spend time on location in either ENG or EFP applications, you need a portable video system that can shoot, edit, and give you something to show in no time flat. Without awkward equipment hassles.

JVC's CR-4400LU is the one to take along when you can't bring a studio.

Because it's the lightweight machine with heavyweight features

- **Weighs in under 27 lbs.** So you can take it anywhere, and assemble edit on the spot. You enjoy total flexibility. Complete freedom. Fast results.
- **AEF (Automatic Editing Function)** gives you clean assemble edits.
- **Built-in, full color recording and playback circuitry.** No need to buy an adaptor.
- **Low-power consumption** that lets you operate on a miserly 13.5 watts, for longer battery life. A multi-purpose meter checks battery, audio, video and servo levels for precise control of all functions.
- **Flexibility to record with the CY-8800U** or other high quality color cameras.

So if you need a field-tested recording system with the features you want at a price you can afford, check out our CR-4400LU Portable Videocassette Recorder.



*registered trademark of North American Philips Corporation.

**registered trademark of Hitachi Corp.

**JVC's new breed of professional video.
Backed by an old tradition of JVC quality
and reliability.**

For the past fifty years, more and more professionals have turned to JVC for innovative equipment they can count on to perform.

Isn't it time you discovered why?

Call your JVC representative for a demonstration. Or write to your nearest JVC office:

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(213) 537-8230

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Houston, Texas 77021
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TV reception simulated

**JVC Professional Video.
The tough new breed.**

JVC
JVC INDUSTRIES COMPANY
DIVISION OF US JVC CORP.

Home videocassette company

Bell & Howell and Memorex announce the formation of M/B&H Home Video, a company to manufacture home videocassettes. Paul Dotray, formerly with the 3M Company, has been appointed general manager of the company.

Dotray's immediate responsibility will be to establish the venture's manufacturing facility in the Chicago area, and see to operational start-up by early 1979. Dotray will also have responsibility for the overall, ongoing operation of M/B&H Home Video.

The two companies announced the joint venture in mid-July of this year. Plans call for the venture company to manufacture product for the two parent organizations. While M/B&H will produce both VHS and Beta format cassettes, it is likely the VHS cassettes will be introduced first, possibly by the first quarter of 1979.

Neve acquires orders

Neve Electronics International Limited has recently acquired orders in excess of \$1 million from leading music recording studios and network broadcast authorities in North America.

A and R Studios, Electric Lady Studios and Mediasound, all in New York City, have each invested in Neve mixing consoles. Capital records, Studio 55 and Village Recorder, all in Los Angeles, have just installed the Neve NECAM computer consoles.

Successful year for Harris

Fiscal 1978 was the most successful year in Harris Corporation's history. New orders topped the billion-dollar level for the first time and sales rose 35% to \$872 million. Earnings increased to \$52 million.

RCA satellite distribution

RCA American Communications, about to enter its third year of operation, now carries more hours of nationwide television distribution on its system than any other carrier in the world.

The company's two orbiting sat-

ellites distribute more than 4,000 hours of television programming monthly. Using the RCA Americom satellite, 11 different program packages offer more than a dozen channels of television to millions of cable TV viewers. Four of these channels are offered 24 hours a day. Five channels of pay TV are offered for up to 12 hours or more each day. Many more TV offerings are available via satellite on a part-time or occasional basis in both cable and broadcast markets.

Cetec Audio renamed

Cetec Audio, a division of Cetec Corporation, has been renamed the Cetec Gauss Division, according to Hugh P. Moore, chairman of the board of the parent corporation.

The name change is due to the reputation and importance to the company of the Gauss high-speed audiotape duplicators and the Gauss professional loudspeakers.

Record Plant order

Ampex Corporation recently announced it has received an order from Record Plant, New York City, for six 24-track MM-1200 recorder/reproducers.

Ray Cicola, president of Record Plant, said two of the units will be placed in a recently-purchased mobile unit and the others will be used in the studio. The purchase is part of a program to upgrade facilities of the company.

AFRTS awards contract

The American Forces Radio and Television Service (AFRTS), in its effort to supply U.S. military personnel and their families with television entertainment and news, has awarded Bell & Howell the contract for duplication and distribution services of prerecorded videocassettes.

Bell & Howell plans to supply both 1/2-inch and 3/4-inch prerecorded cassettes from its new duplication and distribution facility on the west coast.

Betamax ad campaign

Sony Consumer Products Company will spend nearly \$4 million during the last four months of this

year to advance the popularity of its Betamax recorder/player.

National consumer magazines and network television, along with newspapers in major markets, will spearhead the campaign that is designed to create an awareness of the Betamax SL-8600 and inform consumers of the recorder/player's benefits.

Don Gallagher, vice president/marketing communications of the consumer unit, said the campaign is the biggest in the history of the company for a single product.

IEEE directors call for trade wage differential

The board of directors of the Institute of Electrical and Electronics Engineers (IEEE) recently approved a far reaching resolution which calls for industry and government to pay their engineers more than they pay their nonprofessional supporting personnel. The action follows a recent action of the National Society of Professional Engineers which limits its recommendations to cover civil service employees only.

The specific language of the resolution states in part, "Each employer, including all agencies of government, should establish engineer compensation schedules in accordance with certain criteria."

RCA agreement

In a recent agreement, RCA American Communications will provide daily satellite television service to Modern Talking Picture Service.

RCA Satcom I will be used for nationwide distribution of Modern Cable Programs, a series of free-loan video programs, to the cable television market. The satellite is expected to distribute a variety of programming to more than 800 earth stations serving about 1,000 cable TV systems and over 8,000,000 subscriber homes.

Sales appointments

The Penril data communications division recently announced the appointments of sales representative companies in the U.S. The appoint-

continued on page 24



TAPES

AMPEX

AMPEX ATR-700

CH1 CH2

RECORD READY SAFE

SPEED HIGH LOW REEL LARGE SMALL

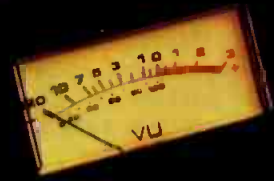
LIFT DEFEAT

VARI-SPEED

EDIT

PULL ON

RECORD



CHANNEL 1 A B

CHANNEL 2 A B

SSIONAL

ATR-700

This is the portable audio recorder designed for commercial service—the Ampex ATR-700. A reel-to-reel tape recorder in a compact package, tough enough for the continuous demands of full-time broadcasting, or the bruising insults of location work.

Use the ATR-700 for full or half-track monaural, or full-range stereo, and you'll get a response that's virtually flat from 40 Hz to 18 kHz. And every switch and control is clearly marked on the compact front panel for easy identification. The back-lit meters show you the situation even when the room lights dim, and switchable equalization means instant setup for most situations.

ATR-700 durability runs deep. All switches and connectors are heavy duty, professional types, and the transport itself is a rigid, massive casting that keeps all moving parts aligned even after hundreds of trips back and forth between the studio and the field.

Now there's no excuse for less than professional audio in the programs, commercials and productions you turn out. Ampex has the finest, most up-to-date reel-to-reel portable on the market, and it's available at Ampex audio distributors in every major city.

AMPEX MAKES IT EXCITING.

Ampex Corporation, 401 Broadway, Redwood City, California 94063, 415/367-2011
Circle (16) on Reply Card

continued from page 21

ments will provide additional sales coverage of the data communications marketplace and include: Comspec, Tulsa, OK; Austin, Houston and Richardson, TX; Crane & Egert, Elmont, NY; CSS Telecommunications Specialists, Mountain View and Santa Ana, CA, and Seattle, WA; First Rep Company, Chicago, IL, and Eden Prairie, MN; G. Gerhard & Associates, Columbus, OH; Sierra Financial, Cupertino, CA; and Technical Representatives, Hazelwood, MO.

Earnings reported

Frank G. Hickey, chairman and chief executive, announced recently that General Instrument Corporation, set new quarterly revenue and earnings records for the period ended August 27, 1978, and that all-time records were also set for the first half.

Revenue for the second quarter increased from \$123,117,261 a year

ago to \$131,299,517; earnings on common stock increased from \$6,232,911 to \$8,294,039, or from 83 cents per common share to \$1.08 an increase of 30%.

Sales appointments

C. Harrison Associates has been appointed to represent the Professional Products Department of Sharp Electronics for the sale of video and security systems in the southeast, it was announced recently by Robert Garbutt, department manager.

The firm located in Norcross, GA, will represent Sharp in North Carolina, South Carolina, Georgia, Alabama, Tennessee and Mississippi.

Comcast dividend increase

Comcast Corporation recently announced an increase in its annual dividend from 10 cents per share to 12 cents. The first quarterly pay-

ment at the new rate of 3 cents will be made December 27 to stockholders of record December 6.

"Monitor" is VPA awards

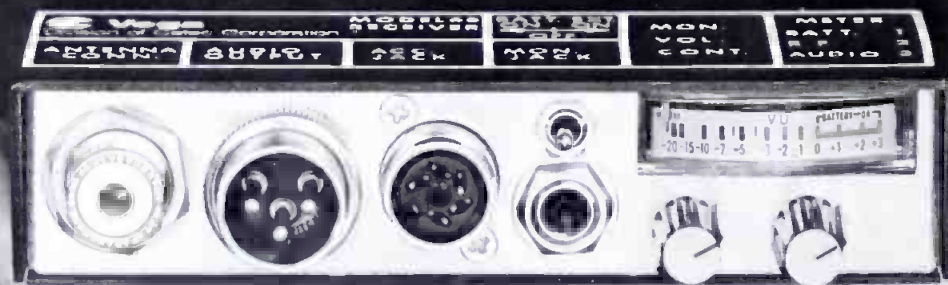
The Videotape Production Association has announced that their annual creative awards will be called the "Monitor." The first annual Monitor awards will be presented at a dinner/dance in the fall, according to Morton Dubin and Joe DiBuono of the VPA.

Scientific-Atlanta terminal

Scientific-Atlanta has received an order for LANDSAT satellite tracking terminal for the National Remote Sensing Agency of India. The \$619,000 terminal is to be installed near Hyderabad, India.

The terminal, consisting of antenna, pedestal, controls and receivers, is similar to several such terminals supplied by Scientific-Atlanta for use in Brazil, Italy, Canada and Iran. □

The Ultimate PORTABLE RECEIVER for wireless microphones



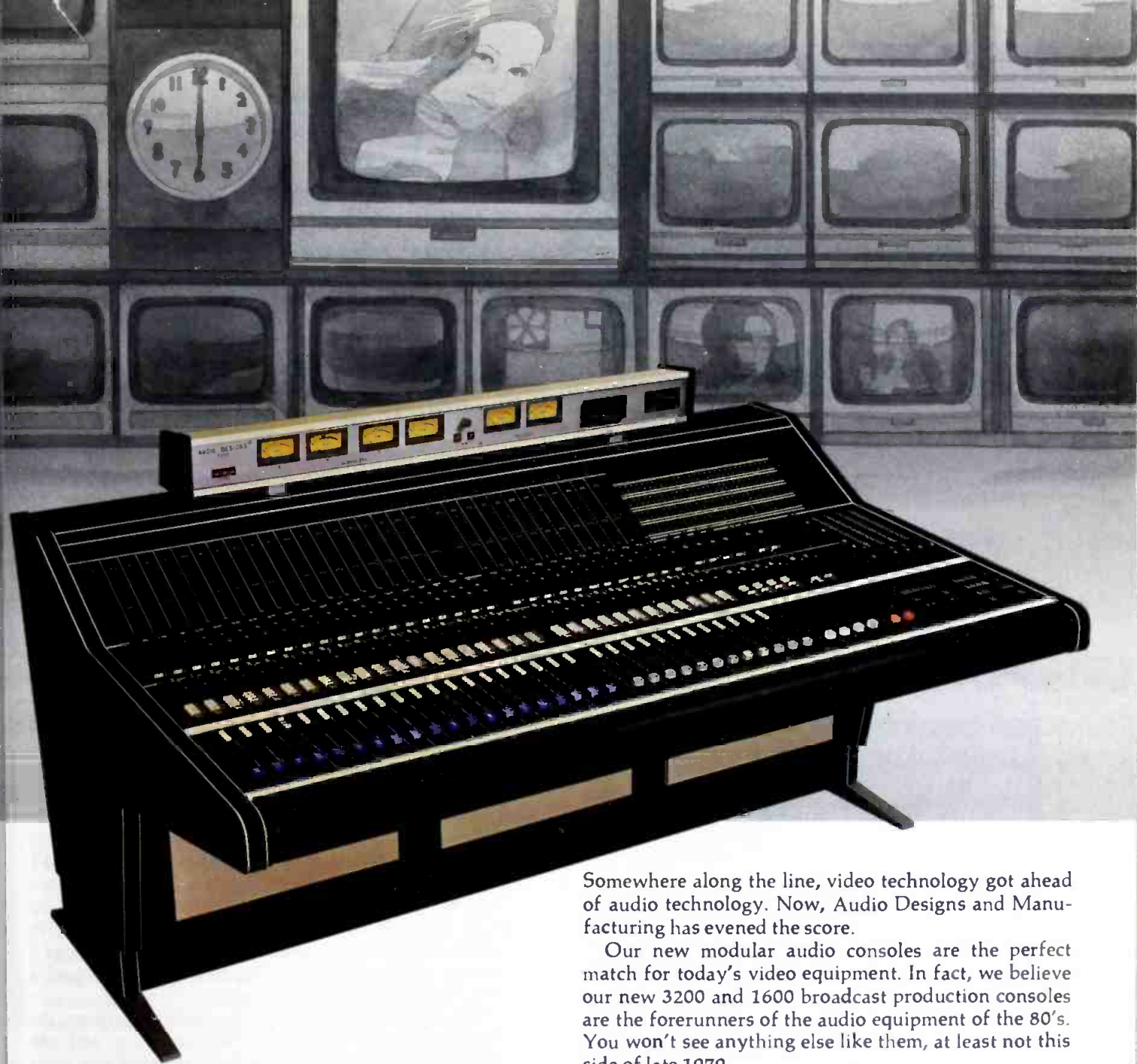
Vega now offers the most advanced portable receiver in the industry. The Model 66 provides operation superior to the highly successful Vega Model 55, but in a rugged single unit that is much smaller. (Dimensions: W 5.4" x H 1.3" x D 6.25"). Designed for the professional sound user, the 66's compact size makes it suitable for mounting to leading portable recorders, both audio and VTR's. The unit operates from either internal 9V batteries or an existing D.C. voltage source. Contact Vega for complete specifications on this exciting new unit or the Model 67 Portable Diversity Receiver.

 **Vega**

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With our new 3200
your audio can
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Somewhere along the line, video technology got ahead of audio technology. Now, Audio Designs and Manufacturing has evened the score.

Our new modular audio consoles are the perfect match for today's video equipment. In fact, we believe our new 3200 and 1600 broadcast production consoles are the forerunners of the audio equipment of the 80's. You won't see anything else like them, at least not this side of late 1979.

Our totally new consoles employ the finest proven components and integrate them into a cohesive, versatile, reliable unit . . . one that will accommodate your most exacting requirements. Our total in-house design and manufacturing capability put so much quality into all of our consoles that ADM[®] offers an exclusive 5-year warranty, the most comprehensive in the industry.

Learn more about how ADM can increase your audio capabilities. Contact Audio Designs and Manufacturing, Inc., 16005 Sturgeon, Roseville, Michigan 48066. Phone: (313) 778-8400. TLX-23-1114. Southeastern Office: Phone (904) 694-4032. **AMPEX** Distributed outside U.S.A. by Ampex International Operations, Inc.

ADM

The Audio Company

Comsat participates in U.N. experiment

A satellite 22,300 miles in space and small portable earth terminals were used to relay simultaneous language interpretations for a United Nations meeting in Buenos Aires, Argentina in an experiment to demonstrate and evaluate remote translation and interpretation.

In the experiment, speeches and documents presented during certain sessions of the U.N. conference on Technical Cooperation Among Developing Countries from August 30 to September 12, 1978 were relayed via satellite to U.N. Headquarters in New York. The U.N. interpreters in New York not only translated the documents for return the next day, but also provided simultaneous interpretation of the plenary session of the conference.

The United Nations, with the cooperation of NASA, Communications Satellite Corporation (COMSAT) and ENTEL of Argentina, conducted the experiment to demonstrate and evaluate the feasibility of remote simultaneous interpretation of a conference and the transmission...via satellite of documents for remote translation...via satellite.

To carry out the experiment COMSAT Laboratories installed a transportable earth terminal with a 2-meter diameter antenna on the roof of the 12-story conference building in Buenos Aires. The COMSAT terminal was connected via the Communications Technology Satellite (CTS) to an earth terminal at the U.N. Building in New York. The New York earth terminal, owned and operated by NASA, consists of a bus containing all of the required electronics and a roof-mounted 2.4-meter antenna.

The communications links established between the COMSAT earth terminal in Buenos Aires and the NASA earth terminal in New York included one color television channel each way plus a high fidelity program audio channel and eight voice-grade channels in both directions.

During the experiment the voice and a television picture of the speaker in the conference in Buenos Aires were sent via CTS to New York. The simultaneous interpretations in five official U.N. languages were returned to Buenos Aires via satellite for transmission to the audio headsets of the delegates attending the conference. Each delegate selected the language of his choice. Two-way television was used at the end of the experiment to evaluate the results of the interpretation and translation experiment.

Facsimile copies of selected documents presented in Buenos Aires were also transmitted at high speed via satellite to New York for translation. Translated versions were returned the next day to Buenos Aires. For the experiment, Rapicom, Incorporated provided

continued on page 28



ALL EQUALIZERS ARE NOT EQUAL

COHU'S NEW 9800 SERIES VIDEO CABLE EQUALIZER HAS FEATURES NOT FOUND ON OTHERS... FEATURES LIKE...

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Of course, Cohu's 9800 Series Equalizer will provide up to 30dB of equalization, sufficient for over 6000 feet of RG-11/U foam cable, accepts either 75-ohm balanced or 124-ohm unbalanced inputs, and has an exceptionally low hum and noise level.

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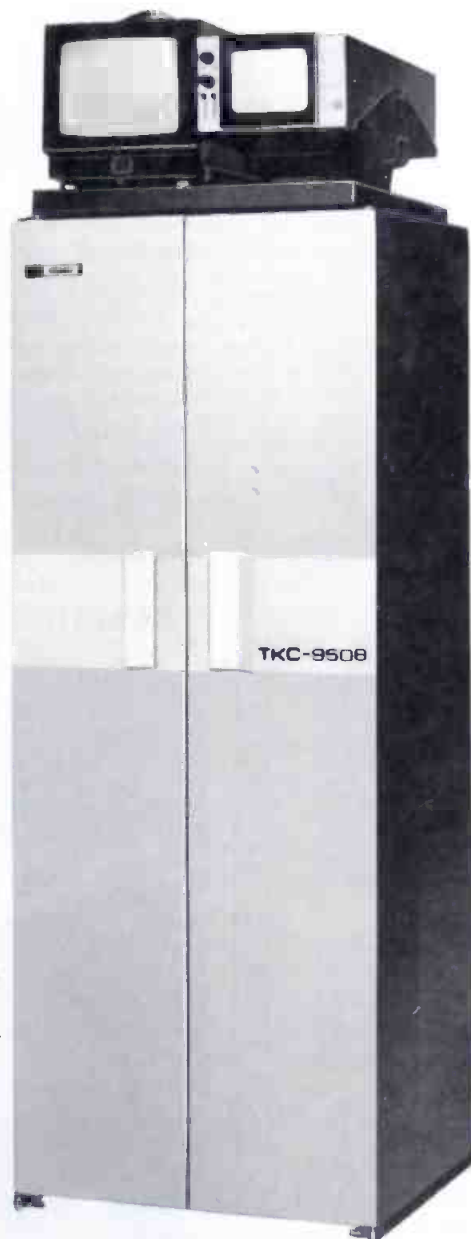
No more dirty movies.

The reason: the Ikegami TKC-950B film chain camera's unique optical system removes the correcting field lens from the focal plane where the aerial image is located. Thus, any dust that collects on the field lens is out-of-focus. When you run movies on the large-image field lens of the TKC-950B, the viewer receives a clean, sharp, dust-free picture on his home TV screen.

The TKC-950B system is dedicated to produce the highest color quality and picture stability. For example, a prism beam-splitter separates the images to its three one-inch vidicons.

The TKC-950B takes into consideration the tight quarters in which most film chains must be installed and operated. Remarkably small, it can accept an external multiplexer on either the left or right side of the unit for additional installation flexibility. Compatible with your existing equipment, it is easy to replace obsolete cameras.

Because film chain cameras must run with minimum supervision, we've built a lot of self-



control into the Ikegami TKC-950B. A servo-controlled neutral-density filter disc, built into the optical system — along with fast-acting video gain control — respond so quickly, there is no need for individual light compensators with your projectors. A very stable color encoder provides precise color reproduction. Three types of test pulses with six functions, built into the unit, are provided to facilitate set-ups, daily checks and calibration of the gamma-correction circuit.

The TKC-950B is highly stable and any variations in the source material can be compensated for manually or with an optional new automatic color balance accessory which balances white, black and gamma automatically. And each function is available for local or remote control.

For a complete picture of the Ikegami TKC-950B or a demonstration, contact: Ikegami Electronics (USA) Inc., 37 Brook Avenue, Maywood, N.J. 07607; phone: (201) 368-9171.

Ikegami

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BROADCAST CARTRIDGE TEST TAPES

Specify—Aristocart, Audiopak, Fidelipac 350, or Mastercart cartridge

CATALOG #			DESCRIPTION	PRICE (EACH) (FOB HAYWARD, CA)
Mono	Stereo	Mono/Stereo Compatible		
34-1	34-2	34	Reproduce Alignment — NAB 1976 $\infty/50\mu\text{sec}$ 160nW/m level, voice an- nounced frequencies from 50-16000 Hz, 12.5 kHz azimuth, 1 kHz level set.	\$40.00
P-34-1	P-34-2	P-34	Pink Noise —20-20000Hz, $\infty/50\mu\text{sec}$. For stereo phase check, and fre- quency alignment when used with a $1/2$ octave analyzer.	35.00
F-34-1	F-34-2	F-34	Sweep —700 to 15000 Hz, 100 ms log sweep re- peated for 4 minutes with a dead section between sweeps to facilitate scope synchronization—Useful for fast response checks	35.00
—	—	L-34	Level Set —1kHz, 160 nW/m, 1 1/2 min.	25.00
—	—	A-34	Azimuth —12.5 kHz, 1 1/2 min.	25.00
—	—	35	Flutter & Speed —1 1/2 min. 3150 Hz, tape accuracy —.03% RMS Flutter— 0.1% Speed at 74°F.	25.00
—	—	36	Flutter & Speed —1 1/2 min. 3000 Hz, tape accuracy .03% RMS Flutter— 0.1% Speed at 74°F.	25.00
—	—	Q-34	Q Track Test —Upper and lower limit frequencies, upper and lower limit levels, long and short duration, on and off at zero crossings. Voice announced.	35.00

STANDARD TAPE MANUAL

Recently announced, this data book is a must for the audio tape recordist, engineer, and designer—priced at \$45.00.

FREE CATALOG

For a full description of the manual and a complete listing of all cassette and reel to reel test tapes please send for our latest catalog.

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news feature

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continued from page 26

Rapifax 100 facsimile equipment in Buenos Aires and New York.

The satellite used in the experiment is owned jointly by Canada and the United States, and satellite time was shared equally between U.S. and Canadian experimenters. The Government of Canada made available some of its time on the satellite for the experiment.

CTS is a powerful communications satellite which simultaneously can transmit and receive color television, voice and data in both directions, between two earth terminals. The earth terminals operating with CTS transmit at a frequency of 14 GHz and receive at 12 GHz.

While the U.N. experiment was considered an overwhelming technological success, the results were extremely helpful in planning things differently for future experiments. The difficulties encountered were primarily human related. First, interpreters appear to need more overall familiarity with the system in order to do their jobs smoothly. Second, they seem to need visual contact with the speakers to lipsync translations and to generate mood, voice tones, etc. Third, broadcast-quality audio appears to be required for optimum translations.

Further work may be planned to continue these experiments. Details could not be learned at this time, but if these experiments could point the way for later elimination of the video, international broadcast and translations of political and technical meetings could be handled more economically. □

The parents were angry
when she was hired.
Now they're glad she took the job.



The President's Committee on Employment of the Handicapped
The School of Visual Arts Public Advertising System



Transmission Line Reliability

We have replaced every major coax manufacturer's line and never had a breakdown or burn-out.

LUCK? No. We just build the most reliable transmission line you can buy.

Patent No. 3,818,421

Most TV & FM stations replace or make major repairs on their Coax System about every ten years. There are exceptions, ranging from 5 to 18 years, depending on the power & frequency of the station. Some Broadcasters believe this is the normal life cycle or bad luck. The fact is they buy the same type line that gave them the problems to begin with. One with the finger connector.

Transmission line is like a chain. Weak links cause failure and the More Links you have the less reliability. Our transmission line alone has no fingers to make poor contact or split. We are the only manufacturer to give you one contact joint per section of line. All others give two. (½ the links). Our wrist band connector makes contact at each segment of its spring giving it excellent surface contact (The finger connector has as little as one high point per finger times eight fingers per connector). Our inner conductors are made with heavy wall copper for better heat transfer and are less susceptible to installation damage than thin wall line. The thick wall also allows a generous taper on the female cup eliminating the knife edge common on thin wall line. Unlike the back to back finger connector that allows metallic dust to fall on its own insulator below causing the line to self-destruct, our connector captures all dust generated during its daily expansion cycle allowing it to maintain peak performance. After 15 years instead of replacing contaminated line or \$100 connectors, simply slip on a \$20 wrist band spring (leave the dust where it's at) and go on for another 15 years.

The chart below shows standard off the shelf 6-1/8 coax. The unshaded area indicates what we consider desirable in a premium line for reliability. Chart based on 75 Ω inner.



68
CONTACT JOINTS
RCA
PRODELIN
PHELPS DODGE

34
CONTACT JOINTS
SWR

Manufacturer →	S.W.R., Inc.	R.C.A.	Prodelin	Phelps Dodge
No. of contact joints each section of inner	One	Two	Two	Two
Types of contact at each section of coax line	Wrist Band Spring	Finger Connector Also Wrist Band Spring	Finger Connector Also Finger Connector	Finger Connector Also Finger Connector
Standard wall thickness of inner offered	Heavy .040	Thin .025	Heavy .040	Heavy .040
Has design to capture wear	Yes	Yes	No	No
Seals lower end of inner to prevent mfg. dust from falling out	Yes	No	No	No
Years of warranty by mfg.	Two	One	One	One

Luck? No. **RELIABILITY? YES!**

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A system that will perform like new after 15, 30, even 45 years. We fabricate all components in 3-1/8, 4-1/16, 6-1/8 and 8-3/16" line. Our engineering Dept. will assist you with any installation planning.

OLD SYSTEM

We at SWR can fabricate inner conductors with our patented connector for replacement of your existing line giving you a better line than you purchased originally at a considerable savings over the cost of new line.

Besides transmission line call or write for information on Gas Barriers, Coax Switches, and our complete line of T.V. Antennas both horizontal and circular-polarized.

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ASSURED
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The Wilkinson
Line Surge
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IT REALLY WORKS!

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Self Testing
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Replace Directly
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- * Self Testing — A neon indicator for each diode warns of failure.
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**meetings,
events & seminars**

.....
December 2—The Annual Midwinter Symposium/ Chairmans reception will be held at the Ramada Inn O'Hare grand ballroom. The reception is sponsored by the SMPTE Chicago Section and honors section members who have given their time for the advancement of the society.

Magician/entertainer Howard Paul will be there along with the 17 piece band, The Music Makers.

For more information, contact: Paul Markun, Sharpe/Markun, Dept. BE, 230 East Ontario Street, Suite 2305, Chicago, IL 60611.

December 5—Distributors in New England will hold a meeting in Woburn, MA. For more information, contact: Barbara Gifford, Dept. BE, Meetings Unlimited, 17 Cummings Park, Woburn, MA 01801, (617) 935-6494.

