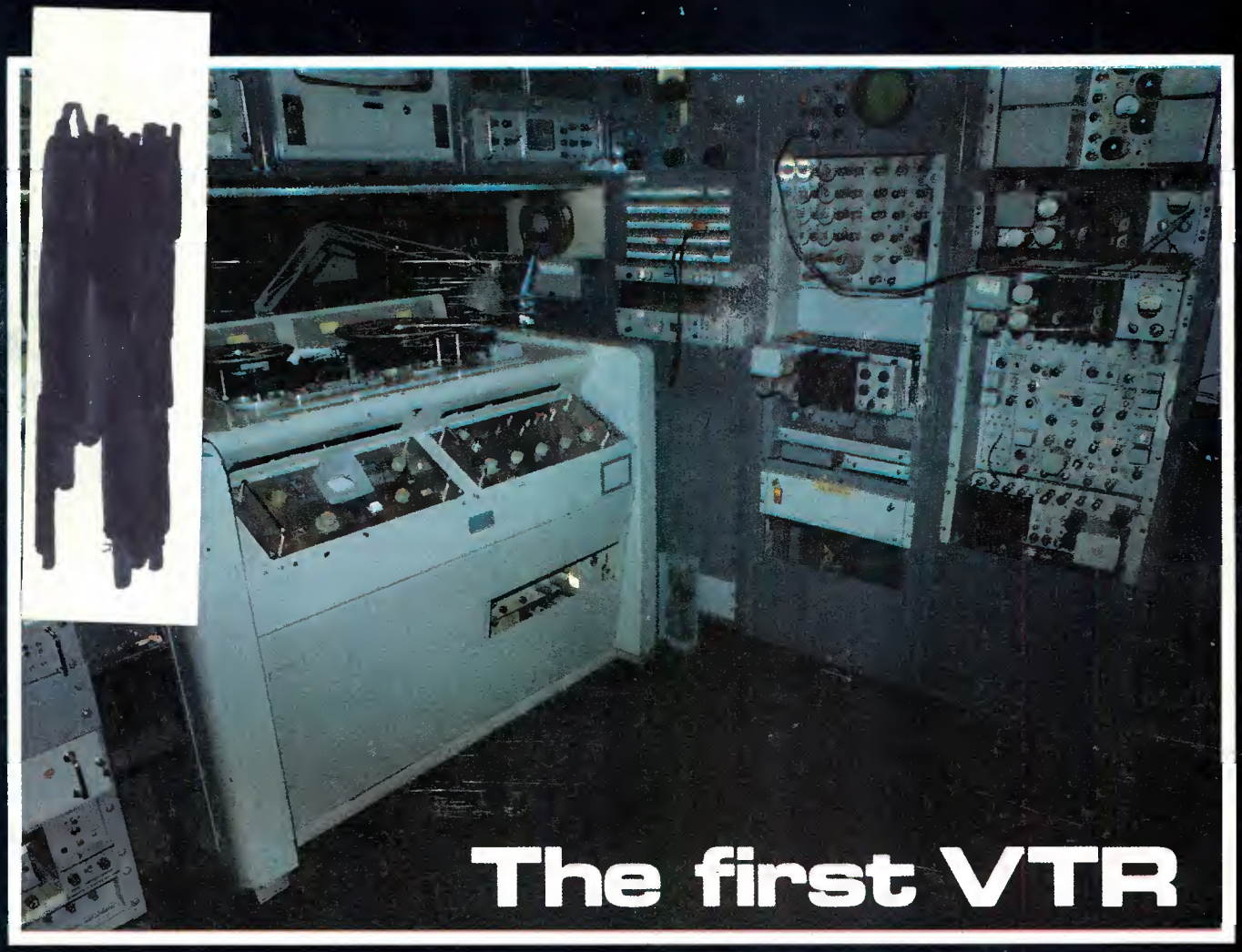
BROADCAST engineering

May 1981/$3



The first VTR

Acoustics for studio design

Character generator roundup

Introducing the only teleterminal that stars on all three networks.

The Cal DataCom CD/300 multi-function teleterminal will outperform any teleprinter in the business. No matter which communications network you plug it into.

At the touch of a button, the CD/300 can directly access TLX, TWX and Direct Distance Dialing (DDD). Your operator can dial up the least expensive network for transmitting messages by simply inputting the line mode, typing the number and entering the message. From there, the CD/300 steals the show and handles the rest. Expensive Infomaster switching charges are avoided. Your communications costs are cut to a minimum.

But that's just for openers. As an added attraction, we've designed the CD/300 to also function as a computer terminal. So instead of investing in extra equipment for your system or for timesharing, you can have the CD/300 play the part.

The reason the CD/300 is so multi-talented is its unique combination of microcomputer hardware and firmware. Along with a solid state buffer memory that gives the CD/300 a cast of extras.

Like an automatic unattended operation feature that lets you take advantage of reduced DDD rate hours. Complete text editing capability. Plus a local/on-line mode that increases efficiency by letting your operator send messages without interrupting incoming traffic.

And even with all these superstar qualities, the CD/300 still has a down-to-earth price. Just slightly higher than what you would have to pay for one of those limited function teleprinters that will soon be obsolete.

So if you think it's prime time to start reducing your message communications costs, give the top-rated star of TLX, TWX and DDD a role in your office. Call toll free, 1-800-854-0171. In California, call collect (714) 540-8553.

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Announcing new AM/FM Stereo Consoles from ADM

THEY DO EVERYTHING BUT THE HELICOPTER REPORT

ADM® is proud to announce the ST Series, newest addition to our line of quality professional broadcast consoles. Compact as they are, they're big on capability and flexibility. They feature the same performance excellence, operational simplicity and reliability you'll find in any product from ADM.

The new ST consoles offer a series of modular frames that we will equip to your particular needs. A variety of input, output and signal processing modules are also available to satisify your present requirements as well as future expansion. Each ST frame offers up to three separate stereo and one monaural output. All modules are front panel plug-ins. Electrical specifications set a new level of excellence for the industry.

So confident is ADM of the excellence of the ST Series, that they're backed with an exclusive 5-year warranty.

To find out more about how the new ST Series can make Audio Broadcasting easier for you, write or telephone us today. ADM Technology, Inc., 16005 Sturgeon, Roseville, Michigan 48066. Phone 313/778-8400. TLX 23-1114. West Central Sales Representative, Gordon Peters. Phone (817) 467-2990.

ADM®

The Audio Company

BROADCAST® engineering

The journal of broadcast technology

May 1981 ☐ Volume 23 ☐ No. 5

THE COVER shows the industry's first videotape recorder, the Ampex VPX-1000, which revolutionized television. The unit shown was first demonstrated at the NARTB Convention in Chicago on April 14, 1956, and then installed at CBS Television City in Hollywood, CA. It was in service for 23 years.

An article describing the efforts to develop and introduce this first VTR is included in this issue. It is written by Charles Ginsburg, leader of the team that developed the system and thereby spawned an enormous VTR market.

The cover photo is printed courtesy of CBS and Donna Foster-Roizen.