December 12-14—The Midcon/78 Show and Convention will be held Tuesday through Thursday in the Dallas Convention Center. For more information, contact: William C. Weber, Jr., Dept. BE, Electrical and Electronic Exhibitions, Inc., 999 N. Sepulveda Boulevard, El Segundo, CA 90245, (213) 772-2965.

January 6-9—The 1979 International Winter Consumer Electronics Show will be held in Las Vegas.

Over 650 consumer electronics manufacturers and importers will occupy 400,000 net square feet of exhibit space and utilize the entire facilities at the Las Vegas Convention Center and the nearby Jockey Club Hotel will accommodate over 100 esoteric high fidelity exhibitors.

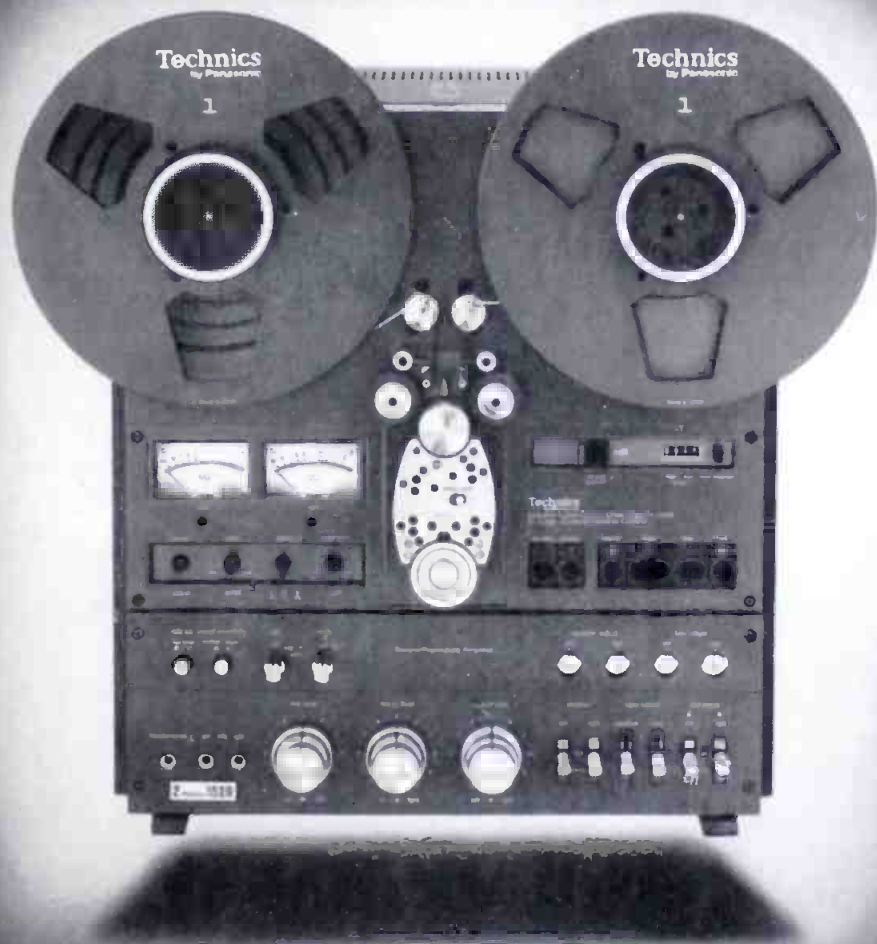
For more information, contact: Consumer Electronics Shows, Dept. BE, Two Illinois Center, Suite 1607, 233 N. Michigan, Chicago, IL 60601, (312) 321-1020.

April 1-4—The 1979 IEEE Region 3 Conference and Exhibit will be at the Hotel Roanoke in Roanoke, VA. Activities include technical and student paper sessions, exhibits, tours, professional activities committee meetings and region 3 committee meetings. For more information, contact: K. Reed Thompson, Dept. BE, Southeastcon 79, General Electric Company, 1501 Roanoke Boulevard, Room 244, Salem, VA 24153, (793) 387-7370.

April 30-May 2—The 1979 IEEE MTT-S International Microwave Symposium will be held at the Sheraton-Twin Towers Hotel, Orlando, FL. The theme is "The World of Microwaves" emphasizing the ever-increasing role of microwaves in today's world. For more information, contact: Dr. James L. Allen, Dept. BE, Electrical and Electronic Systems, University of South Florida, Tampa, FL 33620.

July 17-20—The second joint INTERMAG-MMM conference, jointly sponsored by the Magnetics Society of the Institute of Electrical and Electronics Engineers and the American Institute of Physics, will be held at the Statler-Hilton Hotel in New York City. The purpose of the conference is to provide a forum for the interaction and exchange of ideas between scientists and engineers working in fields of both fundamental and applied magnetism. For more information, contact: Dr. F.E. Luborsky, Dept. BE, General Electric R&D Center, P.O. Box 8, Schenectady, NY 12301. □

You were so impressed by the RS-1500
you asked for a studio version.
Introducing Technics RS-1520.



The RS-1520 has all the performance of the award-winning RS-1500 plus the features you need in a studio deck. Like bias and equalization fine adjustments for each channel to optimize any tape formula. A 1kHz/10kHz test-tone oscillator for accurate equipment checks. The precision of ASA standard VU meters with a +10dB sensitivity selector. A Cue/Edit switch for quick, safe edits. And balanced, low-impedance, XLR-type output connectors to match other widely used broadcast and studio equipment.

To match the performance of its predecessor, the RS-1520 features the "Isolated Loop" tape transport with a quartz-locked, phase-controlled, direct-drive capstan. By minimizing tape tension, it virtually eliminates all signal dropout. While reducing modulation noise and wow and flutter to a point where they are barely measurable by conventional laboratory equipment.

Electronically too, Technics RS-1520 provides professional control. A separate microphone amplifier.

Record amplifier. Mixing amplifier. An IEC standard playback equalization selector. While IC full-logic function permits absolute freedom in switching modes.

Compare studio features. Compare specifications. TRACK SYSTEM: 2-track, 2-channel recording, playback and erase. 4-track, 2-channel playback. **FREQ. RESP.:** 30-30,000Hz, $\pm 3\text{dB}$ (-10dB rec. level) at 15ips. **WOW & FLUTTER:** 0.018% WRMS at 15ips. **S/N RATIO:** 60dB (NAB weighted) at 15ips. **SEPARATION:** 50dB. **RISE TIME:** 0.7 secs. **SPEED DEVIATION:** $\pm 0.1\%$ with 1.0 or 1.5 mil tape at 15ips. **SPEED FLUCTUATION:** 0.05% with 1.0 or 1.5mil tape at 15ips. **PITCH CONTROL:** $\pm 6\%$.

Technics RS-1520. A rare combination of audio technology. A new standard of audio excellence.

Technics
Professional Series

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RUSSCO SOUNDS GOOD!!

If you're looking for professional audio products that will reduce down-time, increase efficiency and ease of operation and save a few bucks, come to RUSSCO! Once you get the RUSSCO story, you'll agree...RUSSCO SOUNDS GOOD!



STUDIO-PRO turntable: Rugged & simple, only 3 rotating parts, oilite bronze bearings, heavy-duty motor, no-slip starting, built-in 33/45 adapter. The Industry's Standard.



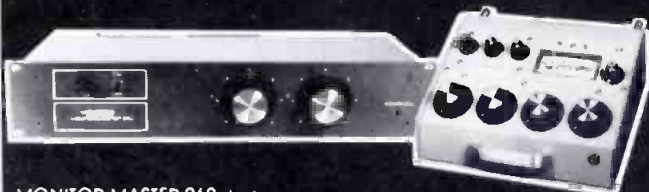
FIDELITY-PRO phone pre-amps: Self contained power supply, more head-room (+18 dBm), easy-access enclosure. 8 models: stereo or mono, balanced or unbalanced.



PHONO-MATE: NEW! lowest priced pre-amp for use with external power supply for reduced hum & noise. Straight RIAA equalization, RFI proofed against interference. Stereo or mono, balanced or unbalanced.



STUDIO-MASTER 5055 stereo audio mixer: 5 channels. 5th channel accepts 5 input lines for 9 channels total. Push-button switching, plug-in pre-amps, cue amp & speaker included. Mod Pots, LED indicators. Monoaural available.



MONITOR-MASTER 260 stereo amp: Long life and dependable service. 60 Watts RMS per channel. Clean solid-state sound with built-in power sensor protects against overload.

DISCO 421: NEW! Portable (5½ lbs.) 4 channel audio mixer for disco, remote, home recording. 1 channel: mono mike, 2 channels stereo. 1 hi-level input for tape. 3 band equalization. Inexpensive!

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people in the news

Manufacturers/Distributors

Ernest W. Pappenfus has been named to the position of president for the Cetec Vega Division of Cetec. Pappenfus has been general manager since he joined Vega eight years ago.

David E. Acker has been appointed president of Microtime, a subsidiary of Andersen Laboratories. Acker had been general manager and will continue as a vice president of Andersen.

William A. Fink has joined Thomson-CSF Laboratories as vice president, director of marketing. In his new position, he will be responsible for marketing the company's line of professional broadcast equipment and for product planning and new ventures.

Merle C. Mueller has been appointed divisional vice president of finance and administration for the TAI division of E-Systems in Garland, TX. Mueller, formerly director of administration, will be responsible for contract administration, material, finance, accounting, facilities and personnel.

The new sales manager for Ampro Broadcasting is **Tom Creighton**. Prior to joining Ampro, Creighton was the eastern regional sales manager for TFI in Santa Clara, CA.

The newly created position of product marketing manager for audio terminals at Hughes Aircraft's microwave communications products has been filled by **Robert A. Park**. Park, who has been with Hughes for seven years, was most recently involved in advanced spacecraft development in the company's NASA systems division.

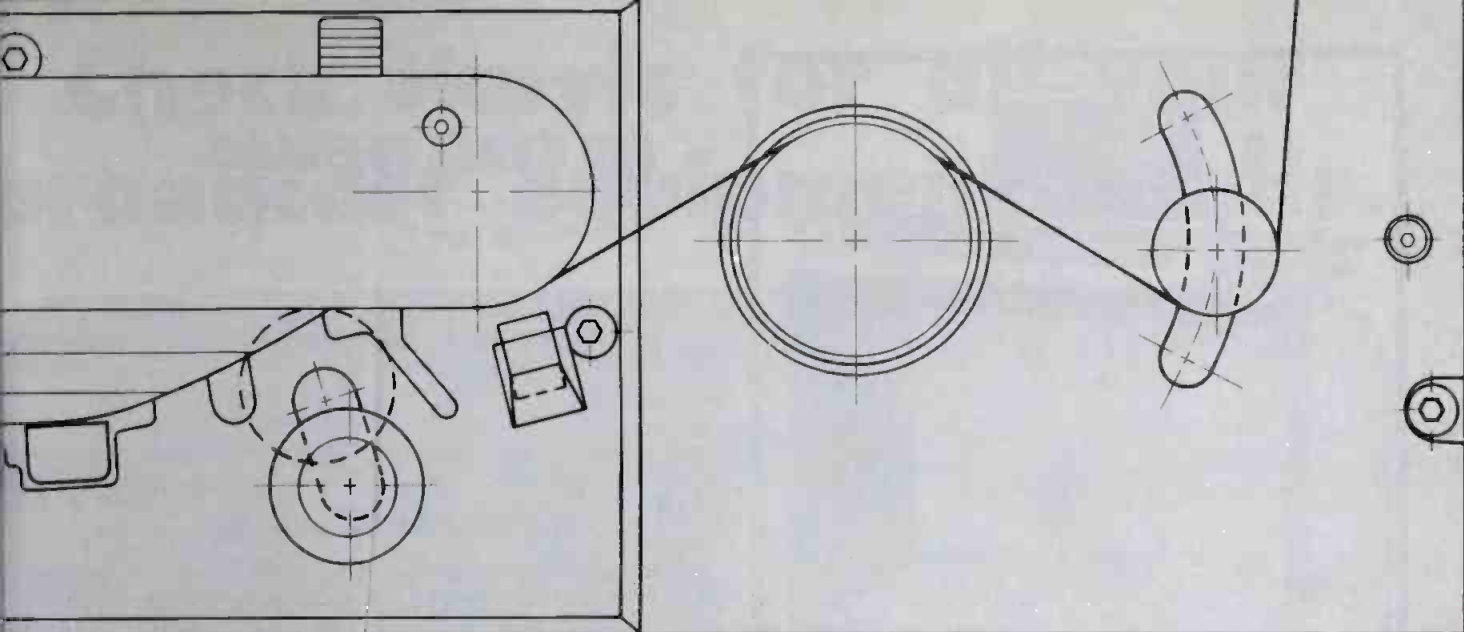
Robert A. Melling, Jr. has been promoted to production manager at Wide Band Engineering, Phoenix, AZ.

Roderick T. Ryan, district sales manager in the Hollywood office of Eastman Kodak Company's motion picture and audiovisual markets division, will receive the 1978 Herbert T. Kalmus Memorial Award of the Society of Motion Picture and Television Engineers (SMPTE). Ryan was cited for "his continuing substantial contributions to color film printing and processing systems."

Shelly J. Bunnett has been appointed a sales administrator at Uni-Sync. Bunnett's duties will encompass co-op advertising, dealer and rep communications, and assisting in the application of the overall Uni-Sync marketing and sales program.

Recent appointments at GTE Lenkurt include **Donald Lyang** as manager of industrial engineering and **Lyle Groberg** as manager of engineering services. Lyang has been with the company since 1955, most recently as the head of an industrial engineering group. Groberg has been with the company since 1952, most recently as engineering section manager.

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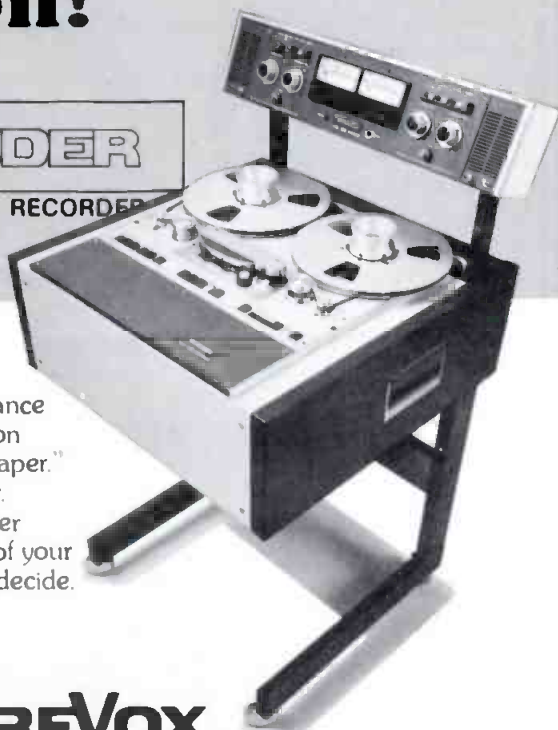


Studer B67

**It's got competitors . . .
but no competition!**

STUDER

B 67 TAPE RECORDER



When you buy the Studer B67 tape recorder/reproducer, you get more than just one of the world's finest tape recorders.

You are buying an engineering philosophy where performance is first and there isn't any second or third. You are buying a dedication to quality seldom seen in today's world of "make 'em faster and cheaper." At Studer, one person in every seven is a quality assurance inspector.

You are buying performance that stays within spec long after lesser equipment has given up. If performance is an important part of your tape recorder buying decision, test drive the Studer B67 before you decide. You'll find the B67 is the recorder without competition.

To learn more, circle reader service number or contact:

STUDER REVOX

people in the news

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continued from page 32

E-Systems ECI division recently announced the appointment of **J. Lawrence Hess** as director of international marketing. Since 1974, Hess has served as director of international business development for GTE Sylvania's communication systems division.

Radio/Television

Edward M. Anderson has been promoted to vice president of program operations for Warner's QUBE division. Anderson, who was QUBE assistant general manager of program operations, will direct day-to-day programming activities for the QUBE service.

The new director of engineering for Catholic Television network of Chicago (CTN/C) is **Martin N. Kite**. Kite comes to CTN/C with 25 years' experience in commercial broadcasting, including 17 years with WGN Continental Broadcasting.

Alex R. Papagan has been named director of marketing and programming for Universal Subscription Television (USTV). He will be responsible for introducing USTV's broadcast entertainment subscription television (BEST) service to the Boston market.

Robb Kunkle has been named to the post of news supervisor at the news department of the Mutual Broadcasting System. Before joining Mutual, Kunkle was a news editor in NBC's Washington bureau.

Marilyn J. O'Connor has been named to the newly created position of director of special projects in the public affairs department of the National Association of Broadcasters. Since June, 1977, O'Connor has been editor of *Highlights*, the association's weekly newsletter.

The position of director of educational development for Warner Cable's QUBE division has been filled by **Dr. Gerry Jordan**, who was most recently a consultant for QUBE and school systems in Baltimore, New York and Connecticut.

Jay Hoffer has been named director of programming at KERE radio in Denver. Hoffer, former vice president of Hercules Broadcasting joined Mission Broadcasting Company's affiliate in Denver on October 2.

WRKO, Boston, has appointed **Richard Ramirez** as local sales manager in charge of local agency and retail sales. For the past year Ramirez has worked for the RKO rep firm in New York city as a representative.

Robben W. Fleming, president of the University of Michigan, has been named president of the Corporation for Public Broadcasting. Fleming has served with the Securities and Exchange Commission, the National Emergency Housing Program and the National Wage Stabilization Board. □



ILS

Lighting Control System of the Future

The ILS (Intelligent Lighting System), is a unique, fresh approach to lighting control for theatre and television. It represents a harmonious blending of the demanding requirements of production lighting control, with the latest technology available from the computer industry.

The operation of ILS was purposely kept simple, because it had to perform complex functions according to the requirements of the production. ILS is designed to communicate in ordinary production language.

We created a system which will not only perform the required functions of a show, but it will also handle many of the bookkeeping functions which used to take lighting directors, their assistants and the board operators hours to write out. Since ILS is truly an "Intelligent Lighting System," it will never belittle the operator.

You won't see a large console filled with levers, switches and lights. That's not needed with ILS. Instead, you sit in front of a terminal. In addition to the usual alpha and numeric keys found on these keyboards, we have added our own special function keys.

The CRT displays information you need to know during the show and often you respond to questions asked by the computer. It's a self-teaching system and will not let you enter an incorrect command.

It's an exciting concept in lighting control and we are sure you'll see why when you take command of an ILS Control System.

The Innovation Company

**ELECTRO
CONTROLS**  **INC.**

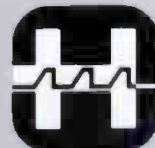
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Check Harris for all your broadcast equipment needs.

- Amplifier - AM, RF
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- Audio DAs, Monitor Amplifiers
- Audio Effects Generators
- Audio Noise Reduction Systems
- Audio Patch Panels, Patch Cords
- Audio Consoles
- Audio Portable Consoles, Mixers
- Audio Reverberation Units
- Audio Tape Recorders/Reproducers - Reel to Reel
- Audio Tape Reproducers - Cartridge
- Audio Test Equipment
- Automation Systems
- Cameras
- Camera Lens
- Camera Tripods, Dollies, Pedestals
- Cartridges - Tape
- Clocks
- Converters, Power Phase
- Demodulator, TV Video - Demodulator, Aural, Noise Meter
- Diplexers, Combiners - TV (VHF/UHF)
- Dummy Loads - AM, FM/TV
- EBS Systems
- Filters, Optical; Test Patterns; Test Slides
- FM Isocouplers, Combiners, Diplexers
- Generators, Engine - Emergency Power
- Generators, Sync; Proc. Amps; Video DAs; Terminal Equipment
- Headsets
- Land-Mobile Communications
- Lights, Studio
- Lights, Studio Warning
- Lights, Tower - Light Controls, Isolation Transformers
- Meters, Field Intensity - Phase Monitors - Impedance Bridges
- Microphones
- Microphone, Audio Cable
- Microphone Stands
- Microwave - TV
- Monitors, Picture
- Monitors, Waveform, Vectorscope
- Multiplexers, Optical
- Printers, Loggers, Terminals
- Projectors, Film/Accessories (Television)
- Projectors, Slide/Accessories (Television)
- Rack Cabinets, Tape Storage Cabinets
- Regulators, Primary Power
- Remote Broadcast
- Remote Control
- SCA Receivers
- Speakers, Loud: Baffles/Accessories
- Studio, Transmitter Links
- Switches, Coax - Manual & Motorized
- Switches, Video
- Tape Cartridge Machines
- Tape, Cartridges, Test Tapes
- Tape Splicers, Erasers
- Tone Arms
- Towers, Tower Erection
- Transmission Line, AM-FM-TV
- Transmitters, AM-FM-TV
- Turntables
- Water Stills

For complete information on any of the products listed contact: Harris Corporation, Broadcast Products Division, Quincy, Illinois 62301.

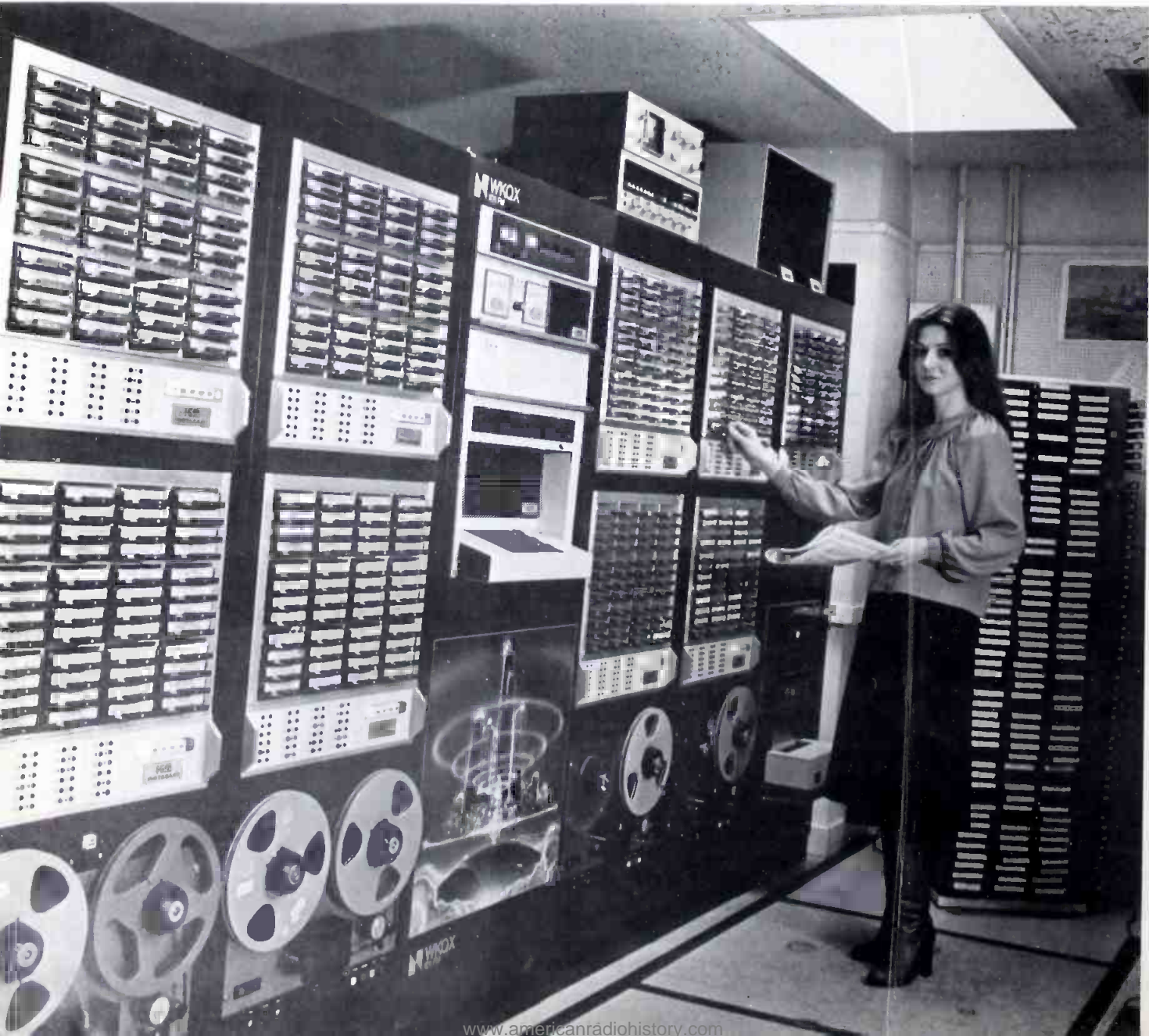


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RADIO AUTOMATION

Charlene Cassidy, WKOX-FM engineer, loads carts containing music selections in one of the station's 10 Instacarts used for the AOR format. While music is on banks of cartridges, voice track and commercials are on reel-to-reel units. This system illustrates but one of many major moves by stations all over the country to automate and improve business. (Photograph courtesy of IGM/NTI)



1978 OVERVIEW OF RADIO AUTOMATION

By Bill Rhodes, editorial director

■ Last month's issue was devoted to automation in the TV industry; this month, automation in radio broadcasting will be covered.

Dramatic strides have been made in all facets of automation since BE presented its first articles on automation in 1959. The phenomenal interest in automation was vividly displayed at the NRBA Convention in San Francisco in September where some 14 of the 80 display booths dealt with one or more aspects of automation. (These were major contributors; those devoted to strictly programming, automated and remote controls, plus isolated instrument systems coupled to automated systems which were not included in the count.) In addition, two other organizations deeply involved in automation had hospitality suites but no booth displays.

The count

As of July, 1978 the FCC recorded 8,511 radio broadcast stations on the air: 4,529 in AM; 3,049 in FM; and 933 in FM educational. It is not possible at this time to accurately estimate how many of these stations have automated their facilities. Many have done so; the evidence is clear. And, it seems conservative to say that all probably have either automated or have considered some degree of automation.

People the key

In reviewing the dynamics of automation, it is obvious that *people* have been the key to getting the industry where it is today. These have been predominately directly from the broadcast industry—engineers, managers' controllers. People who recognized the advantages and opportunities offered by computers and were willing to devote the energy needed to adapt new tech-

nology to change an industry.

However, others were also attracted to this field who were not primarily from broadcasting—computer experts, bankers, electromechanical specialists, NASA technologists and others. All have made their contributions felt in terms of reliable hardware and comprehensive software.

Because this has been a people-directed growth industry, it is not surprising that it grew more rapidly in some directions than in others. Early history in developing the interfaces to couple business computers to the business aspects of a station operation was traced at the end of last month's article.

Some historical highlights in broadcast and its automations are as follows:

- 1901—Guglielmo Marconi sent a Morse Code signal across the Atlantic to begin wireless as a means of communications.
- 1920—KDKA in Pittsburgh reported the Harding-Cox election returns by radio, beginning regular broadcasting in the U.S.
- 1929—Bell Laboratories demonstrated the feasibility of color TV as an accessory to telephone service.
- 1947—Audiotaping of the Bing Crosby show marked the first network use of a radio series in which complete programs were prerecorded.
- 1947—Paul Schafer developed an automatic switching system for hybrid tape machines.
- 1959—BE published the first short notes and articles on broadcast automation.

- 1962—SMC developed the carousel multiple playback cartridge unit.

- 1962—Scully developed the first reel-to-reel playback system for radio automation.

- 1968—IGM introduced the first instant random access cartridge playback device at the NAB show in Chicago.

- 1969—KVOR-Radio in Colorado Springs asked Kaman to write a computer program for generating daily program logs and monthly invoices.

- 1969—First color TV returns from the Apollo 11 successful moon mission (with over 1 billion viewers).

- 1974—IGM introduced the first cartridge playback unit to use a microprocessor.

Consequently, it was the development of magnetic tape recorders right after WWII, the evolution of the cartridge machines in the 1950s, and the microprocessor of the 1970s that have brought automation to its present state.

It can be seen that coupling business operations to a business computer was an early, and continuing, emphasis in broadcast automation. But more dramatic in the recent trends has been the adaptation of microprocessors to dedicated control systems for total automation. At NRBA it appeared that this trend has progressed in an orderly fashion, with station-conscious manufacturers implementing systems that would be precisely dedicated to station use. We have been told that

continued on page 38

We gave you one-inch.