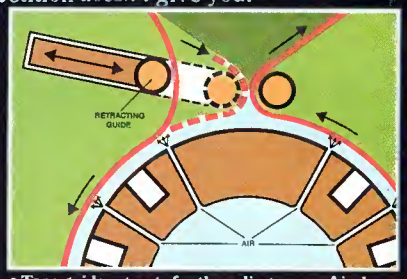
NEXT MONTH
An in-depth coverage of events and exhibits of the NAB '81 Las Vegas Convention. Special emphasis will be given to covering advancing technology as brought out in technical sessions and workshops and to new equipment introduced by exhibitors.

BROADCAST ENGINEERING (USPS 338-130) is published monthly by Intertec Publishing Corporation, 9221 Quivira Road, P.O. Box 12901, Overland Park, KS 66212. Postmaster, return form 3579 to the above address.

Hitachi-5 Competition-0

That's the score in one-inch VTR technology.

We've gone the first generation of TYPE C machines *five* better...to help you get all the potential of one-inch out of your video installation. Here's what the competition *doesn't* give you.



• Tape guide retracts for threading ease • Air drum eliminates head contact in shuttle/standby modes

1. Retracting Tape Guide

Retracts for unequalled ease of threading; repositions with one micron accuracy for up to two million threadings. Provides the reliability of a quad thread system in a one-inch format.

2. "PRO" Tape Path

The protective reverse oxide ("PRO") configuration of the tape path means *only* the video and audio heads touch the oxide surface. All other transport mechanisms guide the tape by its reverse side. Result: noticeably reduced dropouts; longer tape life.

3. Instant Head Replacement

Pre-aligned head design permits easy replacement of video heads in three minutes. No adaptors or jigs; no adjustments required.

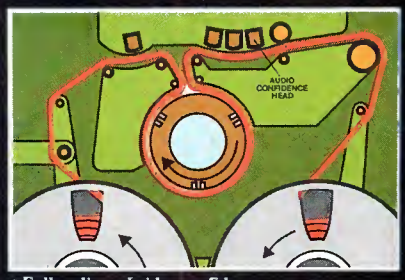
4. Audio and Video Confidence

The others only let you *see* what you're taping. We let you *see* and *hear* everything being recorded...simultaneously.

5. Non-contact Tape Shuttle System

In shuttle and standby modes, tape rides on a cushion of air. Increases head and tape life immeasurably. Cuts frictional resistance, yielding shuttle times of only 80 seconds end to end.

We could go on. With impressive features like microprocessor control; broadcastable slow motion; one-touch shuttle and jog; front access circuit boards; audio spot erase; and on and on. But why run up the score, when it's already no contest? See the Hitachi HR-200, it's equally impressive portable HR-100 model, and companion TC-200 Time Base Corrector.



• Full audio and video confidence
• "PRO" tape path reduces dropouts

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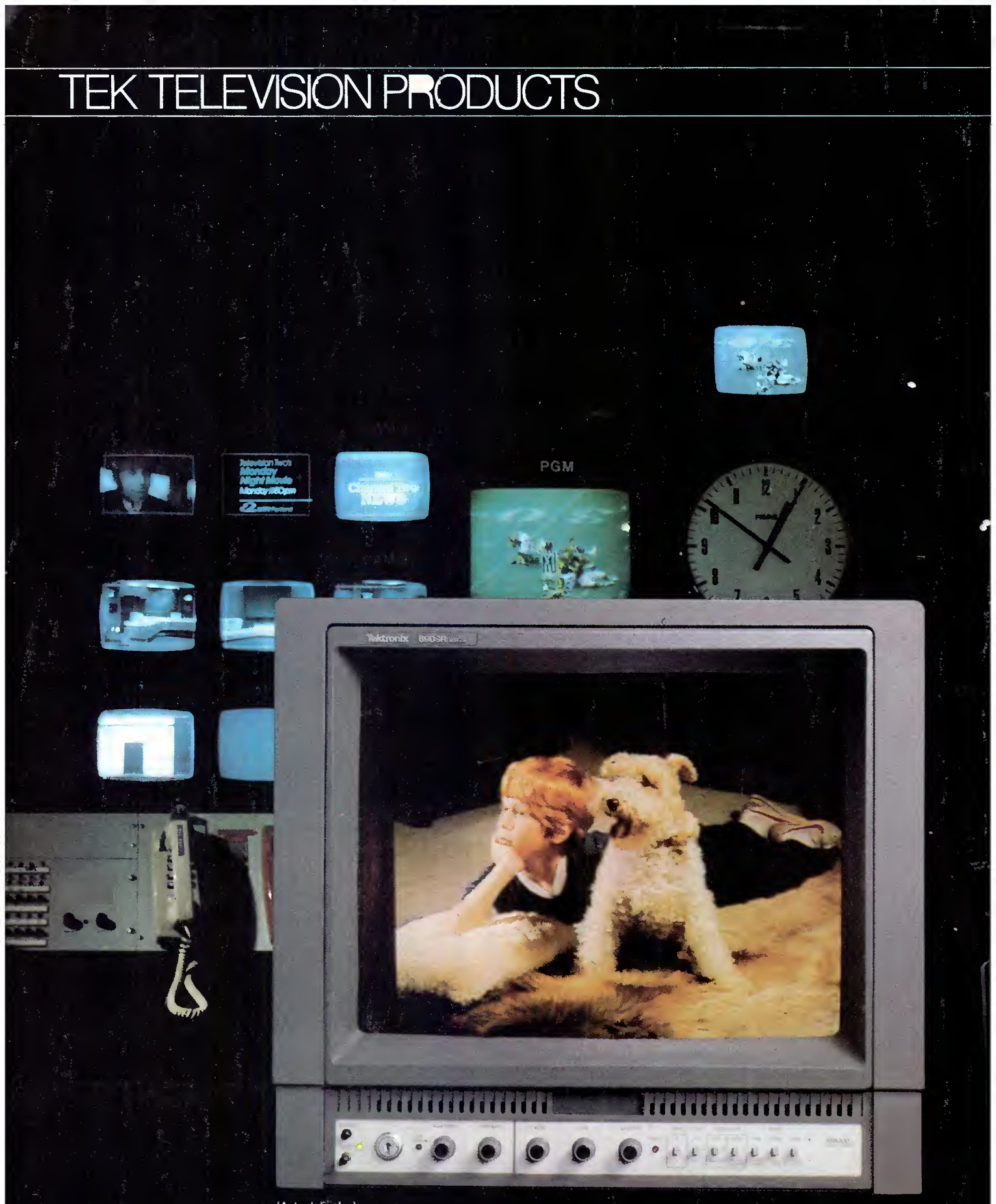

(Actual display)

A growing generation of television products with the same commitment to your signal quality.

If there's one thing in this business that doesn't change, it's your commitment to provide viewers a quality signal. Just as ours is to provide you the products to help you achieve that goal.

Over the years, Tektronix has consistently provided the test, measurement and monitoring equipment to help raise color television signal quality.

This year, three new Tek products exemplify our continuing commitment to signal quality by providing added capabilities and improved performance.

690SR Color Picture Monitor

If there's a monitor you can believe, it's the 690SR. High resolution, precise convergence and stable color make it your best basis for subjective picture evaluation. With the 690SR, there's no doubt your picture is a correct-rendition of input signals.

Monitor set-up is simplified. Logical and non-interactive convergence controls make adjustment a simple, straightforward procedure. And maintenance needs are minimal. Modular design makes troubleshooting easy.

Its adaptibility makes the 690SR a long-term investment that fits future needs. New modules will become available as needed to meet both your own and changing industry requirements.

468 Digital Storage Oscilloscope

Here's digital storage in a portable scope. You'll know the 468 for its bright, crisp display, especially of low duty cycle waveforms. Then look closer. There's stable, sweep triggering of video waveforms in TV line and field rates, plus field selection.

The 468 offers a unique envelope acquisition mode. Ideal for troubleshooting digital equipment, catching glitches, monitoring changing signals and more. A Tek exclusive.

For signal analysis, stored waveforms can be expanded and repositioned vertically and horizontally. Digital cursors offer accurate, repeatable time and voltage measurements of your signal. Storage makes it all easy.

528A Waveform Monitor

When you're looking for consistent, reliable monitoring of your video signal, you're looking at the 528A.

The 528A enhances features of our widely-used 528. New front panel controls, for example, offer faster, easier operation.

An internal CRT graticule assures parallax-free viewing from a bright, easy-to-read display. In short, more accurate overall measurements. With this workhorse around, you'll know for sure levels are right.

TSG7 Color Bar Generator

If you're considering SMPTE Color Bars for easier, more accurate picture monitor alignment, Tektronix is ready with a new source, the TSG7 Color Bar Generator. The TSG7 installs in the mainframe of our 1410 Signal Generator and turns the task of adjusting color monitors into a precise, easy and objective procedure.

Here you have a growing generation of television products. Changes have come out of our commitment to help you achieve better signal quality. That hasn't changed, and never will.

Our toll-free number stays the same, too: dial 1-800-547-1512 for the full story on the products here.

Tektronix, Inc.
P.O. Box 1700
Beaverton, OR 97075

Production switcher is a GVG 1600-7K with Digital Video Effects and Effects Memory System.

Background photo courtesy of KATU, Portland.

Tektronix®
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FCC update

May 1981

Directional antennas

The commission has amended its rules to provide for the conversion of all US AM directional antenna stations to standard patterns. Also, minor change applicants, which are not now required to use standard patterns, will be required to do so.

The commission issued a notice of inquiry on this subject in November 1977 and a notice of proposed rulemaking in September 1980.

The conversion will permit the computerization of these patterns which, in turn, will facilitate application processing and remedy a technical deficiency in the US station inventory data currently before the International Frequency Registration Board (IFRB).

The conversion will be done by the commission, via contract, not by individual stations. However, stations and other interested parties will be afforded a 30-day period following publication of the converted patterns in which to comment on the conversion results. The conversion involves about 2000 radiation patterns and will be completed by the end of May to allow the modified parameters to be submitted to the IFRB in time for its Region 2 interference studies later this summer.

Many AM broadcast stations operate with directional antenna patterns using multiple towers rather than operating omni-directional with a single tower. This directional operation greatly increases the number of stations that can operate on a given channel by suppressing radiation toward other stations. Initially each directional radiation pattern is determined by theoretical calculations. However, tolerances are added in critical directions to provide leeway for adjustments and day-to-day station operation. These tolerances are known as "maximum expected operating values" or MEOV, which are graphically depicted on the plots of the patterns. These patterns are licensed domestically and notified internationally.

Before the advent of computers, MEOV were adequate. However, because they were not mathematically derived, but based on the judgment of the design engineer, they are not susceptible to automation. To provide for a uniform method of developing MEOV, the commission in 1971 required all applicants for new stations and the major changes in existing stations to use "standard patterns" which provide a mathematically derived MEOV in all directions. Because of the mathematical nature of the standard pattern, it is easily computerized.

Stations authorized before 1971 were permitted to retain use of their non-standard patterns. The new rules require all those directional stations given exemptions in 1971 to convert to standard patterns. (Docket No. 21473)

Radio deregulation

In a decision to deregulate several aspects of commercial AM and FM radio, the commission has eliminated (February 14, 1981) community ascertainment procedures, guidelines limiting commercial time and the rules requiring maintenance of comprehensive program logs.

Also, the FCC modified the nonentertainment programming obligation to allow greater programming flexibility for broadcasters. The commission expects that broadcasters will use their new programming flexibility to offer more diverse programming choices to their radio listening audiences.

The FCC determined that the rules had become largely unnecessary in the highly competitive environment of commercial radio and, thus, were no longer warranted in light of the extensive paperwork burdens the rules imposed on both the commission and the industry.

The FCC's action terminated a rulemaking proceeding that began in September 1979 and was the subject of public participation workshops and panel discussions and drew approximately 20,000 comments from citizens, industry and governmental agencies. The decision will become effective at least 30 days after publication in the Federal Register, unless delayed by court action.

Issuing a concurring statement,

BROADCAST engineering

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Control the complete audio spectrum

Our ADM 1600: modest but mighty

Although it's a desk-top model, our 1600 Series audio console offers a brilliant array of features and capabilities for handling the most demanding program material.

One of our new breed of consoles, the ADM® 1600 is available with up to 16 discrete inputs, 4 submaster and 2 master outputs. Combined with a host of pre-selector, buss selector and processor modules, the ADM 1600 creates perfect harmony with today's video. Like all ADM consoles, the 1600 is designed to exacting standards and manufactured to the most rigid tolerances. Each ADM console is backed by an exclusive 5-year warranty.

Make sure you control the entire audio spectrum. Contact ADM Technology, Inc., *The Audio Company*, 16005 Sturgeon, Roseville, MI 48066. Phone (313) 778-8400. TLX-23-1114. West Central Sales Representative, Gordon Peters. Phone (817) 467-2990.

FCC Update

Charles Ferris, FCC chairman, said "We have translated the rhetoric of deregulation into reality. No longer will radio broadcasters be required to follow empty governmentally required procedures and compile stacks of paperwork. Instead they will be able to follow their own path in determining how to serve their community's needs and interests in ways that reflect the realities of today's radio market."

Commissioner Abbott Washburn issued concurring remarks and Commissioner Tyrone Brown issued a dissenting statement. (BC Docket No. 79-219)

Eight revised broadcast forms

The following recently revised forms are now available for use:

Form 303—Application for Renewal of License for Commercial TV Broadcast Station (June 1980. June 1978 edition may also be used.)

Form 303-A—Annual Programming Report (October 1980.)

Form 308—Application for Permit to Deliver Programs Foreign Broadcast Stations (April 1980. July 1977 edition may also be used.)

Form 324—Annual Financial Report of Networks and Licensees of Broadcast Stations (October 1980.)

Form 324-A—Annual Financial Report of Networks and Licensees of Broadcast Networks (October 1980.)