In the last few months, you've had a chance to do some serious thinking about all the new products displayed at this year's NAB Show. Sony Broadcast products. And products by other manufacturers, too.

You've read about them.

You've talked about them.

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And by now, one fact should be obvious.

There's a new dimension in broadcast equipment. One-inch. It's here, and it's here to stay. The SMPTE Type C Standard proves it.

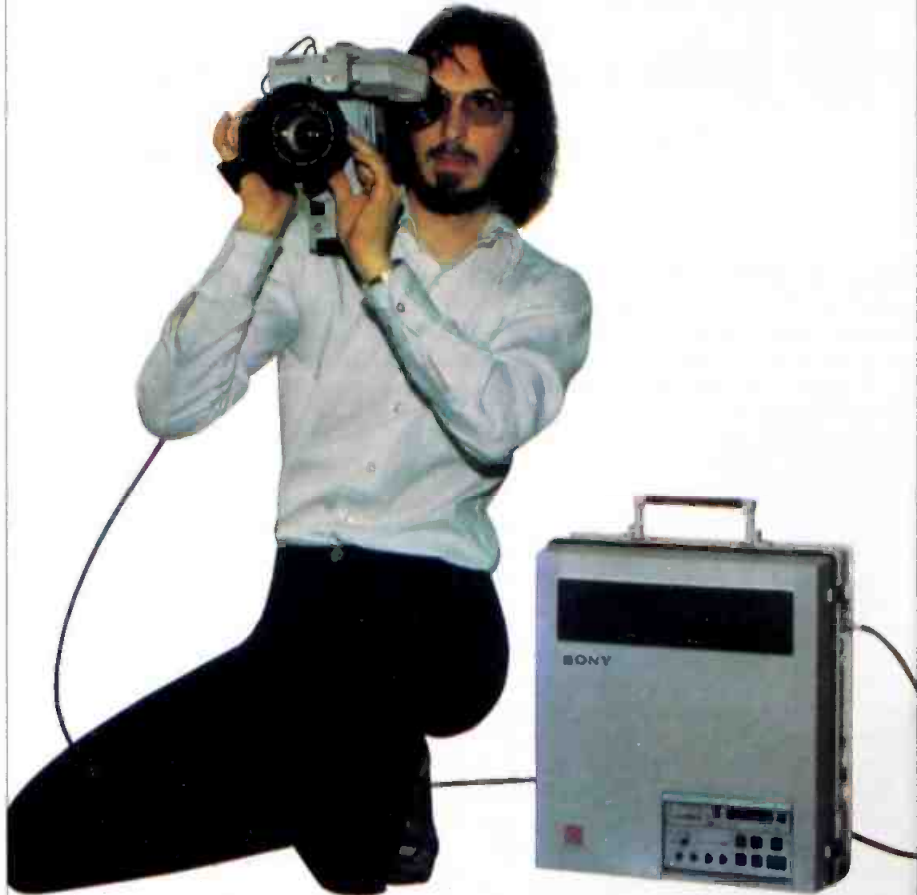
The width of things to come.

Sony Broadcast BVH Series 1" recorders, as we've been saying for some time, are part of a change that will affect every aspect of video production and broadcasting.

But it's one thing to say it. And it's another thing to see it happen.

Because broadcasters and production facilities have taken our one-inch equipment, and run with it.

From coast to coast, Sony Broadcast BVH-1000 recorders are lending their unique advantages to more and more



professional video applications.

Advantages like BIDIREX. That gives you full bi-directional search capability in both forward and reverse, with recognizable picture – even at more than 30 times normal speed. And also lets you position the tape reels as if by hand, for the "film" feeling top creative editors demand.

Advantages like single-camera technique. Because you've got 100% post-production creative freedom, you can use the one camera/one recorder setup once possible only with film. No more dependence on "on the fly," editing using

production switchers. Yet you still retain all the economic advantages of video.

And other economic advantages, too.

The BVH-1000 costs less to acquire. Takes up less space, so you save room in the studio. Cuts down on maintenance costs. And gives you the dramatic savings of 1" videotape, that costs only about half as much as 2" tape.

With a system this good, we predict you'll go far.

And the advantages of one-inch recording don't end in the studio.

Now there's a fully porta-



Now take it a mile.

ble 1" recorder from Sony Broadcast. The BVH-500.

The BVH-500 weighs just 43 pounds, including tape and battery. Operates for 90 minutes on a single rechargeable Ni-Cd battery. And delivers more than an hour of non-stop recording time from each reel of 1" videotape.

To give you continuous usable video for the full length of that tape, the BVH-500 features auto back-space assemble editing. Which achieves scene-to-scene transitions without picture breakup.

And naturally, there's more. Full monitoring capability. A unique video confidence head, to tell you your RF signal is on the tape. Digital servo system, to minimize gyroscopic error. Built-in SMPTE

time code generator. And rugged housing, that stands up to extreme field conditions.

But here's the best part. Our BVH-500 is fully compatible with our BVH-1000.

That means you can record in the field, on 1" tape. Then bring it home and edit or broadcast without converting to another format.

To wrap things up, we've got the best tape.

We gave you a 1" recorder that's revolutionizing studio and field production techniques. The BVH-1000.

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And in case you hadn't heard, we'll let you in on the best 1" tape to use with your Sony Broadcast 1" equipment.



That's right. Sony 1" tape.

We make all of our V-16 Series 1" High-Band Master Videotape ourselves. That makes us different from just about any other manufacturer of video recorders.

Since we make both recorders and tape ourselves, we know how to produce a tape that gets the most from our equipment. After all, we want our tape to make our recorders look good. And vice-versa.

So for wide frequency range, high signal-to-noise ratio, minimum dropouts, and precision winding, always choose Sony V-16 Series videotape for your Sony Broadcast BVH Series equipment.

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We've given you one-inch.

Now, give us a chance to prove how far it can take you.



SONY BROADCAST

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Figure 1. The BASIC A audio control system utilizes three separate microprocessors to handle commands, control functions and print out the records. The article here describes engineering decisions behind the design and development of this system from concept to finished product.

Automation

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this effort has required extremely close cooperation between the manufacturers and the microprocessor source to be sure of success.

From this brief sketch it is obvious that automation has had a long growth phase in coming of age. While the computer, and especially the microprocessor, has been the chief tool making this growth possible, it has been the combined efforts

of key industry people which has made that growth truly productive.

In the accompanying article we have asked IGM/NTI to trace some of the steps in the development of a system significant in broadcast automation. To do so they had to discuss one of their own systems to provide in-depth details. But, it was interesting to note in discussions at NRBA that other industry leaders experienced similar growth pains and expressed similar dedication of efforts in bringing forth new systems to serve the industry. Conse-

quently, the article by IGM may well be considered representative of what must be done in evolving a new system from concept into an industry-accepted product, especially in the high-technology area of automated broadcasting.

Following the IGM article we have touched on some of the systems shown and discussed at NRBA convention in San Francisco held September 17-20, 1978. Other sources may be found in the **BE Buyer's Guide** published in September.

Automation: Designing a new controller

*By Nick Solberg and Charles Minzel,
IGM/NTI, Bellingham, WA*

■ No single factor determines why a manufacturer decides to invest months of research and thousands of dollars in a particular new product. Product development is not creation in a vacuum, an ethereal inspiration, nor the engineering of new equipment just to have something different to market. It is a cry from an industry, the answer pro-

vided when enough potential users say, "it sure would be nice if we had X to achieve Y."

Therefore, IGM's decision to enter a lengthy design program of an English language programming control/switcher, designated BASIC A, (see Figure 1) came as the result of its key position in manufacturing products conceived in re-

sponse to economic laws of supply and demand. Briefly, here is the progression of broadcast equipment in the industry from about 1950 to the present:

- syndicated formats on reel
- development of simple multiple playback cartridge units (SMC Carousel)
- simple switchers using real-time clocks to manage several audio sources
- introduction of first INSTANT random access cartridge playback device (IGM Instacart)
- program control system using a mini-computer and disk memory (IGM 700's)
- solid-state programming/switching control units that used a digital code (IGM RAM, Schafer 903 and 902, Harris 90, SMC DP-1)
- first cartridge playback unit using a microprocessor (IGM Go-Cart)
- manual assist remote control using a microprocessor for disk jockeys (IGM MARC VII), and

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- Split carrier sound detection speeds troubleshooting and alignment of the aural transmitter because no vision carrier is required.

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Improve your program sound

- Synchronous detection and dual video detectors operating in phase quadrature facilitate measurement of the incidental phase modulation of the vision carrier that appears as noise in the received sound.

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If you think there's a problem with the performance of your transmitter or antenna system but you're not sure, choose our 1450. The Transparent Demod will clear the air for accurate, reliable television transmission.

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Automation

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• BASIC A, the first English programmer.

BASIC A was a natural leap forward as broadcast technology grew, responding to a need for better operator-computer communication, better management of memory means, and reduction of operator time in pre-programming a station format.

Relying heavily on feedback from key people actually engaged in radio station operation, IGM/NTI assembled the parameters for its new control system. Simultaneously, salesmen were queried as to how many X units could be sold in their territories. A rough draft of X unit was composed so that accounting and marketing departments could price components, determine availability of parts, and ultimately comprise an estimated selling/cost price relationship, based on numbers to be produced vs. manufacturing costs. Research and development costs, by now closely estimated, would have to be amortized over

such numbers of projected sales, too.

When feasibility studies were positive, rough plans began to narrow to specifics. The overall purpose of the device was defined comprehensively, including such details as:

- Compatibility with existing hardware in the field (so user wouldn't have to buy new gear).
- Easy communication with human operator from control unit, which meant ENGLISH.
- Decision for a CRT readout of programming.
- Decision for modular programming concept, where formats could be entered into memory and recalled as a block.
- Amount of total memory required for the tasks involved.
- System should perform tasks as simply as possible for operator comprehension.
- Error protection for operator—improper commands to be recognized or rejected.
- Physical appearance of control unit, color of case, etc.
- Sources to be controlled by such device.

• Engineering to include ease of maintenance.

• I/O port to be provided for later addition of automated traffic and billing systems by user.

Engineers now knew what the control system must do; the task was to devise means of accomplishment. Two facets needed coordination: the physical or mechanical aspect—such matters as keyboard selection, CRT type, OEM components like VU meters, logging means, printer, etc.—and the software, by far the greater task.

Software development consisted of a series of continuous, closely related stages: (1) Problem definition, (2) Program design to implement that task or problem, (3) Coding, (4) Debugging, (5) Verification or testing of software written, and (6) Preparation of documentation such as maintenance manuals, operations manuals.

In defining a problem and the resultant program to achieve a solution, IGM's engineer used a flow chart—a logic diagram or master design. A sample portion of an actual flow chart is illustrated in Figure 2.

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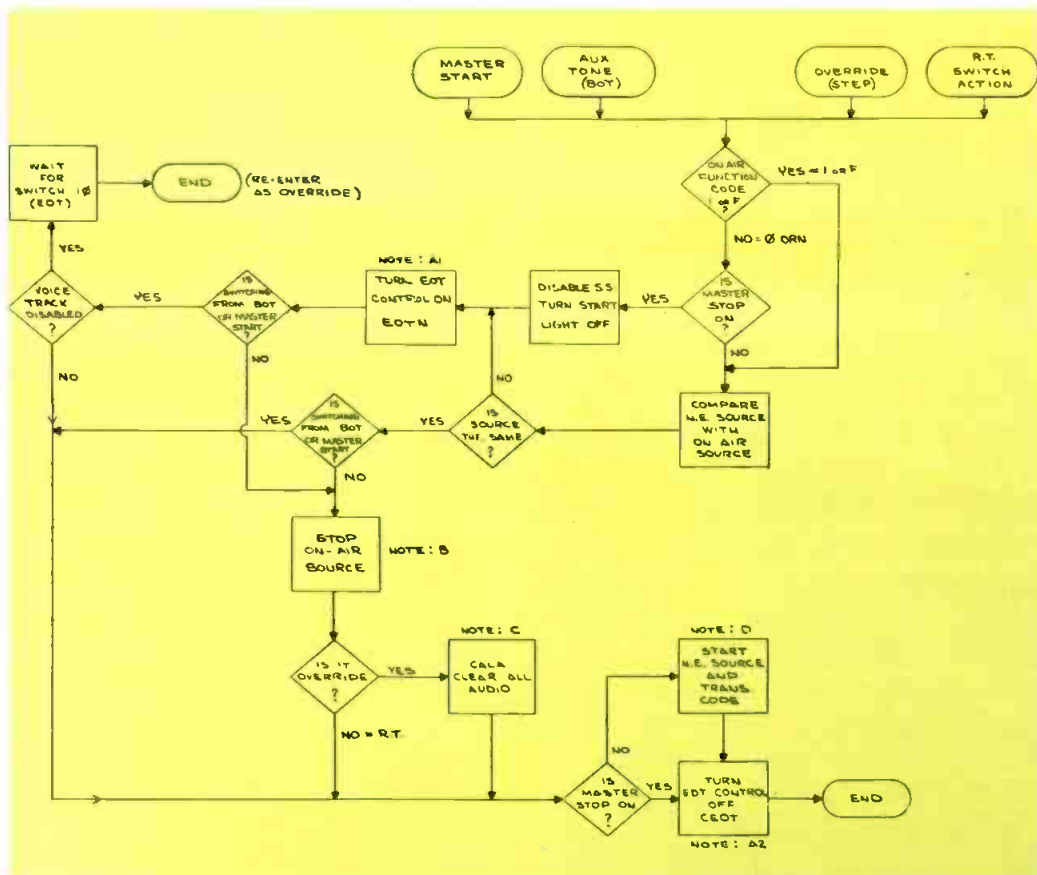


Figure 2. Engineer's actual flow diagram used to thoroughly define a design problem and its resultant solution.

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Automation

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IGM decided to use three Intel 8085 microprocessors in the design, if possible. Before such critical component decisions could be finalized, the manufacturer had to be consulted to ascertain the availability of the component (the Intel 8085 in this case) at projected time of completion. This seems elementary, but a designer may eagerly seize upon a capable component only to find that it is still in research status and has limited production. Intel worked closely with IGM and extended full benefit of its engineering experience with the 8085, its latest microprocessor which had suitable delivery schedules projected. One criterion for selection is that the 8085 runs on a single 5-volt power supply, which the earlier and popular 8080 could not handle.

IGM's reason for splitting the tasks of BASIC A into three portions was to avoid over-utilization of any one microprocessor, to facilitate separations of specific functions, and to implement a certain amount of redundancy (because the monitor panel processor is capable of acting

as a back-up controller, if the central processor fails).

Here are the chief duties of the three separate microprocessors: **Number 1** is the central processor unit (CPU), master of the system and clearinghouse for all intercommunication of the various aspects of the system. The operating software inherent to the RMX-80 and the additional software written by IGM is stored in a PROM memory (32K capacity), to be queried as needed by the central processor. The central processor also keeps track of the broadcast schedule stored in RAM. It manages clock time, sends commands to the other two processors in accordance with the programming, analyzes the responses and communicates with the human operator through the keyboard and CRT. (See Figure 3.)

Number 2, the audio processor, is a separate logic function, and "intelligent" controller because it can process commands received from the central microprocessor and return status information. For its

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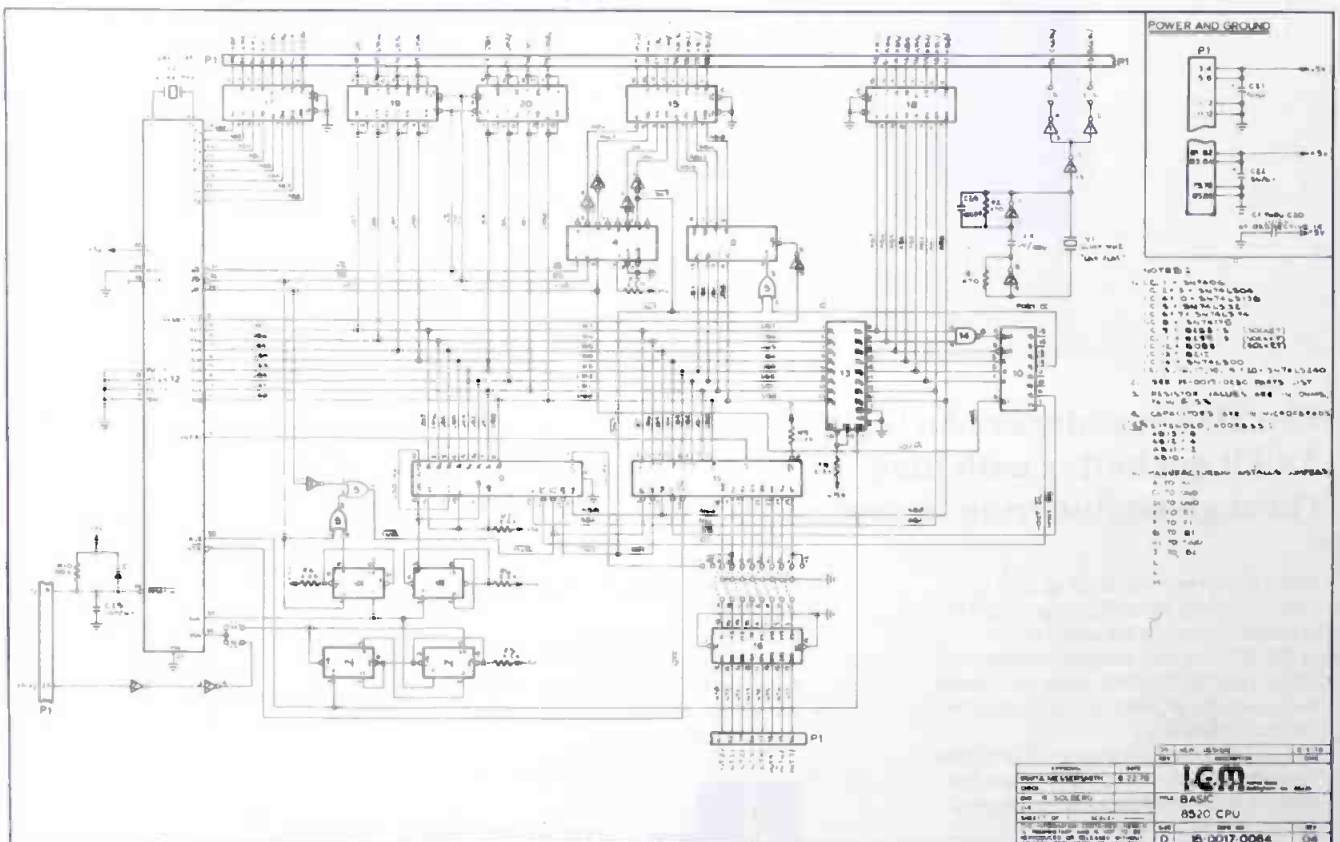


Figure 3. IGM's BASIC A audio control system uses three Intel 8085 microprocessors. Shown here is the CPU that serves as a clearinghouse for intercommunications.

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operating instructions it needs only a PROM of 1K capacity. Essentially, it actuates and controls all of the hardware being managed such as tape playback units, reel-to-reel units, live studio, etc.

Number 3, processor is the operations manager, handling the monitor panel functions such as permitting the operator to preview audio sources before they are selected or monitor on-air audio, controlling monitor volume and VU meter switching, starting or stopping playback units, and such details. The operator can manage the hardware or playbacks from the monitor panel; in fact, a station could use the BASIC A simply as a manual assist device in an emergency.

The systems configuration for BASIC A is shown in detail in Figure 4. Not how the keyboard is interfaced into the main microprocessor, how the main CPU acts as a receiver and router for all system

inputs, and how the audio chassis can handle up to 16 source cards.

The eventual capabilities of the BASIC A control system were broken down under the three categories based on microprocessor functions. Tasks to be performed by each of the groups were defined in another flow chart or diagram. Linking the three microprocessors were RS232 interfaces used to isolate the microprocessors and to channel the orderly input and output of information. IGM software designers, used Assembler Language for the programs under RMS-80, Intel's real-time software support system, which is highly modular in design. There was very deliberate reasoning for this choice. Since broadcast programming of formats is basically modular, where blocks of schedule items really do not change appreciably hour by hour, the use of RMX-80 relieved the designer of writing a special operating system.

True, the order and arrangement of such broadcast schedule items do vary but such variations are somewhat finite.

Therefore, the operating system of RMX-80 was utilized to implement the purposes of BASIC A's broadcast schedule and switching responsibilities as described below:

Primary software is broken into eight modules. The RMX-80 is a fixed-priority, multi-tasking operating system ("fixed-priority" meaning that each task is assigned a priority or "pecking order," and those priorities never change). When there is more than one task ready to run, a typical situation in broadcasting, the task with the highest priority will be executed first by the CPU. In other words, within the processor a "scheduler" resolves conflict between the demands and defers to the task with the highest fixed priority. In practice, internal

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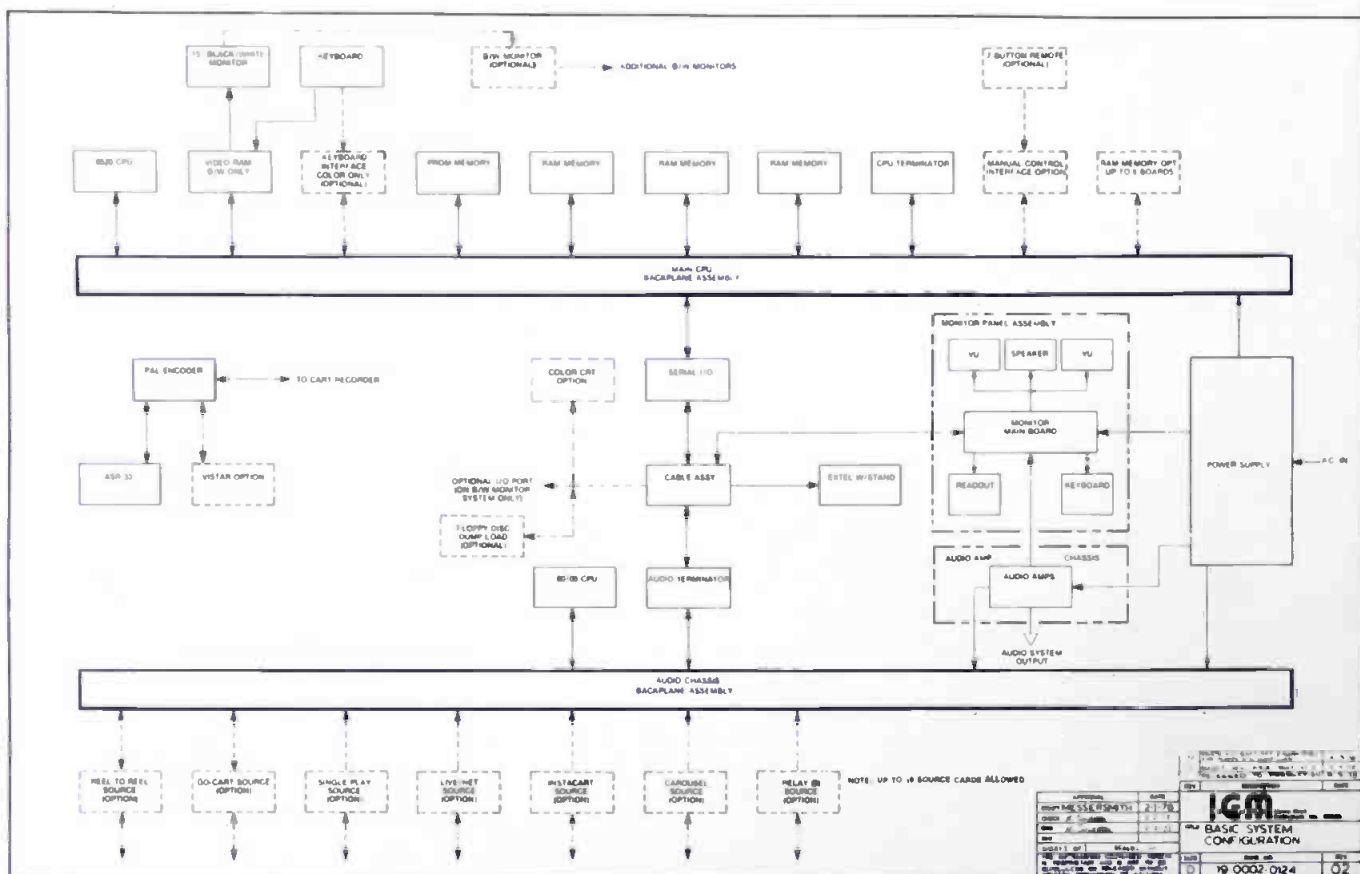


Figure 4. The BASIC A system configuration details the interface between the keyboard and the main microprocessor, and shows how the main CPU acts as a receiver and router for all system inputs, as well as how the audio chassis can handle up to 16 source cards.

Imagine an EFP system with one tape format for field and studio —and a proven track record worldwide

The Bosch Fernseh KCA-BCN lets you shoot in the field and play back in the studio *without changing VTR formats*



Here is a remarkable electronic package from Bosch Fernseh that is on the job right now in working applications in the U.S. and around the world:

- The BCN 20 recorder, the first portable VTR with a 1-inch tape format compatible with a full size studio machine;
- The KCA 90 color camera, providing ENG mobility without a backpack and EFP versatility in a C.C.U. mode.

The system begins with the SMPTE Type B tape format (see diagram), a development of Bosch Fernseh research that made it possible to put 2-inch broadcast quality on a 1-inch format. We introduced it in 1975 on the Bosch Fernseh BCN 50 studio recorder.

But the BCN 50 was only the beginning. The Bosch Fernseh 1-inch breakthrough opened the way for an even more remarkable possibility—portability without sacrificing compatibility.

No need to switch formats

The secret was in the scanner. Its small diameter (50mm), short track length and 190° wrap made it perfect for mobile applications: The result was the Bosch Fernseh BCN 20.

With the 48-pound BCN 20 you can tape up to 65 minutes in the field and edit or even broadcast in the studio without switching formats—without losing a generation.

The scanner is so compact it's practically immune to the gyroscopic effects of sudden motion inherent in the other 1-inch systems with larger scanners. You can use the BCN 20 in a moving car and never worry about serious variations in performance.

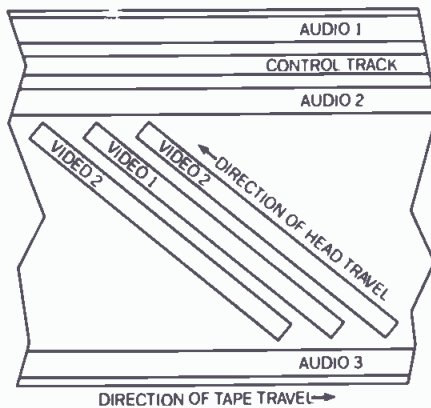
Lock-up time is *ten* times faster than the other 1-inch systems, a remarkable

2.5 seconds. And the BCN 20 has the only 1-inch format that is being developed as a cassette as well.

KCA ideal for ENG or EFP

The versatility of the BCN 20 tape format is matched on the camera side by the Bosch Fernseh KCA 90.

TYPE B FORMAT



Segmented audio and video tracks of the BCN format. Tape crosses the scanner at a 14.3° angle.

The basic mobile unit is completely self-contained, save for the battery belt and charger. You can shoot for 1½ hours without recharging.

All the electronics of the KCA 90 are in the camera head. This does away with the usual backpack associated with "portable" cameras. The entire KCA 90, including its standard 1.5-inch viewfinder, weighs less than 19 pounds.

On production jobs—either in the studio or with an O.B. van—the KCA 90 has even more impressive advantages. You can replace the standard viewfinder with an optional 5-inch screen. And the camera can run in a C.C.U. mode giving you a full range of remote control adjustments, including chroma key signals and RGB monitoring.

The KCA 90 is a camera system, not just an ENG unit. Other features include: automatic sync-timing, iris and b/w balance; flare compensation; and genlock facility for easy matching with other cameras.

Ask for a free demonstration

The Bosch Fernseh KCA-BCN system is something you have to see to appreciate, especially if you have doubts about the production capabilities of a mobile system.