Form 346—Application for Authority to Construct or Make Changes in a TV or FM Translator Station (February 1980. August 1978 edition may also be used.)

Form 395—Annual Employment Report and Instructions (January 1981.)

Form 701—Application for Extension of Construction Permit or to Replace Expired Construction Permit (April 1980. March 1979 edition may also be used.)

VHF drop-ins

Comment dates are approaching about an FCC proposal to increase the number of VHF TV stations. The proposal could add new VHF channels and stations in communities throughout the country. Under the proposed rule change, new channels on the VHF band (channels 2-13) could be allotted in many areas. Many of the communities that could be allotted channels are presently far from existing stations and do not receive the best-quality reception.

The rule change would make VHF stations available in New Jersey and Delaware, where VHF viewers are served by only New York, Philadelphia and Baltimore stations.

There is a remaining issue: balancing diversified programming and ownership vs feared interference with existing VHF stations and harmful competition with UHF stations. Comments were due April 15, 1981; replies June 15, 1981. (BC Docket No. 80-499)

New simplified renewal procedures to reduce paperwork

The commission has adopted a simplified renewal procedure that reduces substantially the paperwork burdens associated with the renewal process.

The procedure includes a 5-question, postcard-size renewal application form for most commercial and noncommercial broadcast licensees and provides for audits and field inspections of randomly selected licensees to assure compliance with FCC rules.

This action is a result of the commission's concern in the broadcast area over the elimination of unnecessary burdens on the commission and the licensee and from an analysis of its renewal procedures undertaken by the Broadcast Bureau, as set forth in 1980. The commission emphasized that the simplifications in its processes and the new procedures it adopted are fully consistent with its statutory requirements under the Communications Act.

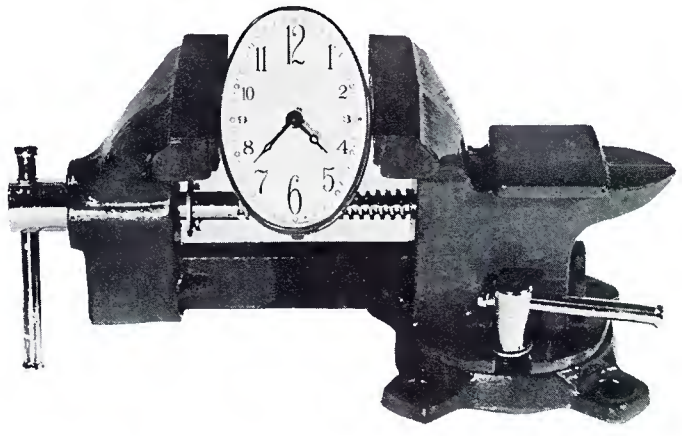
The simplified renewal form will be filed by most radio and TV broadcasters—with the exception of 5% of commercial and noncommercial TV licensees and 5% of noncommercial radio licensees who will receive a long form audit similar to renewal applications now used.

The commission will mail the simplified renewal and audit forms to licensees as soon as possible after the Office of Management and Budget approves them. The review process for FOB public file inspections will begin after April 1, providing adequate time for licensees to learn about the new procedures. Ownership report and balance sheet requirements and amendments to the public notice rules are effective 30 days after publication in the Federal Register. (BC Docket No. 80-253)

Broadcast complaints decrease

A total of 17,369 complaints from the public was received by the Broadcast Bureau in January 1981, a decrease of 1339 from December. Other comments and inquiries for January totaled 1467, an increase of 511 over the previous month. The Bureau sent 1126 letters in response to these comments, inquiries and complaints. □

Eventide Clockworks ends the tyranny of the clock.

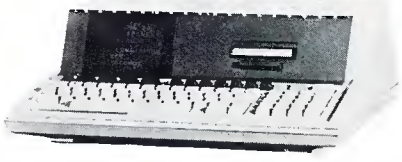


Introducing the Eventide Timesqueeze system.

It lets you control time. Specifically, the running time of videotape and audiotape playbacks. With no editing, no "Donald Duck" audio effects and no material eliminated. In fact, the process is virtually undetectable in use.

Think what this can mean! Did a local commercial come in at 32½ seconds? With the Eventide Timesqueeze system, that spot will fit in a 30 second slot. A 100 second news spot can fit a 90 second news slot. You can even program a 95 minute movie package in a 90 minute slot. And the system works the other way too. It can stretch time. For example, a 36 second musical background can be stretched to cover a 40 second scene.

For television use, the Eventide Timesqueeze system controls your one-inch variable-speed-capable VTR. Radio stations can use the system to control most any pro-audio recorder. And Eventide delivers full 15KHz audio response.



How much does it cost to control time? Amazingly, as little as $3500 for the most basic system. The fully computerized system is only $8500. So not only can you control time, you can control costs.

The Eventide Timesqueeze system. It gives you freedom of time.

Eventide
the next step

Eventide Clockworks Inc.
265 West 54th Street
New York, N.Y. 10019
(212) 581-9290

Circle (5) on Reply Card

Ask Eventide:

Q. How does the Eventide Timesqueeze system work?

A. In order to change the timing of an audio or video recording, first the tape playback speed must be varied so that the original play time is changed by the amount desired. Second, the detrimental effects of the speed change must be negated or corrected. In audio this means restoring the pitch so that the announcer doesn't sound drunk (on slowed tapes) or like Donald Duck (on sped-up tapes, of course.) In video it requires signal manipulation so that sync is not lost as the VTR speed changes. Compatible one-inch VTR's, equipped with their companion TBC's can provide stable pictures at slow and fast speeds.

The Eventide Timesqueeze system accomplishes time compression and expansion by first computing and generating tape machine control signals to vary tape speed by the proper amount, and then by correcting the audio pitch, using the H949 Harmonizer.® The system can be configured in several ways. To control an audio recorder, often the H949 Harmonizer alone can be used. In other cases, such as when very precise final timing is required, the crystal-controlled PTC945 Precision Tape Controller should be added, to generate both the control signals for the tape machines and to control the pitch ratio of the Harmonizer. If the PTC945 is used, the final component of the system becomes a computer. We recommend the Hewlett-Packard HP-85 for its overall quality and reliability, but any small computer with an IEEE-488 interface, including the inexpensive Commodore PET can be used. The computer takes overall control of the system, by sending messages to the PTC945 and thence to the H949. All functions, including tape timing can be controlled by the computer. The computer-controlled Eventide system is unrivalled in operating simplicity. Just answer the questions the computer asks on its CRT readout:

COMPUTER: HOW LONG IS YOUR TAPE?
OPERATOR: 67 SECONDS.
COMPUTER: HOW LONG DO YOU WANT IT TO BE?
OPERATOR: 59.5 SECONDS.

What could be simpler? In fact you don't even have to answer the first question. Just cue up the tape and the computer will time it for you and then automatically set the correct pitch and timing.