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Automation

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requirements of the operating system—like clock updates and aux tones—take precedence or higher-priority over programming, for example. The very brief fraction of a second needed to handle the higher priority item, however, would not even be noticed by the programming person. It merely means that the system keeps itself on time or on cue—a high priority necessity.

Here are the essential duties of the eight modules of the BASIC A software written permanently into the 32K PROM for the central processor:

SYSINT (System Initialization)—The highest priority task, the portion that gets control when the system is powered up.

SIOR (Serial I/O Port Handler)—When the main CPU wants to send a message to the audio processor, monitor panel, Extel printer or Techtran disk drive—or wants to receive data from any of these—it passes through the SIOR.

BCLI (Keyboard interrupt handler)—When a key is depressed on the keyboard, it causes an interrupt which RMX-80 handles, passing the key stroke first to BCLI. BCLI examines the key stroke and pro-

cesses it in a variety of suitable ways.

Clock—The clock receives control once per second. Its function is to maintain the system's date, time, day of week, Julian date, broadcast day, etc.

VRMDVR (Video Ram Driver)—The driver's function is to interface to the CRT, handling such things as cursor positioning, and displaying information on the screen. It has additional duties in the optional color CRT that is available on BASIC A.

LOGGOO—Cues up messages to be logged. Its primary function is to allow messages to be stacked up or "buffered" in the event that you are logging faster than the Extel can print.

RTAXOO—Handles all real-time switching tasks.

UTILOO—Governs all three modes of BASIC A—the on-air, utility and programming modes. These three are separate logics within BASIC A, only one mode can be viewed at a time on the CRT. They are "mutually exclusive."

Finally, all of the above decisions as to distribution of labor and

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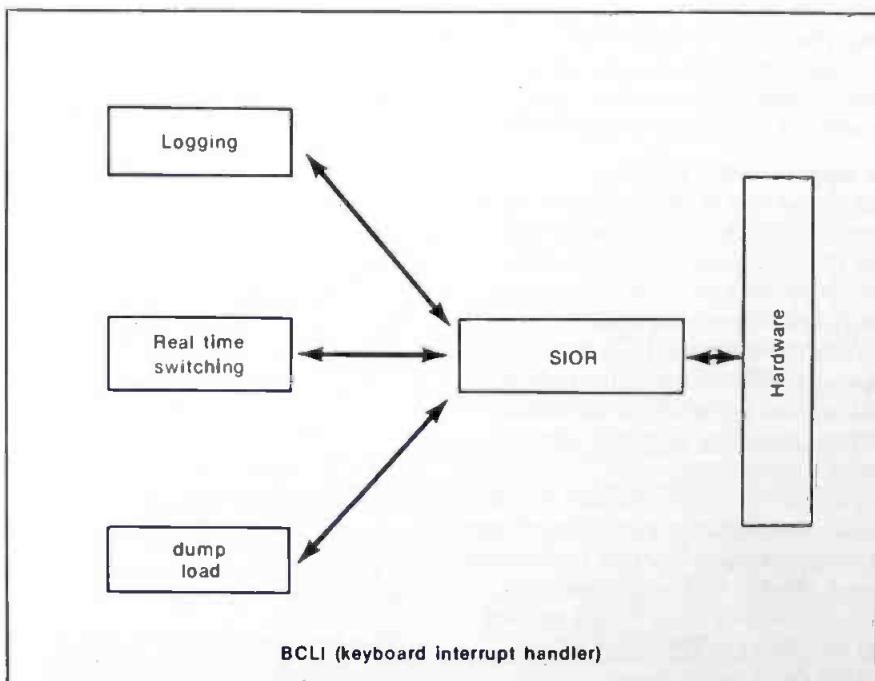


Figure 5. The SIOR serves as an interface that lets the CPU command system components.

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manner of design are drafted in an orderly fashion. Only now does software writing begin. Software coding is a sort of clerical task, somewhat like typing the letter after you have decided what you're going to say.

Today, system engineers often say

that design consists of 20% hardware design and 80% software. Of the software, 40% of the time is devoted to planning or design, 20% to writing the programs, and 40% for testing or validation of programs. Each function that BASIC A is to perform is outlined separately

and the suitable instructions written. As an example, let's take the function of setting the station ID and location on top of the CRT. When the system is powered up, system initialization places on the screen the following (See Figure 6):

Here's how operator performs just one step:

- Depresses keyboard key to cause cursor to indicate the line on the CRT saying "Set Station Identifier."
- Press return key, whereupon the CRT indicates "Station, City and State—Change."
- Operator enters 25 characters, like: "WZZZ, Toontown, Ohio,"
- Operator hits return key. (End of this task)

The actual software written to implement the above function or task is shown in Figure 7.

Similarly, there is a set of software to cover every single function that must occur in the operation of BASIC A. All of BASIC A's software is written in Assembler Language, somewhat more expensive and difficult in initial writing but which, once written, makes more efficient use of memory space than certain other languages.

Although computer and microprocessors operate digitally, it is the interface with human beings that makes English language desirable. Thus, in the BASIC A control system, each operator instruction is converted into English from digital code to appear in readable form on the CRT. Behind the scenes, the English phrase "Avail" that appears on the CRT is discernible to the processor as:

41	56	41	49	4C
A	V	A	I	L

Such code is standard HEX ASCII Language (American Standard Code for Information Interchange). ASCII is an industry-wide standardization of meaning for each of 256 possible digital combinations—instead of having every computer user assign his own arbitrary meanings to these codes.


Upon completion of all software writings, there begins the tedious and exacting period of double-checking every single function and

continued on page 52

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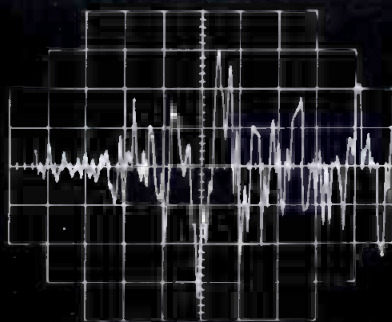
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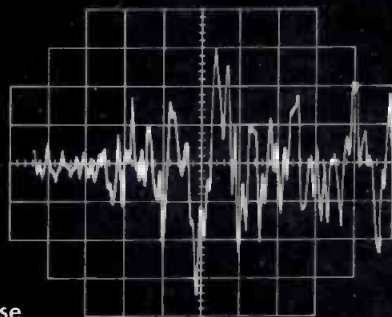
THD as low as 0.02% says a lot about any amplifier. But oscilloscope readings show it all. Look at the waveforms. The output waveform of the SE-9060 is virtually a mirror image of the input.

One way Technics achieved this goal was with dual FETs in the differential amplifier. They give the SE-9060 the DC stability necessary for the highest gain in the crucial first stage. While the constant current load and current feedback used in the voltage amplifier keep distortion to a minimum.

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Output Waveform.

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POWER BANDWIDTH: 5 Hz-50 kHz, -3 dB. **S/N:** 120 dB (IHF A). **RESIDUAL HUM & NOISE:** 100 μ V. **INPUT SENSITIVITY & IMPEDANCE:** 1 V/47 kilohms. **INTERMODULATION DISTORTION (60 Hz: 7 kHz, 4:1):** 0.02%. **FREQUENCY RESPONSE:** DC~100 kHz, +0 dB, -1 dB.

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Automation

continued from page 50

inter-relationship of the control system, connected now to the hardware it will control. Designers attempt to determine every conceiv-

able aberration that might be entered by an operator and to write software blocking incorrect or invalid entries. Despite such care, the

"de-bugging" phase could extend over into actual practice for the first few units. Concurrent with the final wrap-up of a design, internal software is documented by the designer. It is essential to describe how the software is structured, so that persons other than the original designer (or even the designer himself a few months later) can understand how a problem was approached and implemented. Imagine the chaos if this were not done, if the original designer left the firm, and no one else knew what his approach might have been!

Further documentation at this phase consists of writing of a maintenance manual in orderly and specific terms, for the guidance of customer service personnel and station engineers. Next is an operator's manual, detailing exactly how to use the system, to enter schedules, and all normal broadcast programming procedures. It should be emphasized strongly that the OPERATOR or USER of the control system does not need to know how the microprocessor works, how the interfaces achieve their tasks, or how the system is designed. All he has to know is what to do to make the system work, to achieve the programming methods he desires. An analogy is that, through the controls, the driver of an automobile may know how to govern the engine to get to his destination, but need not have any idea how the pistons, carburetor and other mechanisms work. It is IGM's opinion, however, that in today's world—where microprocessors appear in cameras, calculators, machinery, and hosts of common uses—the broadcast engineer must be given the instruction needed (in seminars or advanced study, for example) to update his technology from the tube and transistor era.

BASIC A is what the industry calls a "friendly system;" manufacturers always keep the end user in mind. It's easy to operate and very forgiving. You don't have to use a lot of obscure digital codes. Most operator errors are blocked by software from causing trouble. If you put an extra space or two in some instruction, the system doesn't

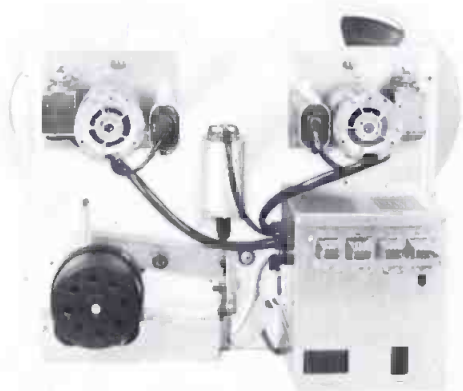
continued on page 56

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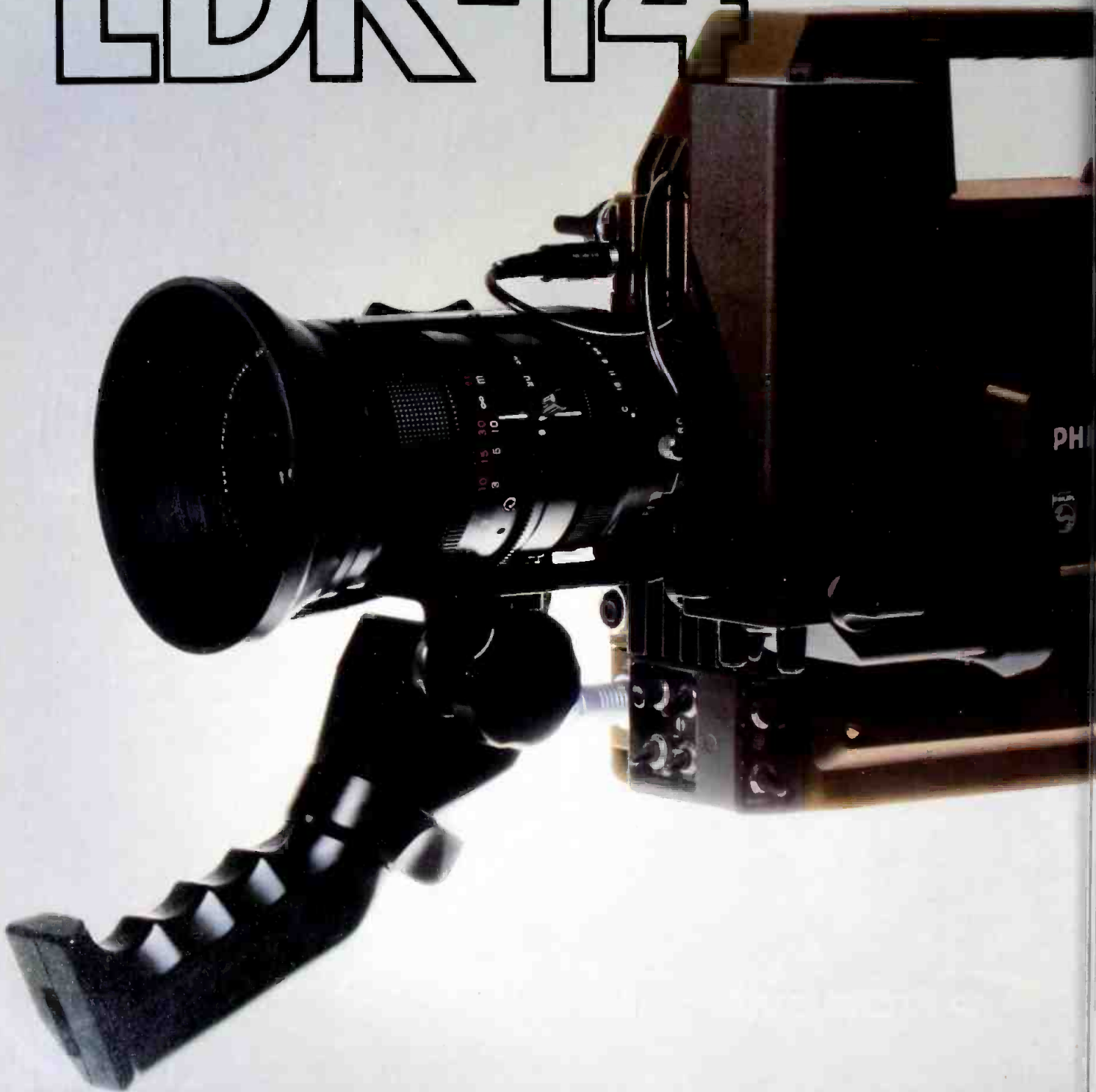
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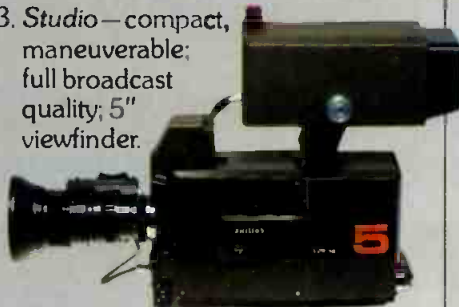


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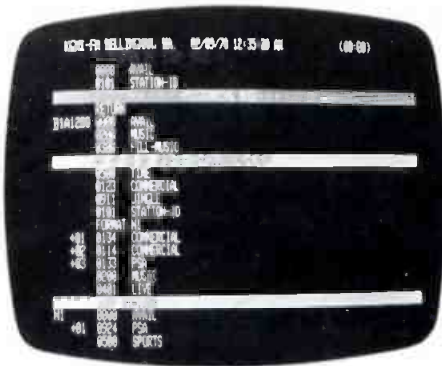
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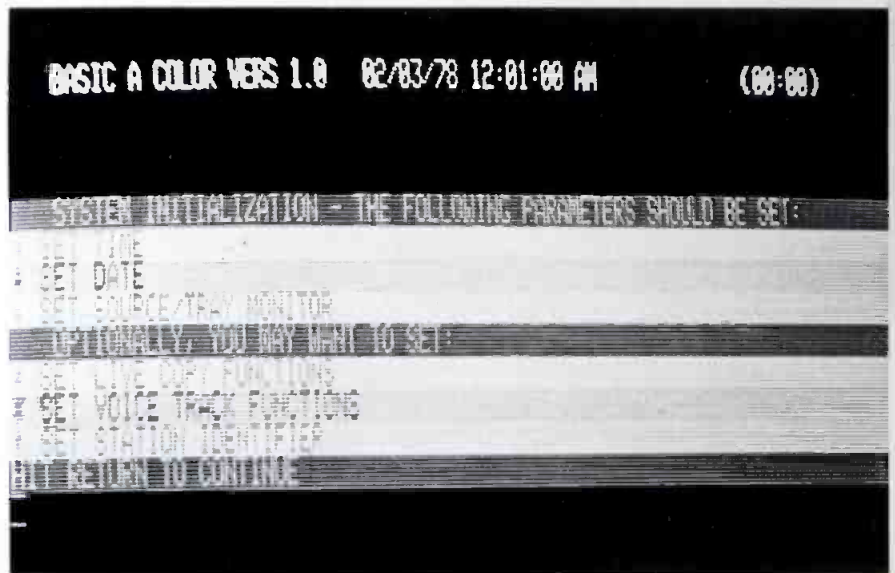


Figure 6. The CRT screen looks like this once the system is powered up and ready for setting the station ID and location on top of the CRT.

Automation

continued from page 52

care and accepts the command—but commands potentially damaging to the system's schedule switching or other critical matters are rejected. The whole purpose of using modern technology is to create a very sophisticated piece of gear that can be operated in a very simple, foolproof manner. As indicated above, the end user really does not have to know how the "black boxes" work. □

Editor's Note: Our thanks to JoAnn Burkhart of IGM for her efforts in coordinating this story underlying the development of the BASIC A audio control system.

We fully acknowledge that the development story covered here is limited to IGM's specific system.

However, we wanted to provide some instruction, the system doesn't ing processes behind a significant system for broadcast automation. In presenting that insight, IGM could only speak authoritatively about their own efforts. It is significant, however, that when we discussed similar developments with other firms at the NRBA '78 Convention in San Francisco in September, those firms faced similar critical decisions—and these obstacles were resolved using the expertise of key personnel, the availability of preferred hardware, and the close cooperation of the microprocessor source. Much of this will be covered, insofar as possible, on the following page and continued in the December issue.

continued on page 58

0040	CD0000	E	241	STANDR	CALL	DSETP	SET STATION HEADER ROUTINE
0050	ES		242		PUSH		CLEAR THE SCREEN
0051	2E07		243		MVI	H,UTLINE	PUT BACK ARROW TO INDICATE LENGTH
0053	2E1A		245		MVI	L,STALEN+1	
0055	CD0000	E	246		CALL	CONLC	
0058	3E3C		247		MVI	H,7C	
005A	E1		248		POP	H	
005B	110000	E	249		LXI	D,STANSQ	DISPLAY STATION MSG
005E	CD0000	E	250		CALL	FILDFP	
0061	CD0000	E	251		CALL	GETLIN	GET OPERATOR'S STATION HEADER
0064	118602	C	252		LXI	D,STATOP	POINT TO UPDATE TABLE
0067	CD4602	C	253		CALL	TOPLIN	REWRITE TOP LINE
006A	C91D00	C	254		JMP	UTILA	GET NEW UTILITY COMMAND

Figure 7. The software used to set the station ID and location.



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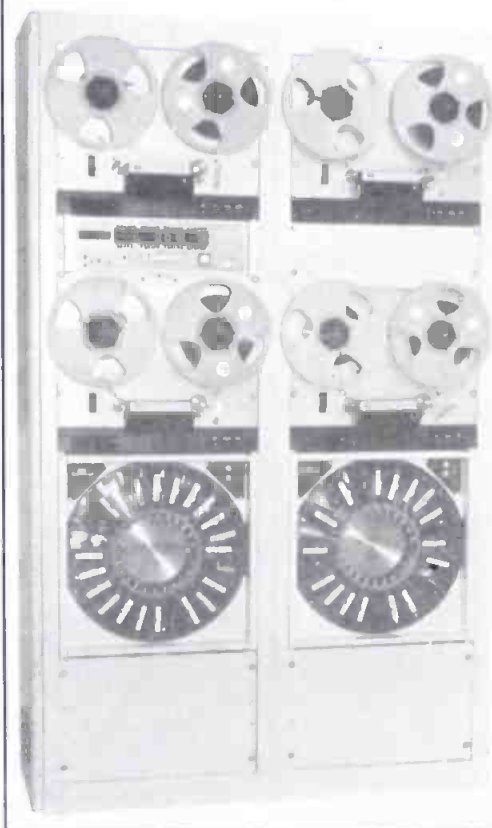
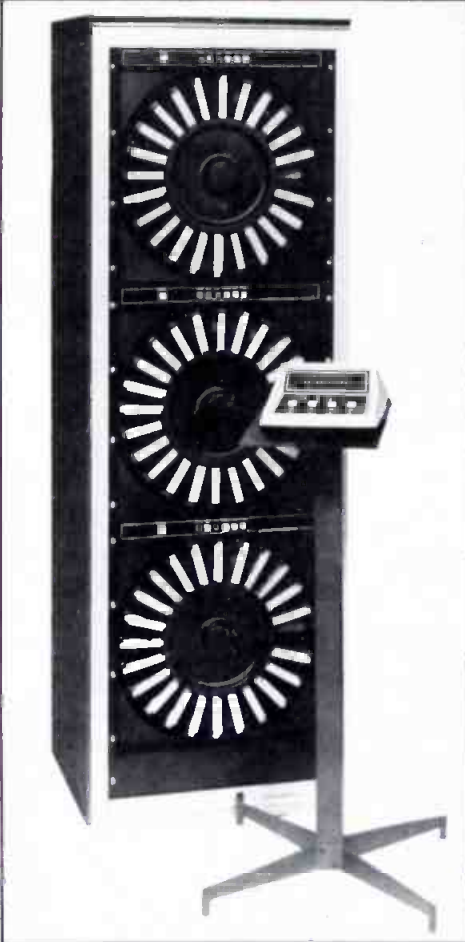
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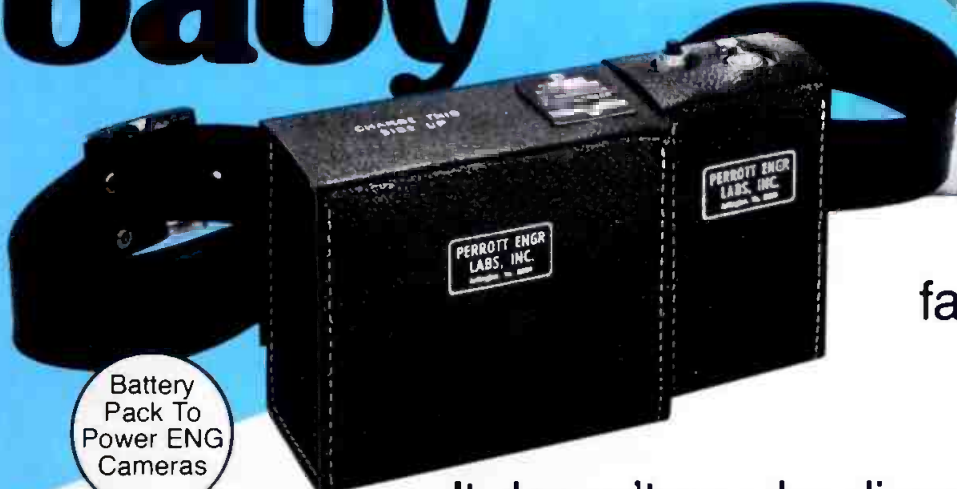
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Automation at NRBA

At the NRBA Convention in San Francisco a number of manufacturers displayed their individual systems for automation in various aspects of radio. The above collage illustrates a sprinkling of these systems and their data printouts. This article will be continued in December with a brief description of the hardware, software, and special features of the systems being marketed by organizations at NRBA.



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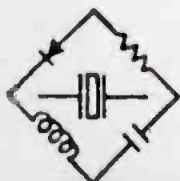
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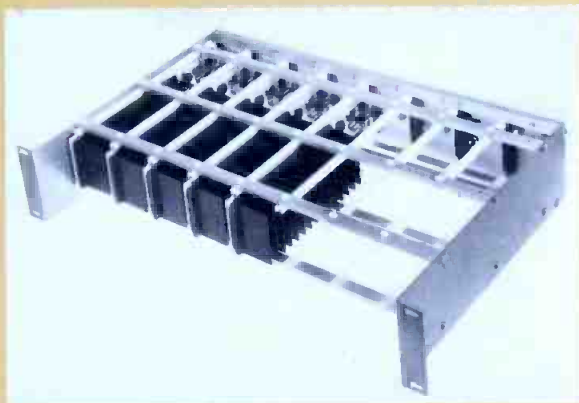


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Synchronous detection beats quadrature distortion in demodulator

By Claus Wittrock, Philips Radio, Test and Measuring Instruments

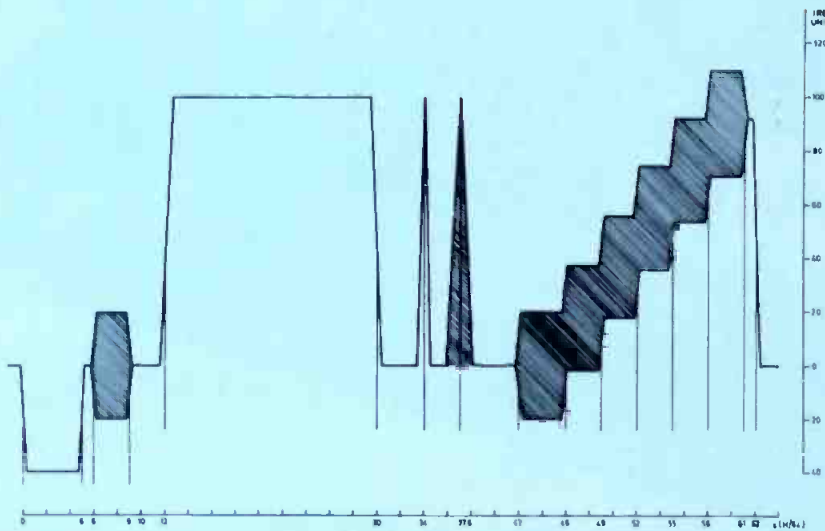


Figure 1A

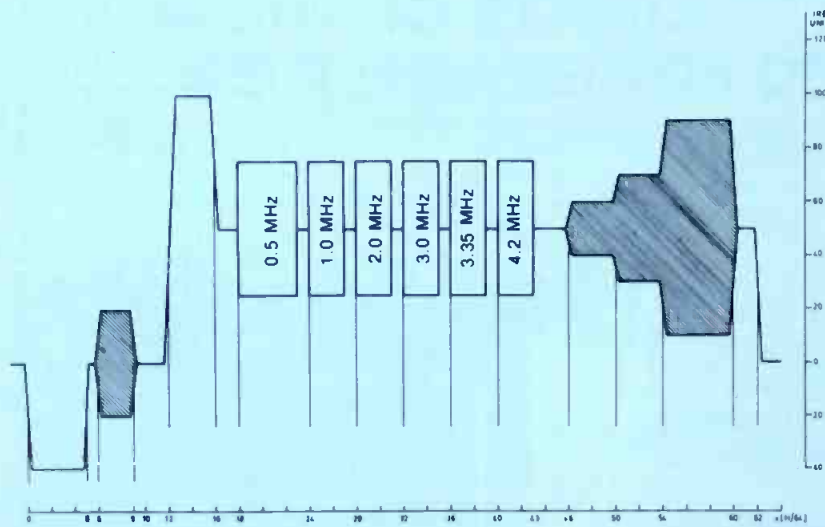


Figure 1B

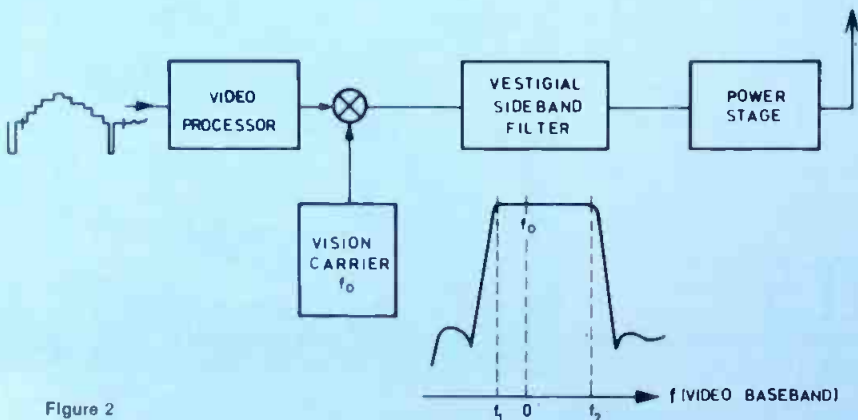


Figure 2

The use of synchronous detection instead of the usual envelope detection in a Nyquist TV demodulator overcomes one of the major problems in broadcast quality control by eliminating quadrature distortion. This allows quantitative testing continuously at full modulation depth, essential for testing during broadcasting hours.

Monitoring transmitter performance is an essential part of video chain testing. Generally this is carried out using a directional coupler in the transmitter antenna feed to pick up the signal or by picking up directly off the air. The broadcast signal is demodulated, normally using a high-quality Nyquist demodulator, and then checked.

Until recently, such testing has been possible only on a qualitative basis during broadcast hours. Achieving quantitative measurements meant reducing modulation depth to overcome the sort of distortion inherent in vestigial-sideband modulation.