A few words about the heart of the Eventide Timesqueeze system, the H949 Harmonizer. This unit performs the most difficult part of the task, pitch change. Pitch changing requires digitally sampling audio at a high speed and then "reading out" that data at a variable rate. The varying input vs. output rate makes it necessary to "splice in" or delete small segments of signal. To prevent "glitches" caused by this process Eventide uses a proprietary splicing algorithm which permits broadcast quality to be maintained. Broadcasters and producers will find many other uses for the H949 Harmonizer, when it is not in time compression/expansion and pitch change use. For example, the H949 can perform flanging, time reversal, digital repeat and many other audio "special effects." TV and radio program and commercial producers will find these additional uses invaluable.

Got a question about time compression or digital audio effects? Send it to "Ask Eventide" 265 West 54th Street New York, N.Y. 10019. If we use your question in print we'll send you an Eventide T-shirt, so include your size.

news

Poniatoff named Man of the Year

The International Tape/Disc Association (ITA) in association with Time magazine posthumously presented the 1981 "Man of the Year" Award to Alexander M. Poniatoff at the ITA annual seminar in Hollywood, FL. Poniatoff died October 24, 1980.

Poniatoff, founder and chairman of the board for Ampex Corporation, was recognized for his pioneering efforts in establishing magnetic tape as the medium for high quality recording and reproduction.

Using developmental work in tape recording in Germany, Poniatoff produced the first professional quality magnetic audiotape recorder in the United States. Although originally intended for broadcast use, the application of audiotape recording eventually extended to recording for phonograph records and tape reproduction, to instrumentation, to theater sound systems and, ultimately, to video.

Under the guidance of Poniatoff, Ampex Corporation developed a new design for amplifiers and speakers that created a more realistic sound reproduction, which gave birth to the modern high fidelity era.

Ferris joins law firm

Charles D. Ferris, 47, chairman of the FCC, left the commission April 10 to become a partner in the Washington offices of a major Boston-based law firm, Mintz, Levin, Cohn, Ferris, Glovsky and Popeo.

Joining the firm with Ferris are Frank W. Lloyd III, 39, administrative assistant to the FCC chairman who will also become a partner, and Thomas J. Casey, 29, deputy chief of the FCC's Common Carrier Bureau.

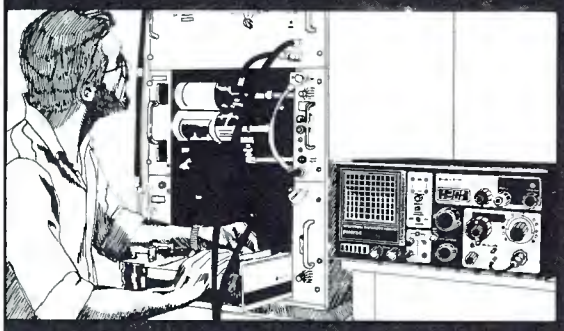
In his new position, Ferris plans to remain involved with the communications industry both in the United States and overseas. He also expects to use his experience working with Congress on a broad range of matters. □

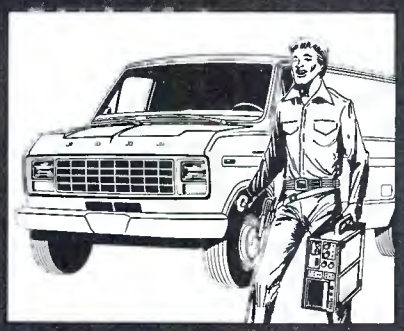
NEW SPECTRUM ANALYZERS

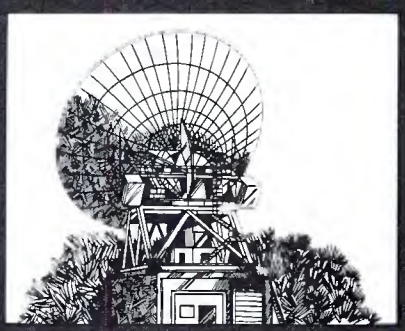
for monitoring, service and testing

100 kHz to 2 GHz

The Model 632B-1 compact Spectrum Analyzer provides excellent performance, high accuracy, ease of use and high reliability.
It is well suited for modern communications signal analysis, CATV, CB, wide range distortion and noise measurements, test equipment calibration, EMC tests, and other frequency domain applications up to 2.0 GHz.







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Circle (7) on Reply Card

National Association
of Broadcasters
1771 N Street, NW
Washington, DC 20036

LPTV recommended for broadcasters

Low-power television (LPTV) broadcasting is supported by NAB but it is opposed to the exclusion of networks and local broadcasters from this new service. NAB also recommends that full service broadcast facilities be protected from LPTV interference.

The association told the FCC that it has not provided a satisfactory justification for its proposed ownership restrictions, particularly as they apply to radio broadcasters. Local broadcasters and networks are potential operators who have the most experience and are in the best position to develop the service, according to the NAB. Also, the NAB said, the restrictions are contrary to the spirit of deregulation and that "the free functioning of the marketplace is the best mechanism for regulation of the media."

The commission's proposal will give preference to applicants meeting any of these criteria:

- first filing of a complete application,
- more than 50% minority ownership and control,
- proposed non-commercial service.

NAB said the FCC's proposed system of awarding "preferences" to applicants "fails to promote the efficient development of low-power television and is contrary to important statutory public interest considerations." It said the licensing procedure lacks the flexibility necessary to make decisions in response to public needs and, NAB said, "in no way guarantees enhancement of the public interest."

Domestic use of new AM channels suggested

The 11 new AM channels allocated by the 1979 World Administrative Radio Conference should be used for domestic broadcasting to the "largest feasible degree," according to NAB.

NAB said the FCC's planning must consider the present and future operation of Travellers Information Service stations, the nonbroadcast uses of the 1605-1705 kHz band during the interim period and the post-implementation sharing of the 1625-1705 kHz band. Following implementation, the 1605-1625 kHz band will be used exclusively for AM broadcasting.

In its filing with the FCC, NAB said the commission should soon establish a plan for prompt relocation of the interim frequency services and that relocation occur as soon as the frequencies are made available by international agreement. The association said the agency must recognize the likelihood of post-1985 conflicts for this frequency space between broadcasting and those services afforded interim use.