Increasing broadcasting hours means that less and less time is available for full field testing with reduced modulation depth. Because of increasing quality demands, testing methods such as VITS (Vertical Interfield Test Signals) permit continuous checking during broadcasting. So, some method of monitoring was necessary to allow the use of VITS in the transmitter signals.

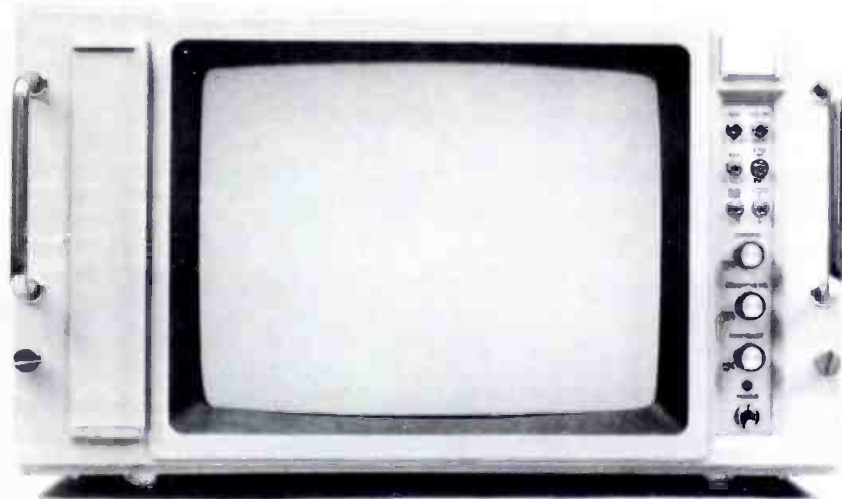
Basic parameters

Several basic parameters have to be checked on the transmitted video signal. Two main ones can be distinguished: Linear distortion (because of group delay and amplitude/frequency response of filters) and non-linear distortion (due to amplifiers and other active components).

Other checks which need to be

continued on page 64

It takes guts to run your video through an Ikegami broadcast monitor.



With twice as many image-making dots on its tube, an Ikegami color-tv monitor can show up in unnervingly high resolution a dozen or more things that could go wrong in your picture. Not just purple cows, but the smallest anomaly in linearity, the slightest picture distortion, the most marginal overload.

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You can get an optional remote control for brightness, contrast, and chrome.

We really shouldn't have to give you all the specs. The name Ikegami alone is enough to tell you how good they are. But if you do insist on more, ask Ikegami. Ikegami, the leading manufacturer of ENG cameras, manufacturer of the best in studio cameras, and now the best in monitors, too.



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Synchronous detection

continued from page 62

carried out include tilt and sag, modulation depth, signal/noise ratio and so on. The simplest method of checking all these parameters is to use VITS.

Two basic VITS signals are recommended for use with the 525 line NTSC color system: the composite test signal shown in Figure 1A and made up of a line bar, a 2T pulse, a 12.5T composite pulse and a 5-riser staircase with chroma; and the combination pulse shown in Figure

1B consisting of a white flag, multiburst and 3-level chrominance signal. The amplitude/frequency response, for example, can be checked using the multiburst, and is complementary to pulse-to-bar ratio and chrominance-luminance gain inequality measurements.

Linear distortions can be checked using several different parameters, including insertion gain and line-time waveform distortion on the line bar, short-time waveform distortion on the 2T pulse and chrominance-luminance gain and delay inequalities on the 12.5T pulse.

Non-linear distortions can be monitored by checking the lumi-

nance non-linearity using the staircase, the differential gain and phase from the modulated staircase and the chrominance-luminance intermodulation from the chrominance bar.

Quadrature distortion

Such signals and their analysis can provide a lot of information about the transmitting station—both the modulator and the transmitter itself. But the problem of quadrature distortion when envelope detecting a vestigial-sideband transmission tends to mask transmitter deficiencies.

The quadrature distortion problem is simple. Due to the vestigial-sideband filter in the transmitter, the double-sideband signal from the modulator unit is distorted to single-sideband signal, from the modulator unit is distorted to a single-sideband signal, when $f > f_1$. A block diagram of a transmitter is shown in Figure 2.

Later on in the receiver the Nyquist filter compensates for the difference in power between the double-sideband component ($-f_1 < f < f_1$) and the single-sideband component. But the Nyquist filter itself introduces a distortion of the spectra of the signal. The result is that the signal fed to the envelope detector in the receiver can be considered more or less as a single-sideband signal.

Figure 3 shows the difference vectorially between a double-sideband signal and a single-sideband signal, when modulating with a sinusoidal signal. The length OA represents the envelope-detected signal and the length OB the vestigial-sideband signal.

The vector OB can be resolved into an in-phase component OC and a quadrature component CB. Because of this quadrature component, the envelope of the modulated carrier is no longer a replica of the modulating signal. So when this signal is passed through a normal amplitude-responding envelope detector, the resulting signal will also contain the quadrature distortion. A typical example is shown in Figures 4A and 4B.

Modulation depth

As can be seen, the problem increases with the modulation depth. Near black, the distortion is minimal, but as the signal approaches the white level, distortion becomes very marked. Therefore, to obtain accurate measurement on the demodulated signal, the modulation depth has to be reduced—preferable to a modulation index under 30%.

Various methods are used to try

continued on page 66

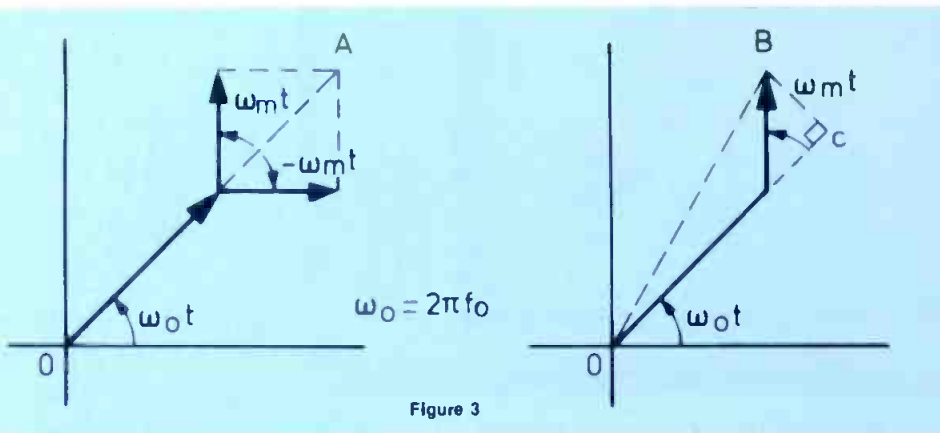


Figure 3

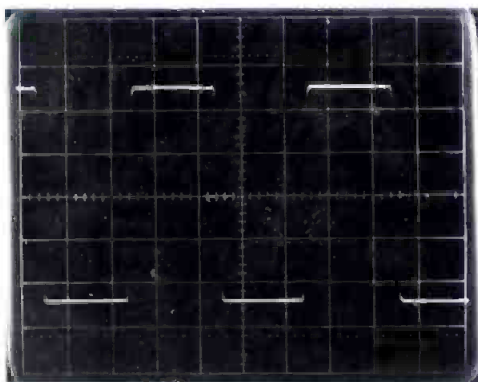


Figure 4A

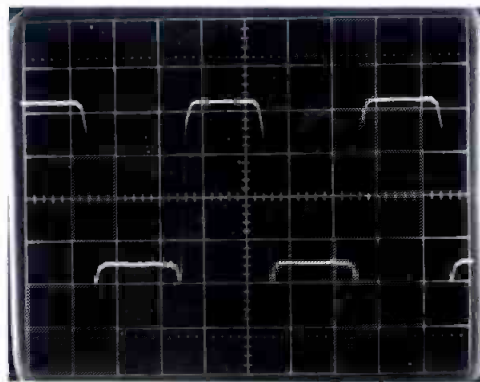


Figure 4B

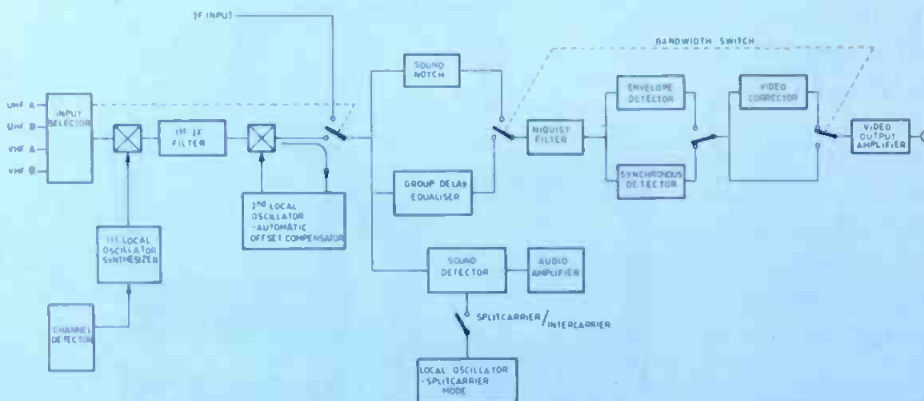
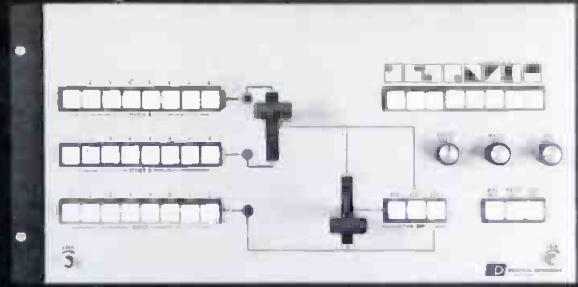
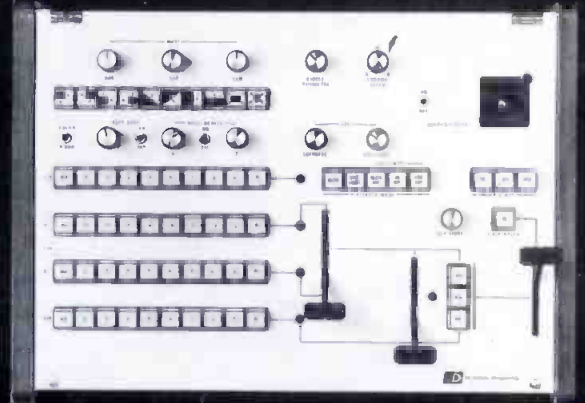


Figure 5

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VS-10



VS-14



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Synchronous detection

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to overcome the effect of this distortion. Perhaps the most widely known is that of providing precorrection at the transmitter to offset the effect of the distortion. This allows the envelope detection system to provide a reasonably faithful reproduction of the modulating signal.

Such a method is suitable for quality improvement of signals received with domestic receivers, but still leaves a lot to be desired for transmitter testing. Here the main problem is distinguishing between transmitter distortion and that of the transmitting method.

Synchronous demodulation

Quantitative testing can only be carried out accurately if the transmitter conditions are clearly established.

So, the solution must be some form of demodulation which will give the original modulation signal directly—no masking of transmitter faults by quadrature distortion. This

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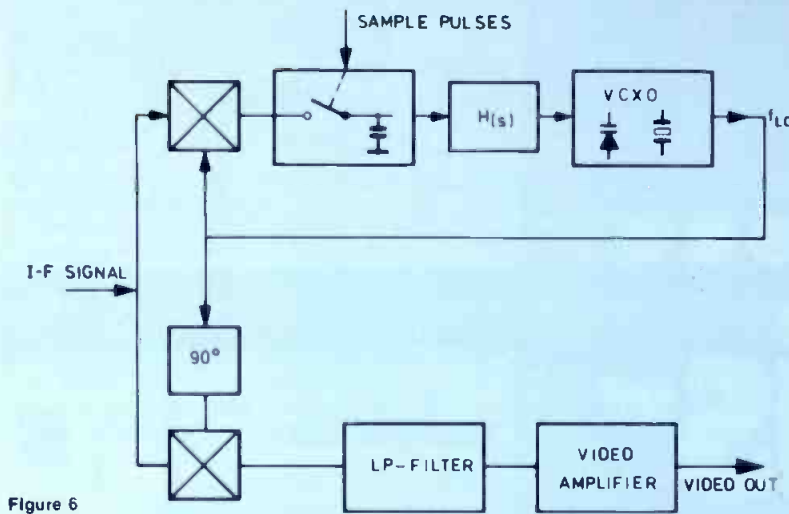


Figure 6

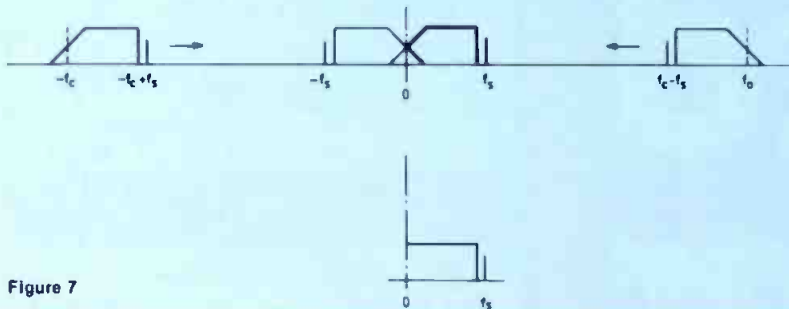


Figure 7

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"We needed a board to handle a great variety of tasks at the Superdome, and we checked out half a dozen different brands. The stretched version of the Auditronics 110 gave us the greatest flexibility for the lowest cost, and they customized it for exactly what we needed. With Auditronics modular design, we essentially got a custom board with the quality we required for the Superdome at the price of a standard item."

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If you'd like to know what WWL and over 300 other broadcasters and studios have learned about Auditronics quality and reliability, circle reader service number or call us.



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November, 1978

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67

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... an extra degree of excellence in video equipment for every application.

Synchronous detection

continued from page 66

is just what synchronous demodulation provides.

The block diagram of a Nyquist demodulator with both envelope and synchronous detection is shown in Figure 5. The broadcast signal is passed first through a broadband down converter from broadcast frequency to the IF of the demodulator, here 38.9 MHz. This converter does not affect the group delay.

Because of the vestigial sideband, the resulting signal has to be passed through a Nyquist filter to remove the vestigial sideband. At this stage, some group delay correction is carried out to adjust the conditions to the the standard group delay of a typical domestic receiver.

The filtered signal is then passed to a conventional amplitude-responding envelope detector or to the synchronous detector. The synchronous detector uses sampling and phase locking techniques to regenerate the carrier of the IF signal.

Straightforward operation

Operation is reasonably straightforward as the block diagram in Figure 6 indicates. The signal f_f from the filter stage is mixed with a signal f_L coming from a local oscillator.

The resulting signal can be written as:

$$p.f_f + q.f_L, \text{ where } p, q = \pm 0, 1 \dots$$

But, $f_f = f_c - f_v$, where f_c is the carrier signal and f_v is the video signal.

However, due to the phase-locked loop, $f_L = f_c$.

So, when $p = \pm 1$ and $q = -1$, the result is a signal $-f_v$. When $p = -1$ and $q = \pm 1$, the result is a signal of f_v .

Due to this mirror effect in the mixer, the missing sideband is regenerated and the demodulated output is equal to that of a double sideband. This system works very well, functioning satisfactorily even in cases of overmodulation. And within the normal modulation range, an extremely linear performance is obtained.

The synchronous stage can be switched out if necessary. For example, when performing differential phase measurements, the incidental phase modulation found in some older types of transmitters can sometimes disturb such checking in the synchronous detection mode.

Practical applications

Just how necessary is synchron-

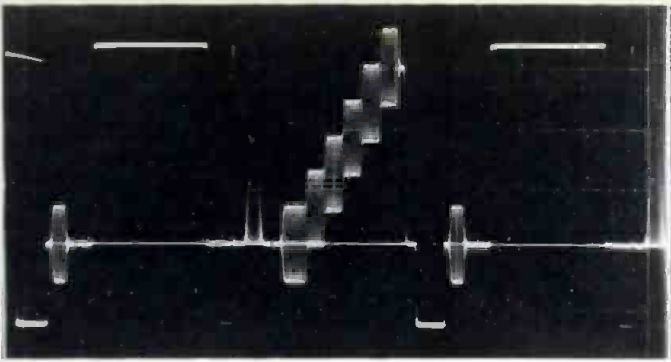


Figure 8A

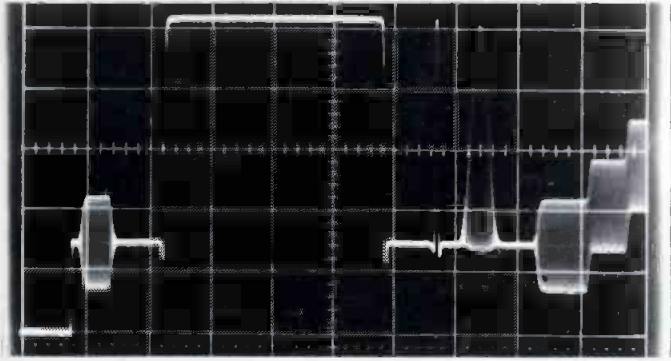


Figure 8B

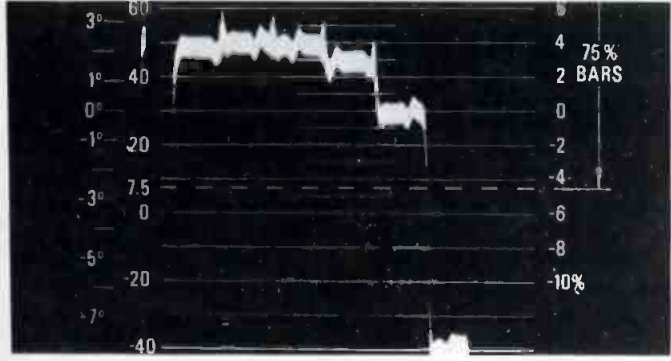


Figure 8C

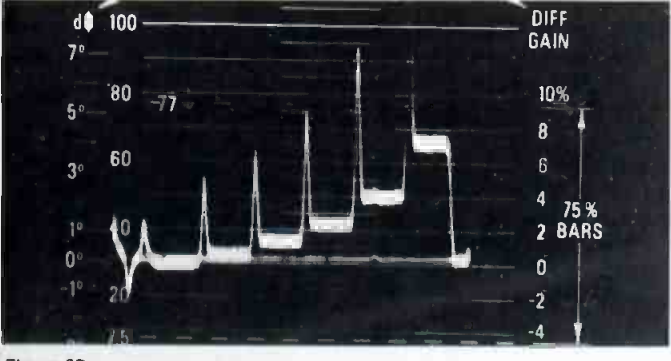


Figure 8D

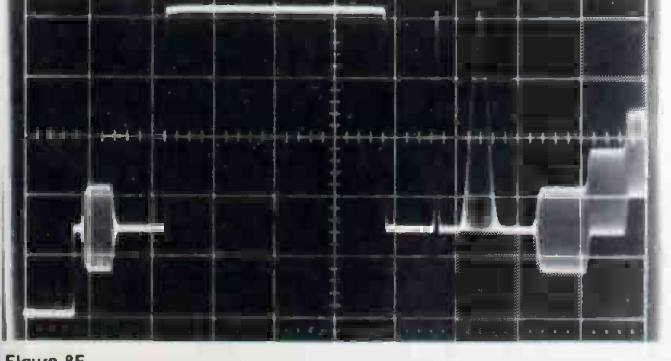


Figure 8E

ous detection? The answer is shown clearly in Figure 8, which shows the comparison between differential gain and phase measurements by means of VITS from an off-air signal using the two modes. Figure 8A shows the VITS applied to the transmitter.

Figure 8B shows the envelope-detected signal, while Figure 8C and 8D indicate the results of the differential gain and phase measurements carried out on the 5-riser chroma staircase. Distortion is fairly bad, but compare this to the distortion on the signal from the synchronous detection stage shown in Figure 8E, 8F and 8G.

By using synchronous detection, true transmitter distortion can be picked up and shown clearly. Quantitative measurements made on the VITS, therefore, relate directly to transmission chain problems and not quadrature distortion. □

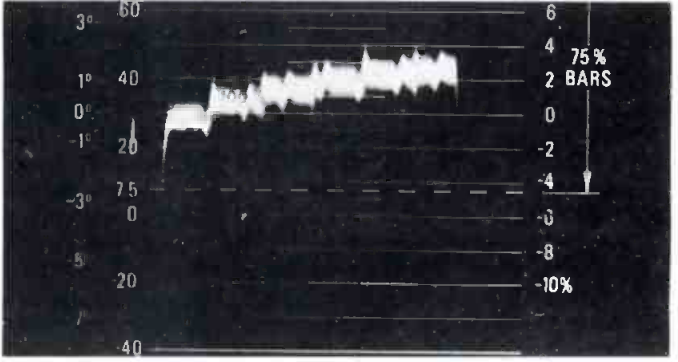


Figure 8F

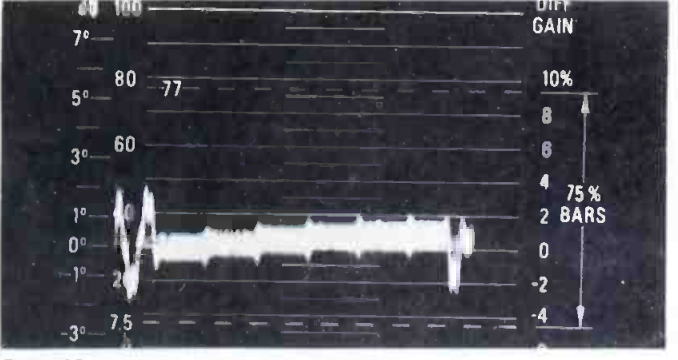


Figure 8G



Figure 9

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"YOUR KEY TO QUALITY"

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EBS: Another Link in the chain

By Nancy Pridgeon

On a summer's night in North Dakota, at about 10:15, a flash flood warning is called by the National Weather Service for Bismarck and the surrounding counties. Minutes later, area residents hear the message and begin to prepare for the worst.

In Paragould, AR, employees of radio station KRDS open the back door as they are leaving for home and find a tornado staring them in the face. Seconds later, the station broadcasts the word about the dire emergency, and the town's disaster preparedness plan springs into action.

In Laconia, NH, a tanker filled with 9,000 gallons of liquid propane overturns in a populated area. Local radio station WEMJ remains on the air throughout the night with evacuation notices and half-hourly live reports from the scene.

In Charleston, WV, the governor of the state, John D. Rockefeller IV, takes to the airwaves to broadcast a message far and wide that a crippling blizzard is on the way. His warning is heeded by citizens prepared to do battle with the icy monster.

Getting the word

These success stories are of people in the vicinity of a hazard who got the message in time to react defensively. Getting the message was as easy as listening to the radio or watching TV; it wasn't even necessary to change channels. The incidents, and many more like them, are the fulfillment of everything Joe Conte, NWS emergency broadcast system program manager, has tried for the past two years to achieve for his program—to forge another link in weather service's watch-warning-preparedness chain.

"The 2-year program," Conte

said, "was designed to revitalize and prominently place the Emergency Broadcast System on the nation's most wanted list."

Severe weather and other emergencies demand quick action on many fronts so that every person who may be in danger may be warned in time. Already in operation by the weather service are such technical achievements as the NOAA weather radio (which requires a special receiver) and the NOAA weather wire (available by subscription). To make the chain stronger, a way was needed to send the warning directly into the greatest number of private homes that possibly could be reached.

The emergency broadcast system offered one solution, but before it could be considered an effective tool, new ways had to be sought to bring the system up to date, to enlist the aid of community disaster preparedness agencies, and to motivate each community's broadcast media to put themselves into the picture as an important voluntary link.

To do all this, Conte, FCC communications chief Ray Seddon, and DCPA emergency communications officer Bill Beatty traveled more than 100,000 air miles, journeying to all 50 states, Puerto Rico and the Virgin Islands, Guam and the U.S. trust territories. All along the way, they were given a hand by dedicated FCC, DCPA, and NWS employees in the field.

Replaced CONELRAD

The emergency broadcast system first came to life in 1964 to give the President of the United States a way to get in touch surely and quickly with the American people in the event of war, threat of war, or grave national emergency. It replaced the World War II-generated CONELRAD

(CONTROL of ELECTROMAGNETIC RADIATION) system, where a single, continuous tone alerted the listener to tune to the 640 or 1240 band on AM radios to hear what danger was imminent.

The CONELRAD system worked by putting into action a network of broadcasters (radio station personnel) previously configured and trained, to get word to the people and activate civil defense and Red Cross plans to instruct people what to do or where to go. CONELRAD was intended to hold the country together and unify responses to military threats.

The new Emergency Broadcast System works the same way, with two important differences: CONELRAD preempted two radio bands and all other stations went off the air, but EBS uses all radio stations, all TV stations, all available broadcast frequencies. CONELRAD was activated only from the top, from the highest office in the land, but EBS also can be activated by state or local public officials, civil defense officials, or the National Weather Service. This means that in addition to the broad sweep of a national alert, EBS can be fine-tuned to pinpoint an exact area of danger, a locale, even a single street.

Participating in the system today to give the national alerts are the Aerospace Defense Command (ADCOM) and the Federal Preparedness Agency (FPA). On the local level are state emergency communications committees, local operational area emergency communications committees and state associations of broadcasters. On the national level are the National Association of Broadcasters and the National Industry Advisory Committee. The federal civilian agencies participating are the Federal Communications Commission

(FCC), Defense Civil Preparedness Agency (DCPA, formerly the Office of Civil Defense), and NOAA's National Weather Service, who have taken the lead in working to make the system a success.

A purpose, a schedule, a timetable

The plan of action for the three federal lead agencies—FCC, DCPA, and NOAA—began with a purpose, a schedule, and a timetable.

The purpose was to persuade state and local broadcast stations to develop written plans for reacting to sudden emergency situations, whatever their nature, and to help state and local community preparedness committees to develop written plans for community response. To do this, it often was necessary to overcome the apathy and the perception of broadcasters that the existing state and local emergency broadcast systems were fragmented and uncoordinated.

The schedule called for seminars and workshops to be held in each state, arranged by each state's emergency communications committee and co-chaired with a state or local representative of its office of emergency services or disaster preparedness. And meeting with the group of broadcasters, local civil defense officials, and local law enforcement agents were the three federal agency representatives.

"We'd fly in, pick up the local MIC (NWS Meteorologist-in-Charge), and go to the meeting," said Conte. "And we'd get to the meeting any way we could. Sometimes we went by car; sometimes by plane. Sometimes a private plane was furnished by interested parties. We did six cities in Texas in two weeks that way."

About 150 people would show up for the preliminary meeting. The meeting would be held in a hotel, an available hall, or wherever space could be found.

"I know what a political caucus is like," Conte said. "In those meetings, we got together to smooth out the infighting and the little hassles, and to iron out the wrinkles."

Focal point stations

During the seminar that followed, Conte presented the weather service side, the how and why of forecast and warning. Then the communities were asked for input on what they would need. Help in writing a community plan was always given by DCPA in a workshop.

If the seminar was going well, the group was asked to pick a common station to act much as the pool stations act during important political broadcasts. That is, one station would agree to act as the focal point, to collect and to broadcast emergency information simultaneously over all stations in a community.

In past emergency situations, most radio and television stations functioned admirably as individual stations, getting important lifesaving information to the public as quickly as it could be gathered by the station's staff. In the emergency broadcast system, all radio and TV stations have access to all information and also provide important feedback to the common carrier.

The results can only be in the public's best interest: simultaneous broadcast of warnings and preparedness information by all the stations in the community; authentication of emergency instructions; and interconnection of all types of communications systems (police and fire radio, amateur radio and citizens band radio) into a coordinated system.

To help each community prepare for a potential disaster, DCPA urges that written procedures be tested and rehearsed well in advance so that officials, broadcasters, and the public are familiar with the emergency plan and will know just what to do when time is short.

Activating EBS

Should an emergency occur, there are many ways available (radio, telephone, Associated Press and United Press International wire services, the NOAA weather wire teletype, the NOAA weather radio) to activate EBS, to get the message to the EBS "common program control station." This key station is the one that will push the button. So

the public will get the word, no matter what station may be tuned in at the time.