Radio board reaffirms full-time service

The National Association of Broadcasters' Radio Board has reaffirmed

Our Co-Ax Digital Remote Control system is now available for:

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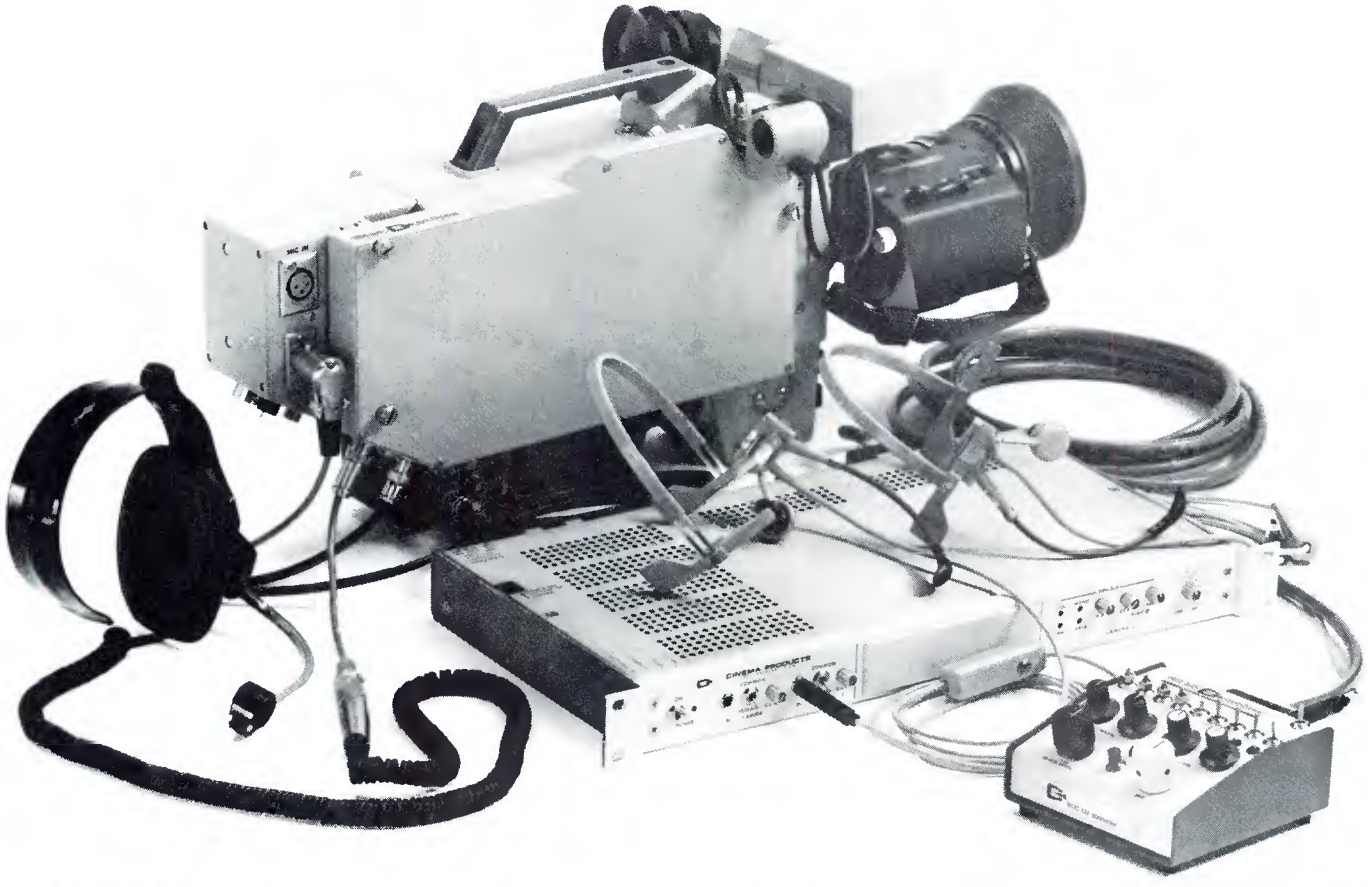

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its resolution, adopted January 15, 1979, in which it stated,"...that as a matter of national radio allocations policy, all broadcast stations (present and future) be authorized to provide full-time service and, in this connection, it urges the conversion of existing daytime stations into unlimited time facilities, and that this national allocations goal be accomplished without significantly diminishing service by other classes of stations."

As a first step in achieving this goal, and in as much as post-sunset operation has been approved pursuant to a Mexican-US treaty, NAB held a meeting with the Canadian Association of Broadcasters (CAB) and the Camera Nacional de la Industria de Radio y Television (CIRT) in Williamsburg, VA, in December 1980, in which the CAB indicated it would be willing to begin discussions on allowing post-sunset operation of US daytime-only stations and agreed to meet early in 1981 for this purpose.

The NAB Board directs the staff to continue discussions with the CAB, with the objective of persuading both the US and Canadian governments to allow daytimers to operate from 6 AM to 6 PM.

9kHz shift opposed

The Radio Board of the NAB has passed the following resolution:

Whereas the National Association of Broadcasters continues to be concerned that the FCC has made a decision on reducing AM channel spacing from 10 kHz to 9 kHz prior to conducting studies showing the impact on the public and broadcasters of such a proposal, and;

Whereas the NAB commissioned extensive technical and economic studies which have documented the very real deficiencies associated with reduced channel spacing such as increased interference, decreased service area, and disadvantages to consumers through disruptions in service and receiver obsolescence and direct financial costs to the broadcasting industry in impletinging such changes, and;

Whereas the FCC's own Task Force on 9 kHz spacing stated that the burden of proof of changing the present system of AM channel spacing 'rests more on those who advocate change than those who defend the status quo.' Yet the Commission has not conducted studies on such basic factors as the matter of interference which would be caused by a 9 kHz spacing system. Based on the results of the studies commissioned by the NAB, the Ca-

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nadian Association of Broadcasters, and others, it is clear that the burden of change to 9 kHz has not been met and, indeed, the costs to the public, the industry and our national interest of reduced channel spacing far outweigh the benefits;

Therefore, the NAB Radio Board opposes the shift of AM channel spacing from 10 kHz to 9 kHz and urges the U.S. government to retain 10 kHz as the AM spacing system in the U.S. and in Region 2.

NRBA
National Radio Broadcasters' Association
1705 De Sales Street, NW
Washington, DC 20036

Board commits resources to radio deregulation

The Board of Directors of the National Radio Broadcasters Association (NRBA) has reaffirmed the association's long-standing commitment to achieving the deregulation of radio through legislation.

"Radio deregulation will continue to be our number one priority. Years of effort have resulted in a very positive piece of legislation, S-270, and the NRBA board has voted to commit the bulk of the association's resources to the adoption of radio deregulation legislation," NRBA's president, Sis Kaplan, said. The NRBA Executive Committee was directed by the board to acquire the service of a legislative consultant to work with the NRBA staff.

The NRBA Board also:

- Discussed the possibility of sending an NRBA representative to the Region 2 Conference in November. A final decision will be made by the NRBA Executive Committee.
- Approved a new publication devoted to radio sales and promotion and an improved mailing schedule for membership services.
- Approved an adjustment in monthly dues caused by minor changes in rate categories.