This sounds easy to explain at this point. But at the beginning of the project, it seemed a monumental task. Conte wrote articles for broadcasters' in-house magazines. He helped write the EBS national plan and construct the national agreements. He set up the visitation schedule and coordinated the action.

"It was a low budget project—around \$100,000 total cost."

The cost was born by all three agencies. As Conte wrote the script, DCPA prepared the publications, presentation slides and artwork. When the scheduling was ready, the time-table came into focus. The project was slated to run from October, 1976 to October, 1978.

All was not rosy out on the road. While many communities entered enthusiastically into the system, some resisted the idea. During a seminar that took place in the state of Washington, for example, one topic was the danger of radioactive emissions from a nuclear plant close by. One member of the press attending the meeting objected that there was no problem, and the meeting ended with no decision made. But three days after the team departed, there was a local radioactive explosion. The community lost no time in putting a plan into effect for the next emergency.

Nature helps out

While it would not be true to say that the EBS team scheduled its seminars to mesh with weather emergencies, if an emergency were expected, its proximity was usually put to good use.

At the Little Rock seminar, there was a tornado warning in effect during the meeting; the tornado hit Fort Smith just as the seminar wound up. During the meeting, the attendees were kept posted by the MIC, who was tied in to the forecast office and used the stage microphone to give the latest word to the assembly.

In California, a tropical storm came up the coast while the EBS team was in the area, so the

continued on page 74

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Another link

continued from page 73

meetings held at San Francisco and Fresno got "blow-by-blow" accounts.

"It did a lot to sell the program," Conte said. "It helped to have something tangible so we could say, 'You, as a broadcaster, are responsible to the people.'"

Georgia was one of the first states to activate the Emergency Broadcast System state-wide. The Georgia plan consists of 11 EBS areas. Eleven radio stations act as primary entry points for emergency messages so that the system blankets the state.

In a ceremony held in November, 1977 in Atlanta, Georgia's governor George Busbee presented awards to the persons who brought the system to operational readiness and personally tested the activation with a special test message.

Among those present for the ceremony were major general Billy M. Jones, Georgia state director of civil defense, local weather service personnel, and a host of Washington dignitaries as well as members of the EBS team, of course.

The Emergency Broadcast System's biggest advantage, as Conte sees it, is that people do not have to change stations or risk missing a warning that could save their lives. The station they were listening to would bring them the message.

"We're dedicated to getting warning messages in every possible way to all the people possible," Conte said.

Ahead of schedule

Before the program began in 1976, the old EBS was activated fewer than 50 times at the local and state level. According to an FCC survey of 600 stations, with 480 responding, more than 1,000 activations have been put into effect since the beginning of 1977.

By July, the EBS team will be ahead of the timetable, and the program will be turned over to the people. Videotapes and handouts prepared by DCPA are ready for distribution to let the public know what EBS is and what it will do for them. The team's "mission impossible" can be stamped "mission accomplished."

"Except for the backpackers," Conte said. "I worry about how we'll get the word to backpackers." □

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microphone is equally at home in a recording environment or broadcast studio. When hand-held it puts sex appeal in a voice with its bass-boosting proximity effect. With shaped high-frequency response and its ability to handle high sound pressure levels (140dB with 1% THD at 1kHz), the CS15P is ideal for close-up vocal or solo instrument miking applications.

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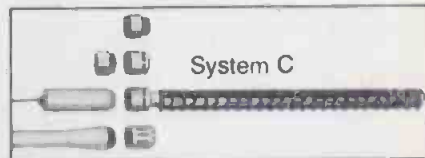
The CO15P condenser omni extends frequency response to the very limits of audibility, 20 to 20,000 Hz. Unlike other "omni's," the CO15P maintains its omnidirectional polar pattern at the very highest frequencies.

Perfect for the distant miking of an entire orchestra as well as up close on individual instruments. And like the CS15P, it's phantom powered and it's rugged.

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Lighting exhibits to sell products

By Imero Fiorentino,
president of Imero
Fiorentino Associates



Convention exhibitors attempt to attract and sustain the interest of a wide range of people attending the NAB. (Photo by Donna Foster Roizen)

For 14 consecutive years, leading manufacturers have called upon Imero Fiorentino Associates to provide lighting, design and production services for their TV camera exhibits at the NAB Convention. The challenges inherent in this undertaking could well be described as unique—for whether the end product is the creation of a small scale display area, or a larger, more complex production, we still have to work within the boundaries of a specific framework. This framework is established by the answers to two basic, but key questions.

Basic questions

The initial question is: "Why is the manufacturer spending time and money to exhibit at the NAB Convention in the first place? Although some manufacturers may want to have an exhibit to keep up their name and position in the marketplace, their foremost and primary object is to sell. This means that in addition to having camera equipment and sales personnel present at the booth, the manufacturer must provide a display or demonstration that is arresting enough to attract a potential customer to the area. Then, the pictures appearing on the monitors have to be good enough to impress this potential

client with the quality of the camera so that after the demo the customer will stay and talk with a salesman.

The second key question is: What are we, the production consultants, trying to achieve in our concepts, design and direction of these exhibits? In the final analysis, the answer to this question turns out to be the same as the answer to the first question directed at the manufacturer. We are not at the NAB to do "show business" per se. Although our mini-productions may be entertaining, our major intention is to find a way to help our clients sell their products. Even though we are professionals with a theatrical orientation, our years of experience at the NAB have taught us to downplay pure entertainment and sharpen our sensitivity to the problems of selling. Once we establish the framework of salesmanship, we then employ our television and theatrical production skills as a tool to reach our goal, which is identical to the goal of our client.

Selling approaches

Now, what are some of the selling approaches that are utilized at the NAB? Naturally, the first consideration is to make the booth as attractive as possible. Among the numerous ways to accomplish this

are eye-catching colors, interesting materials, modern graphics, an attractive model standing by the product, properly designed lighting, etc. These elements are sufficient for a static display, but when the manufacturer wants to actively demonstrate his cameras' capabilities on a regular basis, we go further in our approach.

We mount that demonstration in a somewhat theatrical manner because we know that NAB audiences of today are not only comprised of people solely interested in the detailed technical, electronic aspects of the equipment. There are also attendees who are more involved with the creative production side of television. Their main concern is how the TV pictures ultimately will look to the home viewer, and how the camera performs under actual production conditions.

Ignoring production

At this point, I must interject that experience has proven to me that there are still many corporate executives and salesmen at the various manufacturing firms who definitely lack this awareness of NAB audiences and choose to ignore the production side of television.

continued on page 78

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Besides "un-canning" carts, the dbx system extends the useful life of old reel-to-reel machines, quiets audio tracks on VTR's, and even cleans up full-frequency telephone lines and microwave links. Because it prevents noise from coming between you and your listeners—and you and your advertisers—it just may be the most important investment you will ever make.

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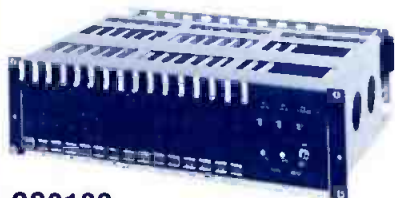
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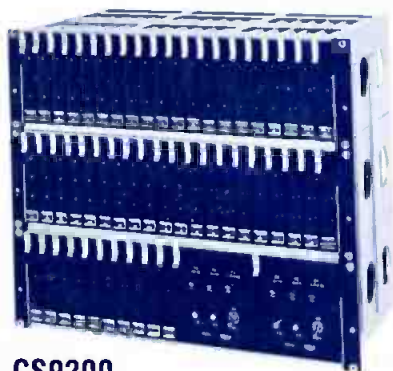
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Lighting exhibits

continued from page 76

I will even venture to say that there is resistance and often animosity on the part of some management level personnel who will not accept the fact that these fantastic engineering tools which they're selling are production tools at the same time. The most well-designed, marvelous pieces of machinery are insignificant by themselves—they only become valuable when utilized by creative, as well as technical, professionals to turn out an end product.

Eventually, this end product will be viewed and scrutinized by the American public, who doesn't know or probably doesn't care about the engineering feats accomplished by the equipment used to produce the program on their home screen. All they see and evaluate is the final picture. So the many corporate executives, who may otherwise be progressive innovators in engineering technology, actually do themselves a disservice if they don't simultaneously progress in production sensitivity; for there is a direct interrelationship between these two areas.

Every year we contend with this persistent corporate attitude, especially when the various executives arrive at the exhibit hall the evening before the NAB opens and request a multitude of changes. By no means am I implying that the changes requested by management are whimsical; it is just that they often lose sight of the original purpose of the production. That purpose is to attract the wide range of people attending the NAB to the specific exhibit, and sustain their interest throughout the brief period of time allotted to the camera demonstration.

Careful structuring

As mentioned before, the demo is mounted in the form of a mini-production, which is carefully structured so that it maintains a certain point of view from beginning to end. The show may incorporate music, an announcer, models and performers; and it will definitely entail camera shots to visually exemplify the special capabilities of the equipment. In producing the program, we meticulously select and coordinate all the moves, the shots, the scenic elements and the dialogue with an acute sense of timing so that there is impact when an important camera feature is being relayed to the audience.

In this manner, we have employed theatrical techniques to create a demonstration that is impressive and hopefully interesting within the scope of selling hardware. However, if one of the corporate executives decides on Saturday night that he wants the show on Sunday to include an additional segment with charts and graphs (for example), he unwittingly stalls the timing of the whole production.

Although the information he wants to add may be pertinent, his way of presenting it to the audience could be completely wrong, and if so, it diminishes the total selling impact by weighing down the show with too much detail and defeating his own purpose. The show is meant to generate enthusiasm about the product. If successful, potential customers will want to remain at the exhibit after the demonstration—that is the time for salesmen to supply details.

Disagreements

In addition to handling the problems that arise with the more complex productions, we also face corporate misunderstandings with exhibits that are purely fundamental. For example, a small NAB set may simply be comprised of a colorful bouquet of flowers and an attractive model, as the main visual elements. We believe that even this type of set, which is unadorned with a variety of props and scenery, can be elegant and should therefore receive the same careful lighting and production considerations.

Our procedure is to position the girl away from the background, and, once all the camera positions and angles are established, design the lighting so that everything is correctly balanced and looks lovely both on and off camera. Then, along comes someone from the company who disregards what we have done on his behalf and moves the camera to a different location. Now, when the camera shoots the set from the changed angle, the girl's key light, back light, etc., are out of balance, causing inferior quality pictures on the monitor. At other times, a company executive walks by the exhibit and decides that he wants the model to be sitting right up against the white background—a decision that completely refutes good TV production practice!

Time after time we raise objections, but the final choice, of course, rests with the client. Our

experience enables us to handle, all of these last minute changes, but they are accomplished at great expense to the client. Obviously, I feel that this is the wrong approach.

To solve this dilemma, I strongly recommend that in the future all of the decision-making executives, managers and salesmen should be present at the initial NAB production meetings that take place several months prior to the actual convention. This is the time—not the night before the exhibit opens—when they should contribute ideas and voice their opinions about how the exhibit should look and what they want demonstrated. A forum for discussion can be established whereby we would be exchanging viewpoints and working together with a common purpose.

Talent egos

Beyond corporate client complications, NAB productions challenge us with yet another problem: preventing the show from becoming a platform for the egos of the talent we hire, whether they be models, actors, mimes, dancers, etc. Characteristic of all industrial shows is the unique premise that the product is the "star attraction", while the talent is just employed as a tool to highlight or direct attention towards that product. However, performers have a natural tendency to get carried away and go beyond this framework.

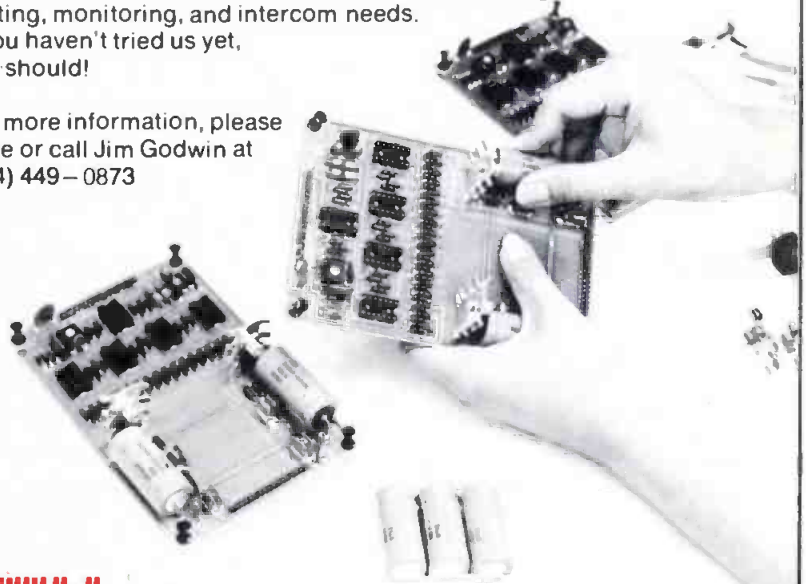
Therefore, at the very onset we alert our production team to this potential hazard so that they channel the performers' energy in the right direction. At the same time we continuously try to make the talent feel important and proud of their role so that they will put forth their best efforts, yet exercise proper restraint. Supervising creative egos is an arduous task, but again, that's just another part of our responsibility to our clients.

Although NAB productions have changed and grown more sophisticated with each passing year, our goal and that of our clients never varies. As stated in the beginning, our mutual object is to sell; therefore, for every exhibit we must have input from the manufacturers about their equipment, just as they require our production expertise, so that collectively we end up with a dynamic product: an interesting demonstration, top quality pictures, and most of all, a selling message that gets across to the audience. □

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Station-to-Station

Solid-state devices tame transient voltages

By Al Gilmore, engineer, WTOW/Baltimore, MD*

Lightning has always been a gremlin interfering with the orderly operation of radio and TV transmitters. It has been generally accepted that damage to transmitters due to transient overvoltages induced on the AC line by lightning was a problem that, while uncomfortable, could reasonably be overcome with spark-type lightning arresters or varistor devices. However, as miniaturized circuits took the place of tubes in transmitters, conventional devices were unable to stop the chief engineer's classic middle-of-the-night trek to the transmitter and

the laborious job of replacing diodes. None of these devices stopped the general manager from bemoaning lost time, lost advertising revenue and concerned audiences.

To overcome inadequacies of the other protection devices, we have investigated devices developed by Transtector Systems to protect broadcast AM/FM television stations. These are solid-state, silicon devices (no MOVs or gas tubes) specifically designed for transient suppressors to ease the tensions of chief engineers and general managers.

The spring and summer of 1978 has seen high lightning activity along the middle Atlantic states,

especially during May and June. On one such evening, Baltimore experienced a real granddaddy of electrical storms. Two stations in the area, WTOW-AM and WLIF-FM, which shared adjacent transmitter sites on the same hill, were both struck by high-energy voltage surges. At WTOW we got a voltage spike at about 6:15 PM, and it appeared on both the triple-phase and the single-phase power lines which fed the audio equipment and the 5 kV transmitter. Also, we had damage to two types of commercial surge protectors at that time. We had an internal short from phase-to-ground on both the 120 V legs. It blew the two line fuses that were

*Contributed via Bill Nilsen, Transtector

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EditMate II is a compact, reliable editor that interfaces to most video cassette decks and to the 1-inch type "C" machines. It offers automatic cue, preview, edit and review capability at the push of a button. Cut-type edits can be accomplished in either insert mode or assemble mode.

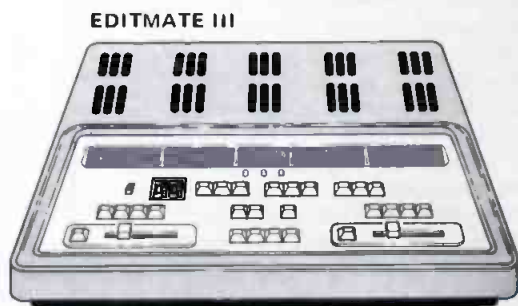
Searching the tape decks to specific edit points is a breeze, with dual sets of motion controls that allow continuous or incremental tape movement at speeds ranging from 1/20th to twice normal play speed. And VaraScan slow-motion forward/reverse/freeze-frame search control is available for selected decks.

The total package is a versatile editor with all the features needed to perform off-line edits simply and efficiently . . . at low cost.

If you want to log your edits on a hardcopy or punched paper tape edit decision list, EditMate III is the editor to choose. It has all the versatile editing features of EditMate II, plus the built in capability to generate industry standard-format edit decision listings as the edits are performed.

With EditMate III, you can perform edits on low-cost off line equipment, list those edits and later input the list to a more sophisticated editing system for addition of special effects and auto assembly of a master videotape. There's no need for tedious and time consuming manual listing or mental math.

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going to the protector and we lost power to our audio rack. We lost an hour and two minutes worth of air time, including taped programs and commercials.

However, a different situation was experienced at WLIF radio, next door to us and equipped with Transtector surge protectors on their transmitter. They had the same voltage surge as we had, but the surge was blocked by Transtector surge protectors to trip their circuit breakers. All this chief engineer had to do was to reset the circuit breaker and they went back on the air.

The five technical specifications mentioned below should be strictly

observed in selecting surge protectors for broadcast transmitters and audio process equipment.

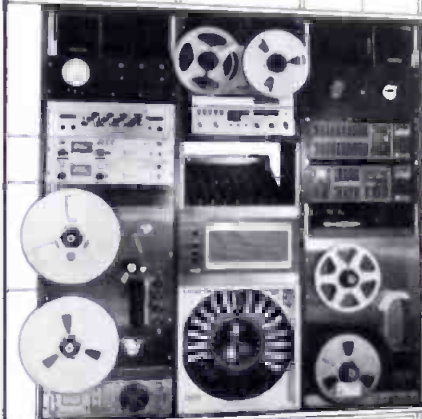
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continued on page 82

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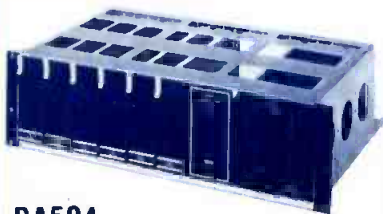
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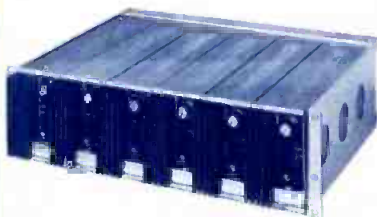
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- Standard DA505 systems are supplied with up to six AM487 self powered amplifiers.
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Station-to-Station

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maximum suppression (power) capability not to exceed 150% of nominal line (a clamping ratio of 1:1.5). If a protector does not begin to suppress at low voltage threshold, it will allow the low level surges through to damage the equipment.

High reliability: The device should

be totally solid-state, with redundant circuitry and be failsafe.

Operation: Automatic or resettable, to prevent an interruption in service.

We've switched to Transector protectors based upon our field observations in Baltimore and because their devices meet the parameters considered crucial to our needs. We would appreciate hearing from others who have had related field experience with voltage transients and comparing solutions.

Portable on-location clock

By Alex F. Burr, consultant, Las Cruces, NM

The problem was to assure a smooth transition between the ending of the interview show from a remote location to the network news. The show was conducted in the dining room of a prominent motel some distance from the studios of the small AM station. The hostess for the show acted as engineer, announcer and interviewer. It was a major problem to pace the reading of the final commercials so they just filled the time between the end of the interview and the start of the network news.

The dining room did not have an accurate wall clock. A watch was too small when one eye must be kept on the guest and one on the commercial. Therefore it was decided to build a small, compact, digital clock with a large readout.

There are many digital clocks on the market, most of which are not suitable for this use. If the readout digits are smaller than 0.4 inches, they are hard to see at a glance. The clock must have six digits because the seconds are important in this operation. The clock must have an internal crystal time base so that it could be carried to the motel each day without losing time

and be battery operated for the same reason.

It was decided to get a complete kit for car clocks including time base and case from Optoelectronics. It was mounted on top of a 4-inch x 4-inch x 2-inch utility box which housed the 8 AA NICAD cells used to power the clock. Two switches were also placed on the box. One, SPST/NO, stopped the time base for setting the time. The other, SPST, turned the display off when it was not needed. The clock drew only 10 mA when the display was off, but averaged over 120 mA when the seven segment LED display was on. Switches for setting the time were located in the clock case. A jack for charging the batteries was also located in the utility box.

The only trouble encountered in several months of use was when one wire leading to the battery pack broke because a small motion of the pack as the clock was carried about caused it to flex too much. This problem was cured with more packing around the battery pack and resoldering. Thereafter the clock provided an inexpensive solution to this remote timing problem.

continued on page 84

The Technics ST-9030 tuner. Purists would feel better if it cost over \$1,000.



To some, tuners that offer 0.08% THD, 50 dB stereo separation, a capture ratio of 0.8 dB and waveform fidelity should demand a price tag of over \$1,000. But with the ST-9030 this performance can be yours for under \$450.

That's quite a feat for a tuner. But then the ST-9030 is quite a tuner. It has two completely independent IF circuits: A narrow band, for ultra-sharp selectivity. And a wide band, for ultra-high separation and ultra-low distortion. It even selects the right band, depending on reception conditions, automatically.

Both bands give you the same extended flat frequency response. Because, unlike conventional tuners, the ST-9030 utilizes an electronic pilot cancel circuit that cuts the pilot signal, without cutting any of the high end. It's ingenious. And a Technics innovation.

The Technics ST-9030 has one of the quietest, most sensitive front ends of any tuner. With an advanced linear frequency 8-ganged tuning capacitor and 3 double-tuned circuits, plus dual gate MOS

FETs in the 2-stage RF amplifier and balanced mixer circuit. What's more, there's a servo tuning circuit that locks into the tuned frequency, regardless of minor fluctuations. The result: Negligible drift distortion and maximum stereo separation.

Technics ST-9030. Compare specifications. Compare prices. And you'll realize there's really no comparison.

THD (stereo): Wide—0.08% (1kHz). Narrow—0.3% (1kHz). S/N: 80 dB. FREQUENCY RESPONSE: 20Hz—18 kHz +0.1, -0.5 dB. SELECTIVITY: Wide—25 dB. Narrow—90 dB. CAPTURE RATIO: Wide—0.8 dB. Narrow—2.0 dB. IF IMAGE and SPURIOUS RESPONSE REJECTIONS (98 mHz): 135 dB. AM SUPPRESSION (wide): 58 dB. STEREO SEPARATION (1 kHz): Wide—50 dB. Narrow—40 dB. CARRIER LEAK: Variable —65 dB (19 kHz). Fixed —70 dB (19 kHz, 38 kHz). SUGGESTED RETAIL PRICE: \$449.95.*

Technics ST-9030. A rare combination of audio technology. A new standard of audio excellence.

*Technics recommended price, but actual retail price will be set by dealers.

Technics Professional Series
by Panasonic

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Let's face it. Even the best equipment is only as good as its installation.

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+ experience
+ installation

= highest quality audio.

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Nashville, TN 37212
(615) 256-6900

Circle (59) on Reply Card

Station-To-Station

continued from page 82

Using a Pulse-Cross Monitor to check Blanking Parameters

By Wray Dudley, Engineer, WWBT-TV, Richmond, VA

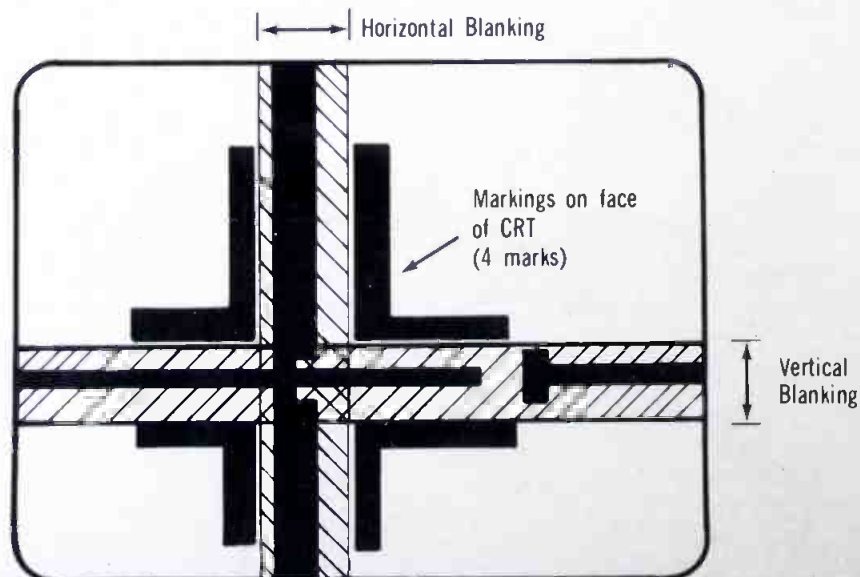
As we find the FCC tightening up enforcement of TV blanking parameters, we also find that video for broadcast is coming to us from an increasingly wider variety of sources. Everything that comes in must be closely checked because we are responsible, of course, for everything that we transmit regardless of who produced it. We do not need to be reminded that some of this material is coming from sources that are not as heavily regulated or informed as we. ("Wadda ya mean the sync is too wide?"—sound familiar?)

We need a quick, dependable and reasonably accurate way to check **everything** that comes into the house, as well as what is already there. It occurred to me that a system used in years past to check sync could be revived and could provide a quick and positive check to determine that the sync was within the prescribed limits. A standard precision (to minimize drift) pulse-cross monitor will display horizontal and vertical blanking and, by marking the blanking

width limits on the face of the CRT, one can quickly see whether or not further evaluation with a calibrated waveform monitor will be necessary. Calibration of the monitor and its markings can be readily checked simply by displaying a known signal, such as the house test signal generator.

This system is intended to be a quick check to save the "busy operator" time by not having to calibrate a scope then switch ranges and count lines or graticule marks and is not an actual measurement. If the pulse-cross monitor indicates an out-of-tolerance condition, the scope should be used in the conventional manner for the measurement.

We have had this system in use here at WWBT-TV on a trial basis for a short period of time using the monitor in a VTR. The Demod display will show what is recorded on the tape and input can be used to check any source that can be routed to the VTR. We have not had significant monitor size drift and our operators have already caught several instances of unexpected "illegal" material. □



Pulse-Cross Monitor display showing horizontal and vertical blankings within limit markings.

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**station-
to-station**

ideas. We'll pay you cash
or send you the NAB
Engineering Handbook.



If your equipment tips or other operating ideas are selected by **Broadcast Engineering** to appear in *Station-to-Station*, you will receive a \$30 minimum payment or a free copy of the prestigious *NAB Engineering Handbook*.

The latest *Handbook* contains over 1,000 pages and 1,000 illustrations covering every aspect of AM, FM and TV operation and maintenance: recommended procedures, fundamentals, standards, rules and how-to instructions.

Station-to-Station affords you an opportunity to share your expertise with readers throughout the industry: how you solved a nagging technical or production problem, modified a circuit for more flexibility, redesigned a studio or facility, developed new test procedures or employed an operating idea to save time and money. By sharing your knowledge, you'll share in the wealth of information contained in the *Handbook*.

Send your items to: Station-to-Station editor, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. Please indicate if you want to receive the *Handbook* or prefer to receive a check.

The *Handbook* can also be purchased directly from the NAB at \$30 a copy for NAB members and \$45 a copy for non-members. Write to: Station Services Dept., NAB, 1771 N Street, N.W., Washington, D.C. 20036.

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SA141, Mono

- Input selector providing 20 mono or 15 stereo inputs, -20dBm to +8dBm, bridging, balanced.
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- Two active, balanced, outputs provided. One, unswitched, at -10dBm max. and one, switch selectable between 2 outputs and off, +8dBm max.
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Circle (61) on Reply Card

association news

AMERICAN SOCIETY OF
TELEVISION CAMERAMEN, INC.

P.O. Box 296, Sparkill, NY 10976



The ratings ASTVC style, or How does it grab you?

The scene is NBC's studio 8H in Radio City. Once the home of Arturo Toscanini and the NBC Symphony, it is now the launching pad for *Saturday Nite Live*. There is no action at the moment, except for several stagehands and a crew of cleaning people, for it's just after midnight and the Friday night rehearsal ended some time ago. So what is there about this almost deserted studio that captures our interest enough to jot down some notes on paper and pass them along to you via the pages of **Broadcast Engineering**?

If you look closely under the RCA TK-46 on the pedestal, you can read these words on a small black and silver sticker, "Fulmar Pedestal... 1974/5 award (given by The British Guild of Television Cameramen." Say, what goes? The British here in studio 8H on our camera? No. Not on our camera, but on a British-made Vinten pedestal and pan-head. What is this piece of gear doing here and why is it sporting this particular award label? What is the Guild of Cameramen award?

In May 1972, 37 British TV cameramen got together to discuss mutual interests and problems. They decided, among other things, that cameramen should have a decisive say in the choice of equipment. The British Guild was established and grew to where they are today.

This group of people has a program that we call a testing and evaluation procedure. Vinten is a case in point. One might presume that a manufacturer makes available a piece of gear that is either in current use in the field or something that is about to be introduced into operations. This equipment is then field-tested by assigned Guild personnel under operational conditions

and all facets of this performance would then be noted, evaluated and then reported through channels back to the manufacturer. This is our assumption as to how such a program might be handled by our British cousins.

A step further might see the piece of gear rated along with similar equipment produced by various other manufacturers. Here is where an award would be properly given for that particular item that most closely resembles what the cameraman would like to get his hands on.

How does this relate to what the ASTVC has in store? Along with our colleagues in the United Kingdom, we have recognized how important a dialogue might be between the equipment producer and the user in the field. In line with this, we have informed potential, and present, corporate sponsor members of the ASTVC that we are most interested in a program very similar to the one currently in effect in Great Britain. While there may be some differences in the manner of conducting our T&E program, we also believe that all parties concerned will benefit from this interchange of technical information.

In accordance with our aims, we have selected the Telex Communication Corporation as the first manufacturer to have their products evaluated by us. The item that we will be concerned with is their Telex Cameraman's Series headset. We will probably start with the CS-83 (single-side w/PPT sw) and the CS-87 (dual-side w/PTT sw). We hope to have samples of this equipment in our possession in the very near future and will, after appropriate testing and evaluation, make our known observations to the manufacturer. We then hope for the

opportunity to repeat this procedure with similar gear from another manufacturer.

You, our members and other interested readers, are earnestly requested to help us by suggesting equipment that you feel you would like to see run through this program. Also, please send us your comments on equipment that you are using (or have used) at your station or production house or school. Let us know what "bugs" you have discovered and how you might want the manufacturer to correct or re-design these items. The manufacturer will be thankful and so will we.

We will award cash prizes for the suggestions judged most practical for consideration by the manufacturer. We plan to have a committee from the various operating areas (camera, VTR and editing, lighting, audio and switching). This committee, which would be enlarged to encompass other areas should the need arise, will judge the incoming suggestions.

There will be further details on this in upcoming BE issues. Send your thought, comments and suggestions to: ASTVC T&E committee, Box 296, Sparkill, NY 10976. □

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American Cancer Society



The new name for professional RF wireless microphones

Only the name is new. You will recognize the picture as the same field proven system that has gained universal acceptance in the industry under the label of the leading professional microphone manufacturer. But now this fine product is available from the people who engineered and built it: HM Electronics, Inc.

The System 22 is HME's top-of-the-line VHF Hi Band wireless microphone intended for

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use by professionals. Critical adjustments can be made by the audio engineer such as soft compression,

transmitter power (can be switched to legal maximum), and internally supplied power for Electret microphones.

To learn more about the System 22 or our new executive and universal lines call or write HM Electronics, Inc. 6151 Fairmount Avenue, San Diego, Ca. 92120 Ph. (714) 280-6050

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PROFESSIONAL

Nashville, the Center
of Country Music, is
Stanton Country, too!



Kitty Puckett checks out 45 rpm stamper, while
auditioning one at 33 1/3 rpm

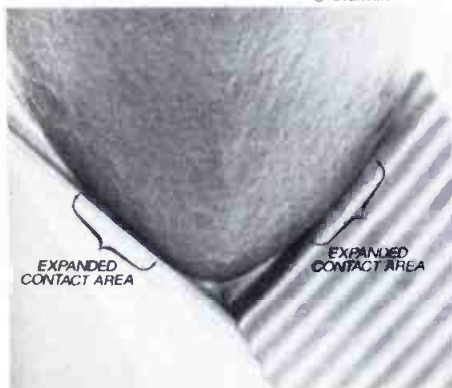
The Nashville Record Production Inc., uses Stanton exclusively throughout its two Disc Cutting Studios. Naturally, they are mostly involved with Country Music, but they also get into Pop and Rock.

John Eberle states that they use the Stanton Calibrated 681A "for cutting system calibration, including level and frequency response" and they use the Calibrated 681 Triple-E in their Disc Cutting operation... with plans to soon move up to the new Professional Calibration Standard, Stanton's 881S.

Each Stanton 681 series and 881S cartridge, is guaranteed to meet its specifications within exacting limits, and each one boasts the most meaningful warranty... an individually calibrated test result is packed with each unit.

Whether your usage involves recording, broadcasting, or home entertainment, your choice should be the choice of the Professionals... the Stanton Calibrated Cartridge.

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Scanning Electron Beam Microscope photo of Stereohedron[®] stylus, 2000 times magnification, brackets point out wider contact area

For further information write: Stanton Magnetics,
Terminal Drive, Plainview, N.Y. 11803

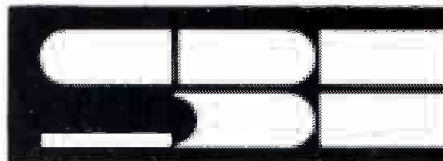


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association news



SOCIETY OF
BROADCAST ENGINEERS, INC.
P.O. Box 50844, Indianapolis, Indiana 46250
(317) 842-0836

The society is doubly happy this month to announce the addition of two new SBE chapters: Chapter 54—Tidewater area, VA, and Chapter 55—St. Louis, MO. Chapter 54 was organized under the direction of Doyle Thompson, director of engineering, Landmark Communication, Norfolk, VA, and has elected William Pulliam, Jr., of WTAR as chairman; John Heimerl, WZAM/WMYK, as vice-chairman and Sam Holben, WYVA, secretary/treasurer. Chapter 55 was organized through the efforts of William B. Martin, RCA Broadcast Systems. Bill has also been elected chairman; John Koch, KTVI, vice chairman and William Beeman, KDNL, secretary/treasurer. The society is very proud of these gentlemen and especially for their efforts in recruiting so many new members to start their chapters.

CHAPTER REPORTS

Chapter 3—Kansas

The September 12 meeting was held at KFDI in Wichita. Annual election of chapter officers was held with the following results: Brad Dick of KANU, Lawrence;; Bob Fulker-son, KPTS-TV, Wichita, vice-chairman; and Dave Wiese of KJCK, Junction City retained as secretary/treasurer. RCA radio sales development manager Fred Huffman presented the program which dealt with FM broadcast antenna application and theory. A tour of the KFDI plant followed the meeting.

Chapter 11—Boston, MA.

The September 21 meeting was held at WGBH in Allston. Tim Holl, director of engineering and Alex deKoster, senior design engineer of Accoustic Research, speaker manufacturer, presented an interesting, informative and entertaining discussion and demonstration of design factors that influence development of loudspeaker drivers, crossovers and cabinet to result in a coherent system. Their top of the line AR-9 was demonstrated with impressive results.

Chapter 16—Seattle, WA.

The regular luncheon meeting was held September 13 at the Black Angus. Chuck Morris, director of engineering for KIRO, coordinated a spirited discussion about the local impact of the recent announcement by the FCC in effect, holding the line and not liberalizing the standards for horizontal and vertical blanking. Eric Aker, assistant chief engineer for KING, presented his recent device that measures blanking and displays the results digitally.

Chapter 18—Philadelphia, PA.

The first meeting of the fall season was held September 19 in the Presidential Hotel. James Hurlley, the national president of SBE, was the guest for the evening and gave a report on the activities of SBE.

Chapter 20—Pittsburgh, PA.

The September 21 meeting in the Viking Motor Inn featured a program by Bob Lasher of Lofstrom Electronics. He demonstrated the use of the Hydro-Ped from O'Connor. It is a hydraulic pedestal camera support unit used in uneven terrain conditions. He also demonstrated the JVC CY8800 3-tube color camera which is primarily used for ENG and EFP.

Chapter 21—Spokane, WA.

The September 28 evening meeting featured a program by Ron Valley and Warren Pritchard, chapter members, on the TV blanking FCC rules.

Chapter 34—Albuquerque, NM.

The September 14 meeting was held in the Royal Fork Cafe. A program was not planned because a number of business items had to be discussed relative to the chapter and membership.

Chapter 38—El Paso, TX.

The September 13 meeting was held in the studios of KDBC-TV. KDBC also presented the program and provided additional videotapes on digital theory. □

The Humor Corner

Editor's Note: It is my contention that work need not be dull and without humor. For this reason, I'd like to have a 'humor corner' in **BE** which will include stories, clever lines, bloopers, limericks, jokes, cartoons—whatever lends comedy, humor and cheer to our profession. I'll kick it off with a few entries and gauge your interest from the poll below. If you like my intent, I'll keep the door open for reader contributions. So, on that note, here goes.

An editor well known for his wit
Writes limericks for fun and enjoys it
If the readers respond
We might carry this on
And have one a month just to grin a bit.
Guess who/ KCOHOH

There once was a hermit named Dave
Who kept his transmitter in a cave
His hair would extend
With corona at the ends
And he served as his antenna that way.
Dave/ WOW/ Mammoth Cave, KY

An FMer highly rated for his sound
Got the call feared by all the world 'round
He was fit to be tied
When his listeners cried
There's no power from your tower. you're down!
WOES/ KCMO



OPINION POLL

Your opinion is requested as to whether or not we should continue this monthly 'humor corner' in **BE**. Check the options below and register your opinion using the reader service card.

Choice 1: I'm glad you took the bull by the horns and added this feature. I'll read it and maybe contribute something for future issues. (Circle 101 on the R.S. card.)

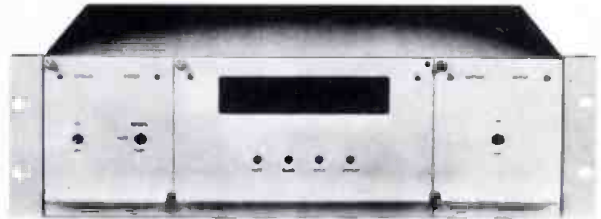
Choice 2: A little bull goes a long way. Maybe every other month would suffice. (Circle 102 on the R.S. card.)

Choice 3: Ah, it's OK. Bull is bull. I'll go by the majority vote. (Circle 103 on the R.S. card.)

Choice 4: Forget it. It's too much bull. (Circle 104 on the R.S. card.)

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If seeing the same time on all your clocks is important, select **ES 192** - Line Frequency timebase, for only \$286.

If a guaranteed accuracy of three seconds per month is what you want, choose **ES 160** - \$775.

How about one second per month? **ES 160/1** - \$935.

Or National Bureau of Standards accuracy! **ES 190** is synchronized to Radio Station WWV to provide a Master with unquestioned accuracy. \$935 with receiver and antenna.

For a Time/Temperature Master, ask for **ES 196** - \$675

ESE Master Clock Systems are simple to install. All Masters have a **Serial Time Code** output, able to drive twenty slave displays without buffering. Slaves range in size from .3" LED to 4" Electromagnetic displays, priced from \$130 to \$404.

IF YOU ALREADY HAVE A SYSTEM AND WANT TO EXPAND IT, get the **ES 167** Serial Time Code Generator (\$130), then add any number of our low cost slaves.

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Standard mounts, made of heavy wall aluminum pipe for lifetime maintenance free operation, are available in both manual and motor driven with remote control.

Antennas are available for the following frequencies: Single polarization: 3.7–4.2 GHz and 11.6–12.2 GHz. Dual Frequencies: 11.6–12.2 GHz RX and 14.0–14.3 GHz TX. Other sizes and frequencies available upon request.

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5439 W. Fargo, Skokie, IL 60076 (312) 675-1500
Made in U.S.A.

Circle (69) on Reply Card

new literature

Portable camera

RCA—Full color catalog, CA. 1450, describes the TKP-46 portable production camera in detail. The 12-page booklet includes technical data, specifications and diagrams showing the system and operational flexibility of the camera.

Circle (110) on Reply Card

Advertising kit

Altec Lansing—A coop advertising kit has been developed in response to dealer demand. The 71-page book explains the coop advertising policy and contains line drawings, veloxes, suggested copy for both newspaper and radio, logos and merchandising aids.

Circle (111) on Reply Card

Test instruments

Continental Resources—Sales catalog for summer and fall 1978 lists over 500 electronic test instruments by manufacturer and model number. Included are Tektronix oscilloscopes, General Radio counters, Hewlett Packard spectrum analyzers and oscillators.

Circle (112) on Reply Card

MIDWEST CORPORATION TELECOMMUNICATIONS DIVISION

New Addresses

The following addresses update incorrect listings in Broadcast Engineering's 1978 Buyers' Guide Issue. Please correct your records.

Midwest Telecommunications
300 First Avenue
PO Box 385
Nitro, West Virginia 25143
Mr. Elijah Midkiff, Vice President and Division Manager
Mr. John Garner, Assistant to the Vice President
Phone: (304) 722-2921

Midwest Telecommunications
4937 Harford Avenue
Beltsville, Maryland 10705
Mr. Welby Smith, Manager
Mr. Owen Wood, Government Sales Manager
Phone: (301) 937-1890

Midwest Telecommunications
3331 NW 82nd. Avenue
Miami, Florida 33122
Mr. Bill Dancy, Manager
Mr. Russ Thom, Export Sales Manager
Phone: (305) 592-5355

Midwest Telecommunications
1804 Cargo Court
Louisville, Kentucky 40299

Mr. Jerry Willingham, Sales
Phone: (502) 491-2888

Midwest Telecommunications
1150C W. Eighth Street
Cincinnati, Ohio 45203
Dr. Dave Barnes, Manager
Phone: (513) 651-1904

Midwest Telecommunications
15046 Beltway Drive
Dallas, Texas 75240
Mr. Jack Wood, Manager
Phone: (214) 387-2755

Midwest Telecommunications
5200 Mitchelldale, Suite F28
Houston, Texas 77092
Mr. George Bates, Manager
Phone: (713) 686-9278

Midwest Telecommunications
1395 Air Rall Avenue
Virginia Beach, Virginia 23455
Mr. Kevin Zmarthie, Manager
Phone: (804) 464-6256

Midwest Telecommunications
300 First Avenue
Nitro, West Virginia 25143
Mr. Ron Crockett, Manager
Phone: (304) 722-2921

Font composite unit

Chyron—A brochure on graphics and titling system which includes information on the wide assortment of font styles and sizes, instant italics, color palette and action graphics is available.

Circle (113) on Reply Card

Filter catalog

Bird Electronics—RF filter catalog displays nearly 200 coaxial filters, filter/couplers and filter/coupler switches. The filter tables in this 20-page catalog list performance data and mechanical specifications of low pass, high pass and band pass models with cut-off frequencies from 1 MHz to 21 2.7 GHz.

Circle (114) on Reply Card

Relays and switches

International Rectifier—Catalog describes the complete line of Crydom power relays and switches. The catalog features descriptions, specifications and pictures of the line.

Circle (115) on Reply Card

Bipolar circuits

TRW LSI Products—Short-form catalog describes their expanded line of bipolar LSI and VLSI circuits. Included are data on a family of multiplier chips, accumulators, video-speed DACs and A/D converters, shift registers and a 15-MHz data-signature correlator.

Circle (116) on Reply Card

Video cable equalizer

Cohu—Product data sheet describes its 9800 series video cable equalizer. The sheet lists the unit's features and specifications as well as applications.

Circle (117) on Reply Card

Cables

Brand-Rex—A 28-page brochure of technical data and charts on flat cable provides information on features and advantages of the cable as well as capabilities, definitions and categories.

Circle (118) on Reply Card



A Winning Combination

In Routing Switchers

Best Performance

Whether you're looking at published specs or as-installed performance, you'll see us beat our competitors—all of them—hands down.

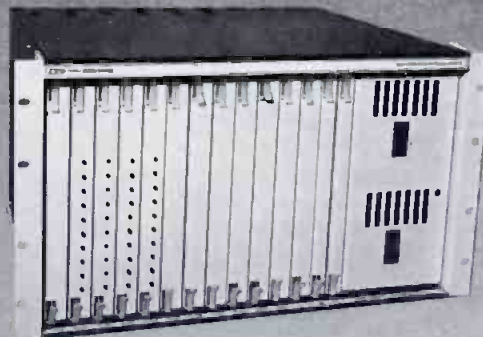
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The following addresses update incorrect listings in Broadcast Engineering's 1978 Buyers' Guide issue. Please correct your records.

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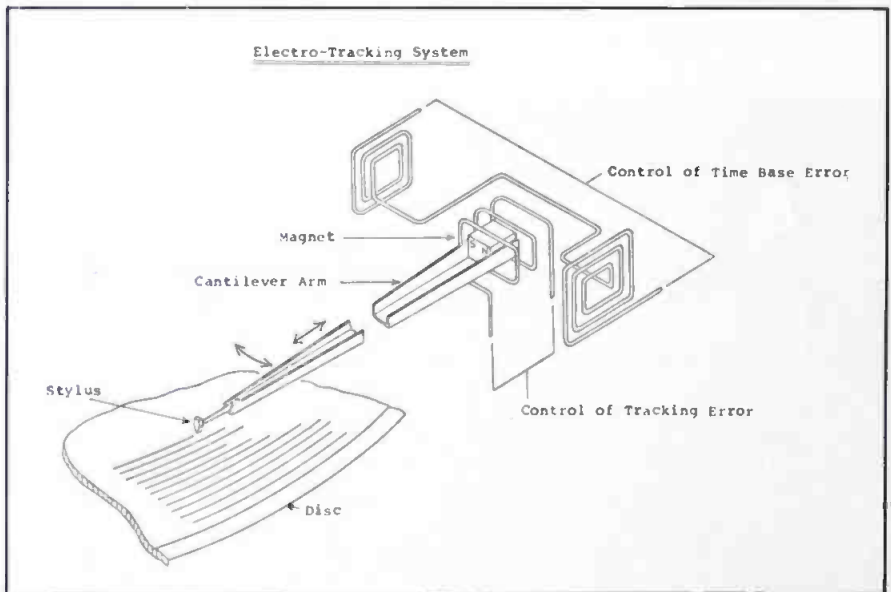
Videodisc system
JVC has unveiled the "VHD/AHD," grooveless, capacitive pick-up videodisc system.



The player, when connected to an ordinary domestic color TV receiver, plays a 12-inch, grooveless

plastic disc which contains up to a total of two hours both sides of color programs with sound. The player will also play digitally recorded, super hi-fi audio (PCM) discs.

The system features: picture and sound information recorded as pits on the disc surface without grooves to guide a pick-up stylus; for recording, a single laser beam split in two, one half for recording information to be retrieved, the other for recording the tracking signal; information and tracking signals simultaneously picked up electronically as capacitance variations between the disc surface and an electrode on the tracking stylus; a servo-controlled cantilever arm to track the imaginary grooves on the disc; and, electro-conductive PVC plastic disc material which requires no additional processing after being pressed.



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Business system

The MITS 300 business system from Pertec Computer Corporation was designed specifically to solve the problems of small businesses.

The cornerstone function, a general ledger, keeps a detailed record of all financial transactions and generates the balance sheet and income statement.

Also included are an accounts receivable and payable function, payroll, inventory management and word processing functions.

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Color production system

Panasonic Video Systems has introduced a system of broadcast quality color production equipment including the AS-6100 self-contained special effects generator; the AS-2000 chroma key generator and the AS-1000 color sync generator.

The special effects generator features 10 video inputs, four input bases, two sets of fade/wipe levers, 14 wipe patterns, positioner, spotlight, colorizer, two downstream key inputs, two external key inputs plus three auxiliary inputs.

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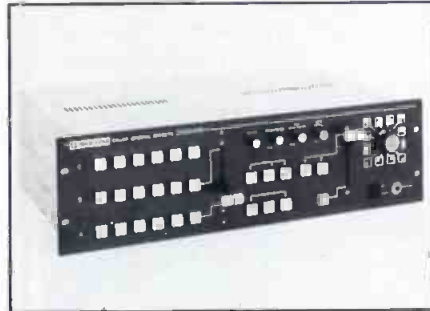
Model AS-2000 chroma key generator adds an extra dimension of special effects to the AS-6100 SEG. Coarse and fine hue adjustments are provided by a rotary switch and variable resistor.

Model AS-1000 color sync generator produces broadcast-stable EIA ES-170 sync using a crystal oscillator. It also genlocks to incoming, non-synchronous composite video signals or composite sync.

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Special effects generator

The image video model SEG-800 color special effects generator from Listec Television Equipment, is designed to meet the needs of ENG, EFP and VTR post production.

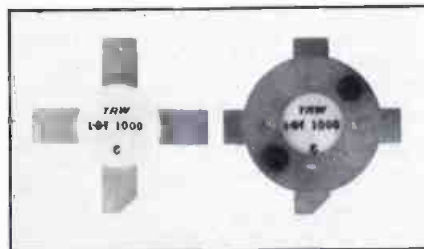


It functions as a standard six input video switcher with mix and effects transition. Matte keys and fade to blacks can be performed with non-synchronous sources using the downstream key function.

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Communications transistor

TRW RF Semiconductors has introduced a 200-watt transistor for 2-30 MHz communications systems. The device is designed for use in military, commercial and marine radios and is said to cut in half the number of power transistors required for a typical 1KW transmitter.



Its low thermal impedance of 0.42°C/W assures reliable operation at 100°C, even while outputting a minimum of 200 watts PEP (peak envelope power).

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ENG color camera

Panasonic's model WV-3800 self-

continued on page 94



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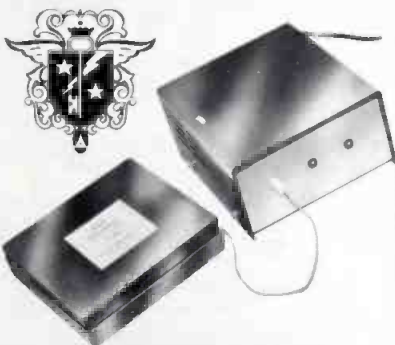
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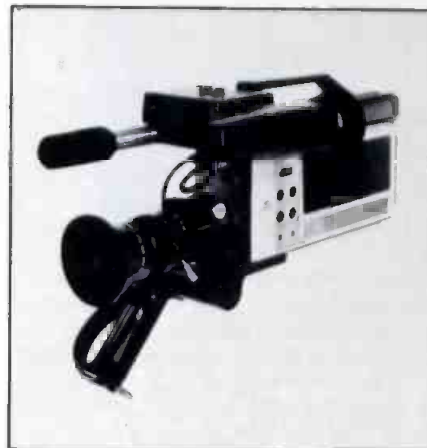
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new products

continued from page 93

contained ENG color camera enables instantaneous color coverage of on-the-spot news, sports and entertainment events.



It is equipped with a 1-inch stripe filter integrated vidicon tube that produces 250 lines horizontal resolution (color).

Along with an automatic iris zoom lens, built-in color bar and built-in color temperature conversion equipment and neutral density filter wheel, the unit is also equipped with Panasonic's Gen-Lock feature.

Circle (124) on Reply Card

Video delay lines

BAL video and pulse delay lines from Listek Television Equipment feature video delay times from 3 to 1000 ns and pulse delay times from 5 to 4500 ns.

Many different configurations are available including switchable, programmable and fixed box packages, DIP and encapsulated mountings for PC insertion.

All video delay lines are equalized to 5.5 MHz with smooth roll-off above 5.5 MHz.

Circle (125) on Reply Card

Remote control assist

The manual assist remote control unit from IGM/NTI can control seven audio sources, each with as many as 99 sub-sources, from a simple keyboard.

As many as 18 events can be entered at a time and are displayed on a CRT.

With the addition of a paper tape reader, the unit can automatically run the station, although its main function is as an assist.

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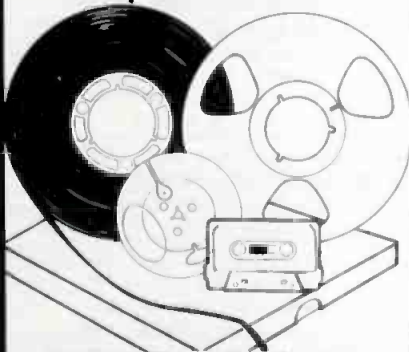
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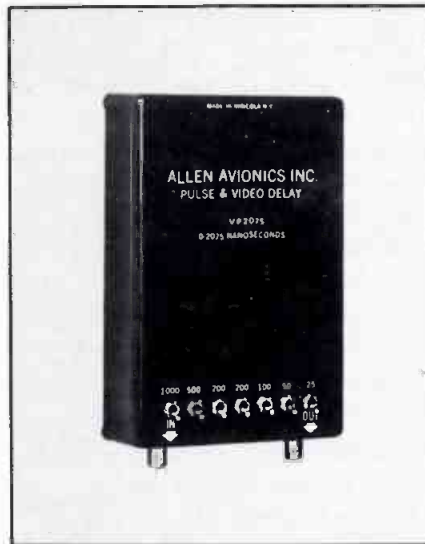
Adhesive labels

Avery Label has announced a line of self-adhesive labels for word processing supplies. White, self-adhesive labels with pre-printed information lines in two sizes are available for standard and mini-cassette tapes.

Circle (127) on Reply Card

L-C delay line

Allen Avionics has announced model VP2075, passive L-C delay lines in 75 ohms, designed specifically for the video industry.



The unit features a longer delay with a flat loss of 3db for any delay setting. The delay range is from 0 to 2075 nanoseconds in 25 nanosecond steps.

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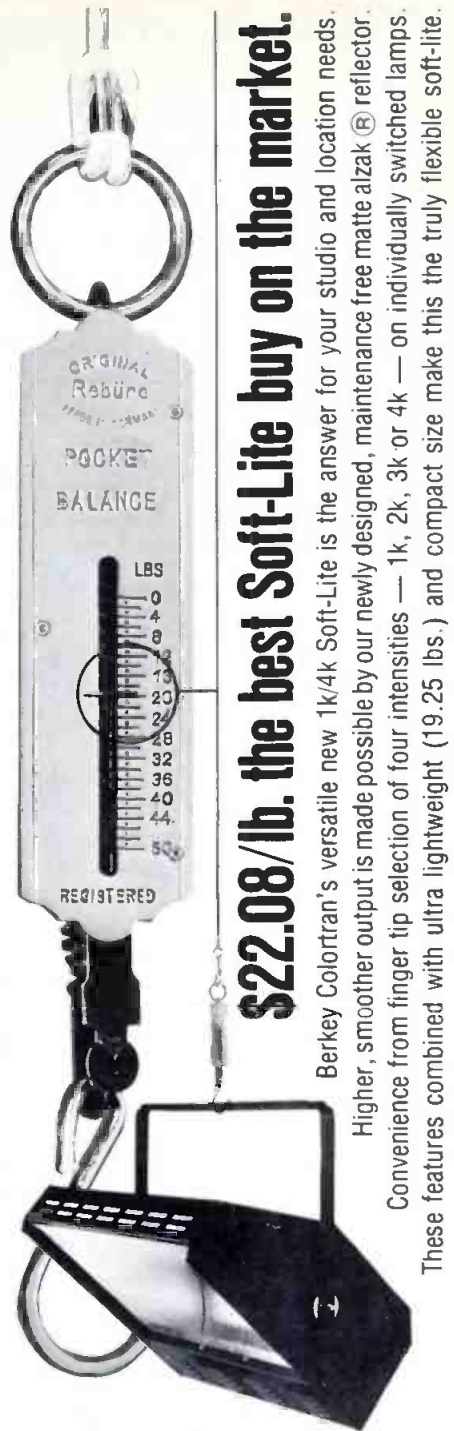
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Reflex cameras

Cinema Products announces the CP-16R and CP-16R/A 16mm reflex cameras.