FCC's EEO rules causes concern

"Among the radio broadcasters of the United States, no aspect of government regulation causes as much distress and concern as the FCC's

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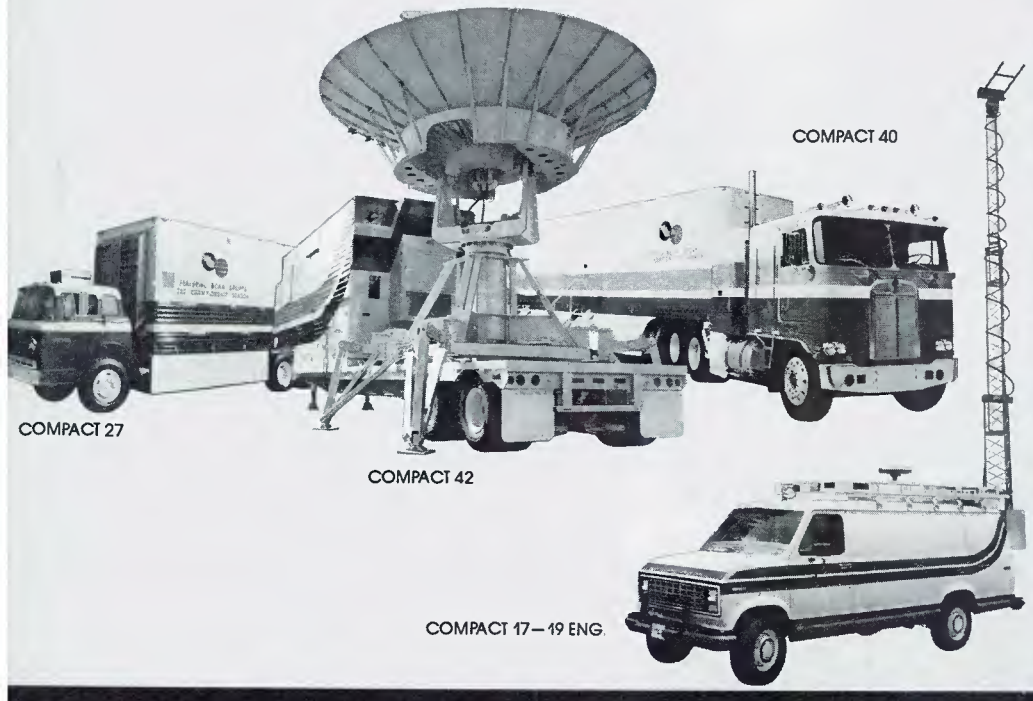

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The VPR-20 remembers through its exclusive tape timer and servo system, so your "cue-ups" are accurate and fast, and your edits are clean and color-frame accurate.

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Equal Employment Opportunity rules," NRBA Executive Vice President Abe Voron said in a February 11 letter to all members of the 97th Congress. Voron's letter was accompanied by an NRBA survey of radio broadcasters' experiences with the FCC's EEO rules.

"The broadcasting industry has been a conspicuous leader in implementing affirmative action programs. The FCC's EEO rules, however, are onerous, inequitable, unproductive and constitute an un-American quota system," Voron said.

"We urge that Congress take the necessary steps to bring broadcasters under the purview of the Equal Employment Opportunity Commission (EEOC), the agency which is regulating all other industries. It is illogical and inequitable to have the FCC, which has life and death licensing power over a business, to also establish EEO quotas and chilling 'guidelines,' " Voron said.

Cautious approach suggested for FCC's deregulation

The FCC's Report and Order on Docket No. 79-219, "In the Matter of Deregulation of Radio," was issued on February 24, 1981. This makes "official" the commission's action of January 14 with the effective date of April 3.

Though it is unlikely, it is possible that the effective date could be delayed by a court ordered stay. On the other hand, it is almost certain the FCC's decision will be appealed to the US Court. A court appeal will not delay the effective date but absolute certainty must await the outcome of the inevitable litigation that will be initiated by "citizen's" groups.

According to the NRBA, it means that great caution should be exercised in changing or eliminating any present procedures. It means that any changes must be made with the understanding that they might have to be reversed or modified to meet future mandate.

Further, important clauses extracted from the Commission's Report and Order have a considerable amount of ambiguity, vagueness and lack of precise language. In the areas of non-entertainment programming and ascertainment, only the ritualistic exercises have been eliminated—the broadcasters' obligations remain and must be considered.

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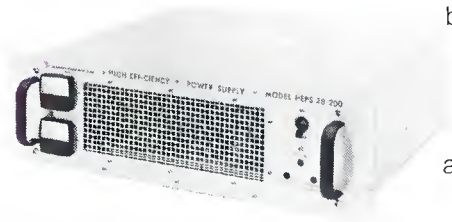

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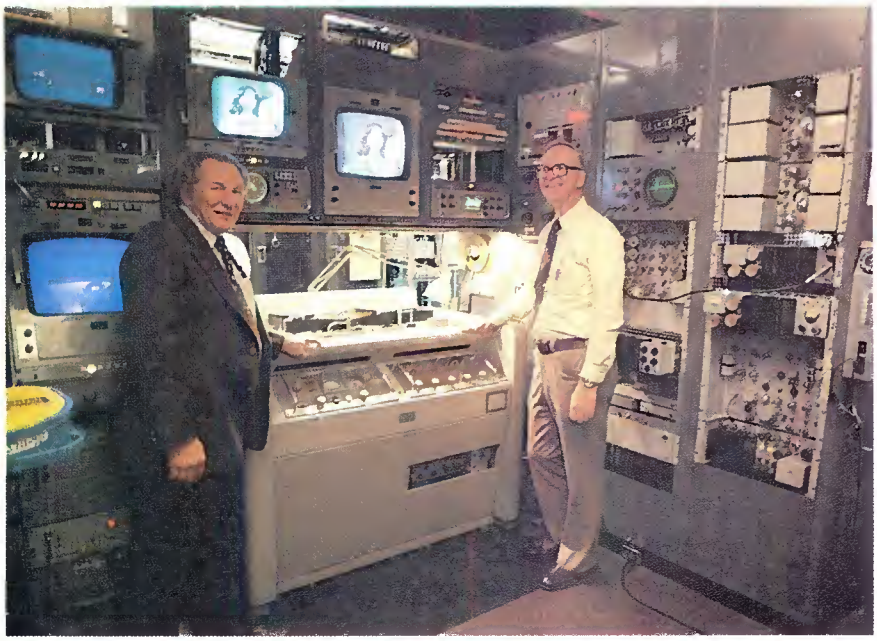


Courtesy of CBS and Donna Foster-Roizen

In 1956, CBS Television City in Hollywood, CA, was quick to use the first prototype and production models of the Ampex VR-1000s. The unit shown here and on this month's cover was the original machine that made history at the Chicago NARTB convention in 1956. This photograph was taken the week that the system was retired after 23 years of service. Posing with the system are Joseph Roizen (left) of Telegen and Charles Mesak, manager, videotape recording, CBS Television City.

The first VTR: a historial perspective

By Charles P. Ginsburg, Ampex Corporation, Redwood City, CA

April 14, 1981, marked the 25th anniversary of the first public demonstrations of the videotape recorder to broadcasters in Chicago, IL, and in Redwood City, CA. This article reviews the efforts that led to those celebrated demonstrations. It is published here as a salute to a technology that altered the course of history for TV broadcasters and program producers.

The work that led to development of the first practical videotape recorder did not flow from a divine inspiration or a miraculous breakthrough onto the road to success.

The first videotape recorder was the product of more than four years of hard—and at times, inspired—work by a team of individuals who brought their own unique skills to bear on the endless problems that confronted the development team. At times, progress was slow—and twice the project was put on the shelf.

And, as it turned out, much of the real work began after we made our first successful demonstration. But that was all in the dim future back in 1951.