The cameras feature a belt-driven, focal plane-type, 170° shutter which provides approximately 10% more light to the film plane.

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DATATRON 5050 EDITOR modified for 3 VTR's. Ideal way to break into time code editing. (216) 822-3770. 4-78-1f

RCA VTY MODIFICATIONS KITS for TR4/22/50/60/61/70. Splicer (single-frame), TEP Interface, Time Code Edit Interface Kit, Audio Splice Timing Mod (Audio Insert Editor), Wideband Audio Amplifiers, most mod kits, some modules available. LAWHED, LTD., 388 Reed Road, Broomall, Pa. 19008, (215) 543-7600. 4-78-1f

LIGHT PEN Tektronix 4501 scan converter and homemade interface. (216) 822-3770. 4-78-1f

FOR SALE: ONE RCA TT50AH Television Transmitter (operating on Ch 11) and accessories, including one BW-58 Sideband Analyzer (RCA), one BW-4B Television Demodulator (RCA) and one Ward TA850 Transmitter Color Equalizer. Complete listing of equipment and other information may be obtained by writing or calling Mr. Harold Holden, Washburn University, Topeka, Kansas 66621, 913-295-6359. The University reserves the right to accept the first offer or to reject any offer which in the opinion of the University is unsatisfactory. 11-78-1f

FOR SALE—LPB 10 Watt Transmitter. New, used only 1 1/2 Months. \$1400 or best offer. Cost \$1550 new. Contact KOJC-FM at 1-319-366-0279 for more information. Write to KOJC-FM, P.O. Box 2937, Cedar Rapids, Iowa 52406, or call 319-365-7797 after 5 PM. 11-78-1f

FOR SALE: Collins 21A transmitter in good condition; includes everything from exciter to tuning unit. In use now, will be replaced in spring of 1979. Contact S. D. Crawford, Chief Engineer, P.O. Box 27, Colby, KS. 67701. 913-462-3305. 11-78-1f

EQUIPMENT FOR SALE (CONT.)

LIGHTING DIMMER SYSTEM for sale. 32 - 3K dimmers, 32 faders with 16 preset memory console. Packed for touring. Must sell! Asking price: \$14,950.00. BC&G Enterprises, P.O. Box 708, Arvada, Colorado 80001. (303) 751-5991 or (303) 424-6151. 9-78-3f

FOR SALE—DATATRON 5050-200 EDIT CONSOLE WITH JAM SYNC GENERATOR FOR TIME CODE EDITING. \$9500. BOB BRANDON, KPRC, HOUSTON 713 771-4631 11-78-5f

FOR SALE: IVC 7000P Color Camera with CCU. Canon 12-120 mm lens w/Auto Zoom, 150' camera cable, cases included. For information, call or write: Louisiana Marketing, 901 Lakeshore Drive, Lake Charles, LA 70601, (318) 439-3624. 10-78-2f

\$500 OR OFFER. Ampex 1000B, serial 729. Drake University Journalism, Des Moines. 11-78-1f

BROADCAST CRYSTALS for AM, FM or TV transmitters, frequency change, repair or replacement of oven types. Also vacuum types for RCA, Gates, Collins, etc. transmitters. Quality products, reasonable prices and better delivery! Don't be without a spare crystal. Frequency change and service for AM and FM monitors. Over 30 years in the business. Eidson Electronic Co., Box 96, Temple, Texas 76501. Phone (817) 773-3901. 12-74-1f

ASACA—5 Cameras—4 ACC 7000, 1 ACC 1000 for sale. Used for demonstration only, value over \$150,000. Best cash offer. Art Florman, F&B/CECO, 7051 Santa Monica Blvd., Hollywood, Ca. 90038, or call (213) 466-9361. 8-78-6f

AMPEX AUDIO RECORDERS: 9 AG440 mono in console \$1,750.00; 1 600 mono portable \$550.00; 1 300 2-track completely rebuilt electronics w/solid state preamp \$1,100.00. All in excellent condition. Contact Rod Hall: (213) 577-5400. 10-78-2f

TELEVISION TRAILER—PRITCHARD-KING. 40' ALUMINUM BODY. Contact: A. F. Associates, Inc., 100 Stonehurst Court, Northvale, New Jersey 07647, (201) 767-1000. 11-78-1f

FM TRANSMITTER Westinghouse 10KW Monaural Style 1353070 S/N 39833 Mfg. in 1956. In original shipping crate—never used. This is a freight liquidation—we have no additional technical data. First cash over \$3000, or offer. Allgood Liquidators, 636 S. Pickett St., Alex., VA 22304, Phone 703-823-2303. 11-78-1f

(2) LDH SERIES NORELCO COLOR TELEVISION CAMERAS. One LDH-20 and one LDH-1 modified to LDH-20 specs. Includes camera heads, 10-1 modified zoom lenses, CCU's, cables, local control units (tubes not included). Very good condition. Contact Lenn Block, Rush-Presbyterian-St. Lukes Medical Center, 600 S. Paulina, AF413, Chicago, Illinois 60612, (312) 942-5185. 11-78-1f

CONVERGENCE ECS-1B edit Syst. with TT-6, PC-3, 3-VO-2860, 2-9" B&W Mon., & cases. Sony VO-3800 VTRS. M. Schlansky, (212) 594-8700. 11-78-1f

WANTED

WCWL, a noncommercial educational FM radio station broadcasting from Berkshire Christian College, urgently needs to replace most equipment, including transmitter (250 watts), studio gear, frequency and modulation monitor, limiter. We seek donations (tax deductible) of equipment or money. If you can help, please write to Dr. Garth Story, Berkshire Christian College, Lenox, MA 01240. 11-78-1f

WANTED: ONE 6 KW OR LESS TELEVISION TRANSMITTER IN GOOD CONDITION TUNED CH. 3. XEFB TV 3, BOX 1875, MONTERREY, N.L., MEXICO. 11-78-1f

WANTED: Pre-1926 radio equipment and tubes. August J. Link, Surcom Associates, 305 Wisconsin Ave., Oceanside, Ca. 92054, (714) 722-6162. 3-76-1f

PROFESSIONALS ACCREDITED

PROFESSIONAL BACHELOR DEGREE....earned with 4 or more years of Broadcast Business Management, Sales, or Servicing Experience. For FREE Information Write: Ebert PROFESSIONALS INSTITUTE, Box 1651, Dept. B, Columbia, Missouri 65201. 6-78-61

SITUATIONS WANTED

TELEVISION—CCTV Video Maintenance Technicians. Full Benefits. Greater New York, Suffolk County or New Jersey Area. Send resume to: VPC, P.O. Box 268, New Hyde Park, N.Y. 11040. 6-77-1f

RADIO CHIEF ENGINEER, good audio and transmitter worker. Excellent conditions, salary, and fringes, at West Coasts oldest station. Send resume to KMED, P.O. Box 1440, Medford, Oregon 97501, or call (503) 773-1440. 9-78-41

HELP WANTED

CHIEF ENGINEER AND ASST. CHIEF ENGINEER

Las Vegas CBS affiliate, KLAS-TV, is expanding its Engineering Department and invites you to be part of that growth. We are searching for a Chief Engineer with ten to fifteen years of broadcasting experience, the past five of which should be as Chief or Assistant Chief. Your Equipment familiarity should include TK-76/BVU-100, AE600's, TCR-100, TKP-45, TK-46, and parallel GE transmitters. Also, since we maintain our own 350 mile network microwave system, your background should include some familiarity with Lenkurt, Microwave Associates, or Farlon Microwave. If you are selected as Chief Engineer, you will be answering to the Director of Engineering and be earning in the upper teens. KLAS-TV is also searching for an Assistant Chief Engineer who has five to ten years in broadcasting, with the past three to five years as Assistant Chief or as a heavy studio maintenance engineer. The Assistant Chief will report to the Chief Engineer and will be earning in the mid teens. Please send complete resume, salary history, salary requirements, and references to Linda Imboden, KLAS-TV, P.O. Box 15047, Las Vegas, NV 89114.

Equal Opportunity Employer

TV MAINTENANCE ENGINEER. Central California NBC affiliate needs an engineer with strong background in all areas of commercial TV engineering, especially maintenance and 2" reel-to-reel VTR machines. TCR-100 cartridge tape equipment and E.N.G. experience/knowledge highly desirable. 1st phone required. 40 hour week, annual salary range \$17-19,000 with excellent fringes. Send complete resume, or call Bob Hess, Chief Engineer, KMJ-TV, Channel 24, 1544 Van Ness Avenue, Fresno, California 93779. (209) 268-6666. An Affirmative Action-Equal Opportunity Employer. 11-78-2f

HELP WANTED (CONT.)

VIDEO SALES ENGINEERS

Choice territories in Washington, D.C., Indianapolis, New Orleans, Atlanta

Tektronix's recent expansion into television instrumentation necessitates adding additional professional sales staff.

Tektronix, Inc., a Fortune 500 electronics leader, manufactures an extensive line of broadcast quality waveform and picture monitors, test and sync-pulse generators, vectorscopes, chrominance correctors, and other test and processing equipment. We're looking for a solid technical background in broadcast TV, an EE or the equivalent experience, and successful sales experience in a professional broadcast or CATV environment.

An enthusiastic, self-motivated personality is required since you will be operating with a high degree of independence. We offer a very competitive salary, bonus incentives, commissions and a company car.

Please contact Bland McCartha TOLL FREE at (800) 638-4053, or submit your resume to his attention to TEKTRONIX, INC., 2 Research Court, Rockville, Maryland 20850.

All replies will be held in strict confidence.

An Equal Opportunity Employer M/F/H

Tektronix
COMMITTED TO EXCELLENCE

TELEVISION ENGINEER—Experienced in studio equipment maintenance including quad tape. Must have first phone. Salary dependent upon experience. Call or write Dick White, First Baptist Church of Atlanta, 754 Peachtree Street, Atlanta, GA 30308, 404-881-1288. 11-78-11

RADIO ENGINEER—Immediate opening for engineer with heavy maintenance experience on 50 KW AM and automated Class B FM. First phone required. Minimum 5 years experience. Salary negotiable. An Equal Opportunity Employer. Send resume to Lana Albright, VP Administration, WLW Radio, Inc., Suite 700, 3 East Fourth Street, Cincinnati, Ohio 45202. No phone calls please. 11-78-11

ENGINEERS: International accounting firm, with established broadcast quality color studio, is seeking a quality-minded ASSISTANT CHIEF with strong maintenance ability. RCA Quads, studio cameras, and field production camera for remotes. Become involved in new studio construction in near future. Pleasant midwest suburban location. Also an opening for a STAFF ENGINEER who is aggressive, with strong technical capability. We are an Equal Opportunity Employer. Send resume to Dept. 436, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 11-78-11

VIDEO OPERATING ENGINEERS, maintenance engineers, camera operators, wanted for Washington, DC videotape production house. Experienced only. Reply to: Dept. 431, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 10-78-2f

CCTV, VTR TECHS—Experienced video equipment repair, full or P/T. Video Marketing Inc., Horsham, PA 19044, (215) 343-3000. 11-78-11

HELP WANTED (CONT.)

VIDEOTAPE MAINTENANCE ENGINEER. Quality Northern Rockies station in top outdoor recreation area, sharp operation, seeking the right person to help us stay that way. Must have First Phone and solid TV studio and Videotape maintenance experience. EOE. Contact Karl Black, KRTV, Box 1331, Great Falls, Montana 59403. 11-78-11

WANTED: An announcer-engineer with first phone. Mostly announcing duties, some engineering back-up. Want someone who is looking for a small town (pop. 6000); no cities near. Contact S. D. Crawford, Chief Engineer, P.O. Box 27, Colby, KS 67701. 913-462-3305. 11-78-11

VIDEOTAPE EDITOR: Southern California video production company requires videotape editor/engineer with at least 2 years CMX or CDL editing experience. Salary commensurate with experience. Write Dept. 434, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 11-78-11

ASSISTANT CHIEF ENGINEER OF MAINTENANCE, independent videotape production facility. Emphasis on Camera and VCR maintenance and production editing. Submit resume and salary requirements to Spring Branch Independent School District, P.O. Box 19432, Houston, Texas 77024, Attn: Personnel, E.O.E. 11-78-11

EXPERIENCED AM/FM Engineer position available immediately in the Memphis area. Preferred experience with Directional Systems 50 KW AM and 100 KW FM Systems. First class FCC required. Send resume to Chief Engineer, WDIA Radio Station, P.O. Box 12045 Memphis, Tennessee 38112. An Equal Opportunity Employer. 11-78-11f

HELP WANTED (CONT.)

Broadcast Engineering Personnel Service (coast to coast)

We specialize in the placement of well qualified people in the Broadcast Engineering Industry: TELEVISION & RADIO STATION; Chief Engineers, Assistant Chiefs, Maintenance Engineers, etc. MANUFACTURING, VIDEO SYSTEMS, CCTV, ITV, CATV; Engineering Management, R&D, Project, Design & Development, Maintenance & Service, Systems, Applications, Sales & Marketing. Nationwide Data Bank for Employers & Employees. No fee to Applicant, Professional, Confidential. Phone/Resume—Alan Kornish, KEY SYSTEMS New Bridge Center, Kingston, Penna. 18704. Employers Inquiries invited. (717) 822-2196. No. 1 in the USA. 10-tfn

TV TECHNICAL HELP WANTED: Experienced Chief Engineer, for independent UHF Family Christian Television in South Florida. RF experience a must. Contact G. Kent Smith, WHFT, P.O. Box TV 45, Miami, Fla. 33169, 305-962-1700. Equal Opportunity Employer. 11-78-11

MAINTENANCE ENGINEER—1st Class License, Exp. on Quad VTR's, Studio Cameras, Umatic VCR's and E.N.G. Equip. helpful. Submit resume to: Jim Bush, Chief Engineer, KFDA-TV, Amarillo, Texas 79189. 11-78-11

CHIEF ENGINEER: AM-FM Station in New Orleans has immediate opening for experienced Chief Engineer. Send resumes to: Mr. Jon Peterson, Box 15860, Orlando, Florida 32858. 10-78-11

HELP WANTED (CONT.)

HEAD OF AUDIO-VISUAL TECHNICAL SERVICES. To be responsible for the selection, maintenance, repair and inventory of audio-visual equipment at a large community college with three campuses; to oversee the production of video and audio tapes to support the educational program of the College; to supervise four experienced technicians; to report to and advise the College Library administrator regarding audio-visual services for students and faculty. Thorough knowledge of audio-visual equipment required. Equipment to include television cassette and reel-to-reel recorders and players, color television monitors and receivers, color video cameras and editing systems, audio recording equipment and sound systems. Appropriate degree at Master's level. Rank of Instructor or Assistant Professor and salary dependent upon academic qualifications and experience. College offers excellent benefits. Send resume to Leonard R. Johnson, Executive Director of Libraries, Suffolk County Community College, 533 College Road, Selden, New York 11784. An Equal Opportunity, Affirmative Action Employer. 11-78-11

TELEVISION TRANSMITTER SUPERVISOR—We need a top engineer to maintain two parallel Harris BT18H's on Channel 11, located in the world's tallest building. First Class FCC license plus five years of high power RF experience is required, along with a good understanding of digital electronics. Good benefits go along with a salary of \$27,924 per year. Send your resume in confidence to: Larry W. Ocker, Director of Engineering, WTTW-TV, 5400 N. St. Louis Ave., Chicago, Illinois 60625. 10-78-21

WORK IN THE NORTHWEST: Successful Northwest Broadcasting Corporation seeks qualified engineers and switchers with a 1st phone. If you're experienced, this is a great chance for you to continue on in all phases of a television operation and do it in the beautiful Northwest. Write Dept. 435, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 11-78-21

HELP WANTED (CONT.)

TELEVISION MAINTENANCE ENGINEER

Needed immediately in mile high Denver. First class license and three years studio maintenance experience, preferably on RCA equipment. required. Group broadcaster, excellent benefits and commensurate salary. Send full resume to Ted Everett, KMGH-TV, 123 Speer Boulevard, Denver, Colorado 80217. An Equal Opportunity Employer.



McGraw-Hill Broadcasting Company, Inc

MAINTENANCE ENGINEER: University located on Long Island, New York. Responsible for installing and maintaining CCTV system which includes broadcast quality color cameras, video tape recorders, switchers, monitors, processors. Writing specifications on and evaluating purchases of new electronic equipment for color and black and white studios. Installing and maintaining fire and intrusion alarm systems, maintenance and operation of electronic gear and supervising office and technical staff. First class radio-telephone license required; technical school required; ten years practical experience. Excellent fringe benefits including free tuition. Send resume to Mr. George Nave, Hofstra University, Plant Department, 1000 Fulton Avenue, Hempstead, New York 11550. 11-78-11

MIDDLE EASTERN OPPORTUNITY SENIOR PRODUCTION/ MAINTENANCE ENGINEER

Raytheon Company has a challenging Middle Eastern assignment based in Jeddah, Saudi Arabia for a qualified individual meeting the following criteria:

- A.S. in electronics or specialized courses in Radio and TV Trade Schools.
- 5 years minimum experience commercial and/or closed circuit TV.
- First Class FCC license desirable.
- Working knowledge of PAL SECAM as well as NTSC desirable.

The selected candidate would supervise and/or perform the installation and maintenance of all Television Studio and transmitting equipment.

Another important element of the job would be the effective training of

customer technicians in Television maintenance.

The assignment has the option of single or family status.

We offer an excellent starting salary, plus overseas premiums and cost-of-living adjustment. Company paid housing and a full range of recreational facilities are also provided.

Interested applicants should forward resume and salary requirements to Mr. J. E. Curry, Raytheon Middle East Systems, International Personnel, 350 Lowell St., Andover, MA 01810, or call him collect at 617-475-2459.

RAYTHEON

An Equal Opportunity Employer M/F

SALES ENGINEER**PROFESSIONAL AUDIO PRODUCTS**

A major manufacturer of Professional Audio Products to Television, Radio and Recording Studios is opening a Sales Office for the Southwest/West Coast U.S. We have an immediate Position for a qualified Sales Engineer to be responsible for this area. This person must be a responsible Self-Starter capable of working with a minimum of Supervision. The ideal person will have an in-depth knowledge of Audio Production techniques and a reasonable technical background. Excellent starting salary plus commission. Growth and earning potential wide-open. Send resume and salary history or telephone collect to:

VICE PRESIDENT - MARKETING

**AUDIO DESIGNS
AND MANUFACTURING, INC.**

16005 Sturgeon
Roseville, MI 48066
313-778-8400

an equal opportunity employer

CHIEF ENGINEER—New T.V. station located in major Northeast suburban market requires a 1st class licensed Engineer knowledgeable in all phases of T.V. station equipment. Attractive salary, benefits. Send complete resume, salary history and references to Dept. 432, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. All replies strictly confidential. 10-78-21

TECHNICAL DIRECTOR

THIS KEY MANAGEMENT POSITION AFFORDS A GREAT CAREER OPPORTUNITY FOR AN OUTSTANDING, HIGHLY EXPERIENCED EXECUTIVE ENGINEER.

ASSIGNMENT CALLS FOR A GENUINE ENGINEERING LEADER, A PERSON OF DEDICATION, FULLY EXPERIENCED IN ALL TECHNICAL AREAS TO SERVE IN THIS KEY MANAGEMENT POSITION FOR MAJOR GROUP OWNER AM-FM TV.

INVOLVED IN TOTAL RESPONSIBILITY FOR MANAGEMENT OF ALL TECHNICAL OPERATIONS, PLUS INSTALLATION, UPDATING AND MAINTENANCE OF ALL EQUIPMENT WITH FULL AUTHORITY IN DIRECTION OF ENGINEERING PERSONNEL, ALL PROPERTIES, REPORTING DIRECTLY TO COMPANY PRESIDENT.

QUALIFIED PERSON WILL RECEIVE A TOP LEVEL SALARY, INCENTIVE COMPENSATION, AN EMPLOYMENT ENVIRONMENT SECOND TO NONE.

WRITE, WITH COMPLETE RESUME, TO EXECUTIVE PERSONNEL, WARD L. QUAAI COMPANY, SUITE 370, O'HARE PLAZA, 5725 EAST RIVER RD, CHICAGO IL 60631.

AN EQUAL OPPORTUNITY
EMPLOYER

CHIEF ENGINEER

To head engineering section of leading national medical communications company, based in New York City. Candidate must have:

- Electrical Engineering degree.
- Minimum 5 years experience in radio/television, either broadcast or closed circuit.
- Demonstrated ability in systems design and implementation, including prototype building.
- Some managerial or supervisory experience.

Excellent salary and benefits. Send resume (including salary history) in confidence to:

Assistant to the President
VISUAL INFORMATION SYSTEMS
15 Columbus Circle, New York, N.Y. 10023
An equal opportunity employer M/F

National Marketing Manager

We are seeking an innovative results-oriented individual to spearhead our sales force in the broadcast television marketplace. Candidates must have a proven track record with ability to train and motivate people and the desire to reach forecasts and goals. Salary plus override, excellent benefits. Position available in early 1979. Send resume including salary history to:

Box 433, Broadcast Engineering
P.O. Box 12901, Overland Park,
KS 66212.

All inquiries will be acknowledged by a company principal.

Equal
opportunity
employer, m/f



TO PROTECT THE UNBORN AND THE NEWBORN

March of Dimes

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- 09. Educational Radio
- 13. Recording Studio
- 18. Distributor
- 17. Government Agency
- 4. Corporate Officer
- 5. Technical Management/Engineering
- 6. Other Management
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1	13	25	37	49	61	73	85	97	109	121	133	145	157	169	181	193	205	217	229	241	253	265	277	289	301	313
2	14	26	38	50	62	74	86	98	110	122	134	146	158	170	182	194	206	218	230	242	254	266	278	290	302	314
3	15	27	39	51	63	75	87	99	111	123	135	147	159	171	183	195	207	219	231	243	255	267	279	291	303	315
4	16	28	40	52	64	76	88	100	112	124	136	148	160	172	184	196	208	220	232	244	256	268	280	292	304	316
5	17	29	41	53	65	77	89	101	113	125	137	149	161	173	185	197	209	221	233	245	257	269	281	293	305	317
6	18	30	42	54	66	78	90	102	114	126	138	150	162	174	186	198	210	222	234	246	258	270	282	294	306	318
7	19	31	43	55	67	79	91	103	115	127	139	151	163	175	187	199	211	223	235	247	259	271	283	295	307	319
8	20	32	44	56	68	80	92	104	116	128	140	152	164	176	188	200	212	224	236	248	260	272	284	296	308	320
9	21	33	45	57	69	81	93	105	117	129	141	153	165	177	189	201	213	225	237	249	261	273	285	297	309	321
0	22	34	46	58	70	82	94	106	118	130	142	154	166	178	190	202	214	226	238	250	262	274	286	298	310	322
1	23	35	47	59	71	83	95	107	119	131	143	155	167	179	191	203	215	227	239	251	263	275	287	299	311	323
2	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240	252	264	276	288	300	312	324

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- 11. CCTV Facility
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- 09. Educational Radio
- 13. Recording Studio
- 18. Distributor
- 17. Government Agency
- 4. Corporate Officer
- 5. Technical Management/Engineering
- 6. Other Management
- Other (specify) _____

1	13	25	37	49	61	73	85	97	109	121	133	145	157	169	181	193	205	217	229	241	253	265	277	289	301	313
2	14	26	38	50	62	74	86	98	110	122	134	146	158	170	182	194	206	218	230	242	254	266	278	290	302	314
3	15	27	39	51	63	75	87	99	111	123	135	147	159	171	183	195	207	219	231	243	255	267	279	291	303	315
4	16	28	40	52	64	76	88	100	112	124	136	148	160	172	184	196	208	220	232	244	256	268	280	292	304	316
5	17	29	41	53	65	77	89	101	113	125	137	149	161	173	185	197	209	221	233	245	257	269	281	293	305	317
6	18	30	42	54	66	78	90	102	114	126	138	150	162	174	186	198	210	222	234	246	258	270	282	294	306	318
7	19	31	43	55	67	79	91	103	115	127	139	151	163	175	187	199	211	223	235	247	259	271	283	295	307	319
8	20	32	44	56	68	80	92	104	116	128	140	152	164	176	188	200	212	224	236	248	260	272	284	296	308	320
9	21	33	45	57	69	81	93	105	117	129	141	153	165	177	189	201	213	225	237	249	261	273	285	297	309	321
0	22	34	46	58	70	82	94	106	118	130	142	154	166	178	190	202	214	226	238	250	262	274	286	298	310	322
1	23	35	47	59	71	83	95	107	119	131	143	155	167	179	191	203	215	227	239	251	263	275	287	299	311	323
2	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240	252	264	276	288	300	312	324

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2	14	26	38	50	62	74	86	98	110	122	134	146	158	170	182	194	206	218	230	242	254	266	278	290	302	314
3	15	27	39	51	63	75	87	99	111	123	135	147	159	171	183	195	207	219	231	243	255	267	279	291	303	315
4	16	28	40	52	64	76	88	100	112	124	136	148	160	172	184	196	208	220	232	244	256	268	280	292	304	316
5	17	29	41	53	65	77	89	101	113	125	137	149	161	173	185	197	209	221	233	245	257	269	281	293	305	317
6	18	30	42	54	66	78	90	102	114	126	138	150	162	174	186	198	210	222	234	246	258	270	282	294	306	318
7	19	31	43	55	67	79	91	103	115	127	139	151	163	175	187	199	211	223	235	247	259	271	283	295	307	319
8	20	32	44	56	68	80	92	104	116	128	140	152	164	176	188	200	212	224	236	248	260	272	284	296	308	320
9	21	33	45	57	69	81	93	105	117	129	141	153	165	177	189	201	213	225	237	249	261	273	285	297	309	321
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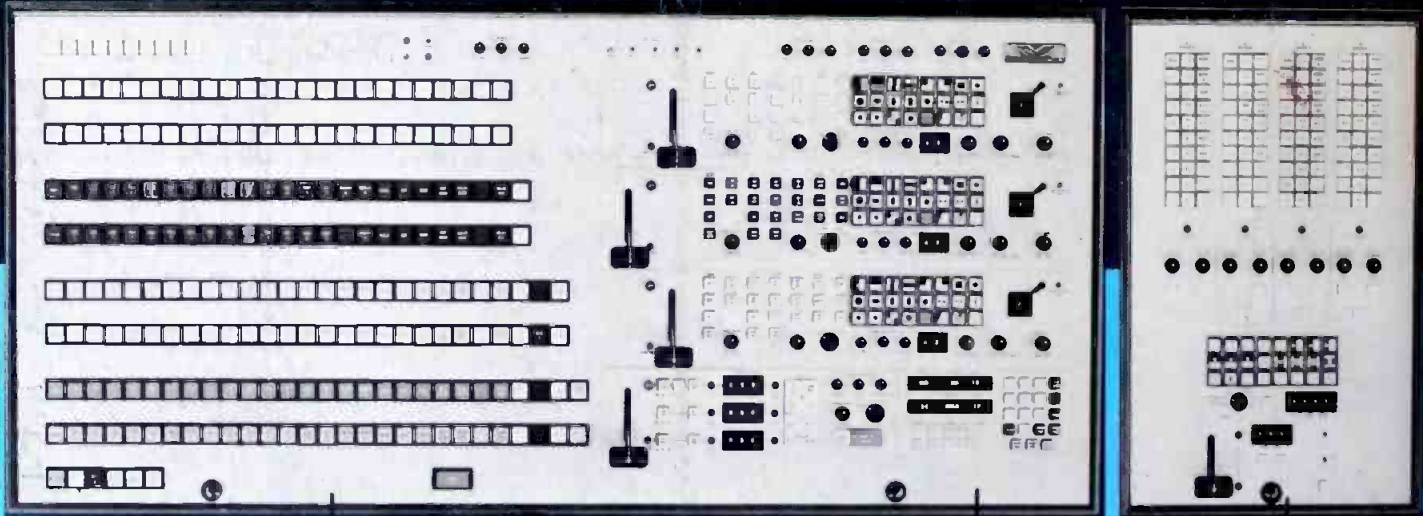
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