In October of that year, after several disputes on the question of how television recording might be accomplished on magnetic tape, Alexander M. Poniatoff, founder and, at that time, president of Ampex Corporation, and Myron Stolaroff and Walter Selsted, his two top technical aides, agreed that a relatively small sum of money should be appropriated for the purpose of investigating a rotating head approach. The rotating head method was one that had been discussed by Stolaroff with Marvin Camras of Armour Research Foundation, of which Ampex was a licensee. The discussions engaged in by Poniatoff, Stolaroff and Selsted were concerned with the feasibility of such a system as opposed to other approaches, notably high speed techniques and time division multiplexing schemes. Accordingly, a project was authorized in December 1951.

The opportunity to join Ampex to work on the project was one that I jumped to accept. Before the actual start of the project, the conception of the system was merely this: three heads were to be mounted on the flat surface of a drum, scanning in arcuate fashion the surface of 2-inch tape. The head-to-tape speed was to be approximately 2500 ips to allow dependable recording of 2½ megacycle signals, and the tape was to move at 30 ips.

In its early days, the project had a relatively low priority and, in May 1952, work on the videotape recorder was suspended for three months in favor of a crash project to turn out a one-of-a-kind instrumentation recorder. It turned out to be a fortunate interruption because it put me into very close contact with a 19-year-old part-time engineering student, Ray M. Dolby. Although at that time he had no formal engineering training, his technical understanding and ingenuity made him a key figure in the development program from the time of his first contact with it. Dolby dropped out of school to join the project when it was resumed in August 1952 and was rewarded by losing his student draft deferment and being inducted in March 1953.

We demonstrated an almost recognizable picture in October 1952 that was promising enough to maintain management's enthusiasm. We designed and built a second system that we had running in early March 1953. In this machine four heads were mounted on the plane face of the drum instead of three to make use of a two-way switching system by which the output during playback of either of the two sets of diametrically opposed heads could be selected. The radius of the arc described by the rotating heads was about 1¼ inches, which permitted approximately 105 degrees of arc to

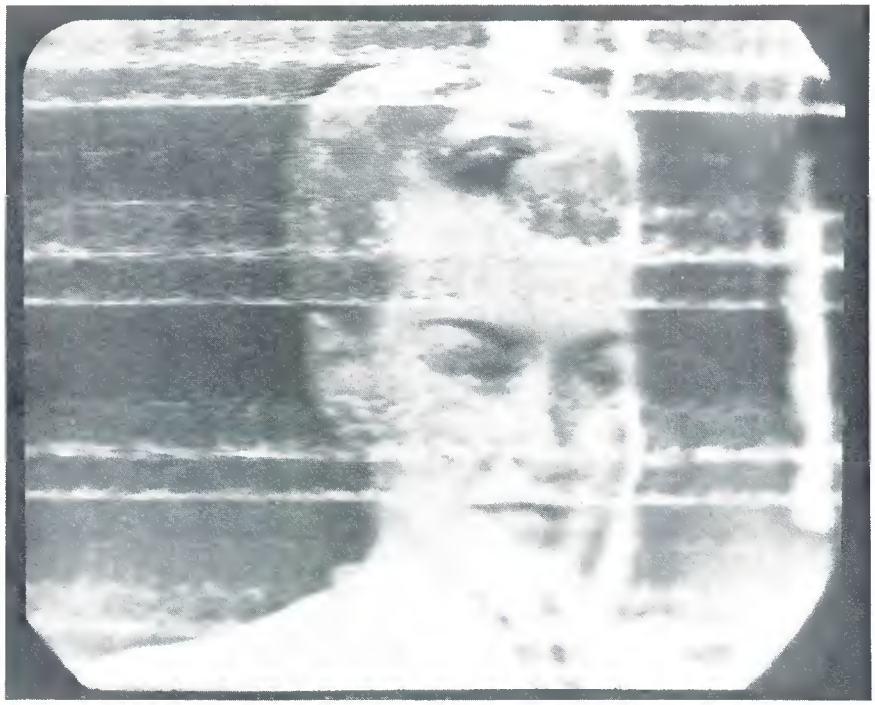
be described by each head as it swept across the 2-inch-wide tape.

An amplitude modulation system was used in which the video signal established the limiting amplitude in the clamp modulator. The capstan motor was driven directly from 60 cycle line frequency and the high speed drum motor was driven by a power amplifier whose input was the fifth harmonic of line frequency. A photocell received the reflected light impulses from a light source that was focused on a rotating guard ring. The 300-cycle photocell drive signal was recorded on one edge of the tape by means of a conventional stationary head. During playback, the 300-cycle signal from the tape was used as the input signal to drive and control the drum power amplifier.

Although we were pleased by some aspects of the reproduced picture, a number of unexpected problems confronted us. The pitfalls of the discontinuous method of recording were becoming painfully obvious. The odious label "venetian blinds" came into being to describe certain very unpleasant flaws at the point representing the cross-over from one head to the next in the reproduced picture. The unsuitability of the method of control and the necessity for extreme accuracy in the positioning of the tape relative to the rotating heads became quite apparent and a good many hours devoted to analyzing the complexity of potential errors in the arcuate sweep geometry indicated that major revisions would be in order before the rotating head VTR could be successful.

By mutual consent, the project was shelved in June 1953 in favor of certain high priority programs then in existence at Ampex. The understanding was that the subject of videotape recording would be revived within a few months in line with proposed solutions to several of the problems. Because of pressure from other engineering needs of the company, the review did not come about as or when agreed.

Between June 1953 and August 1954, the videotape recorder had no continuous status, but a certain amount of progress had been made on specific problems by means of some very small man-hour and money allotments, some authorized and some bootlegged. Backed up by these advances, a report was submitted to management together with an urgent request for an 80-man-hour authorization to modify and demonstrate the revamped machine, which was known to us as the Mach 1.



This February 1955 picture from tape convinced Ampex that its efforts were worthwhile. The "venetian blind" effect, seen as horizontal line interference, was another hurdle to overcome. In the 30 days that followed, that effect was removed.

Receiving verbal notification that the authorization would come through, Charles E. Anderson and I changed the control system and demonstrated it in August for a management committee. As a result, on September 1, 1954, the VTR program was restarted.

At the outset, there were to be two major technical changes. The first was a departure from arcuate sweep configuration to the geometry that became standard in the late '50s in which the tape is wrapped around the rotating drum and consequently the information is written across the tape in straight lines. The second was to be the development of an automatic gain control system to compensate for all of the continuous as well as the step-function type of amplitude fluctuations characteristic of the rotating head approach.

Late in September, Anderson, who was later to become the father

In April 1956, the ability to broadcast from tape stirred pandemonium among the viewing audience and revolutionized the TV industry. The event climaxed four years of work by a 6-man team at Ampex Corporation in Redwood City, CA, that would not give up its dream of recording TV pictures on magnetic tape.

The story of how that dream came true started in 1951 with the arrival of Charles P. Ginsburg at Ampex. Ginsburg, now vice president—advanced technology planning, joined Ampex for the express purpose of putting pictures on tape.

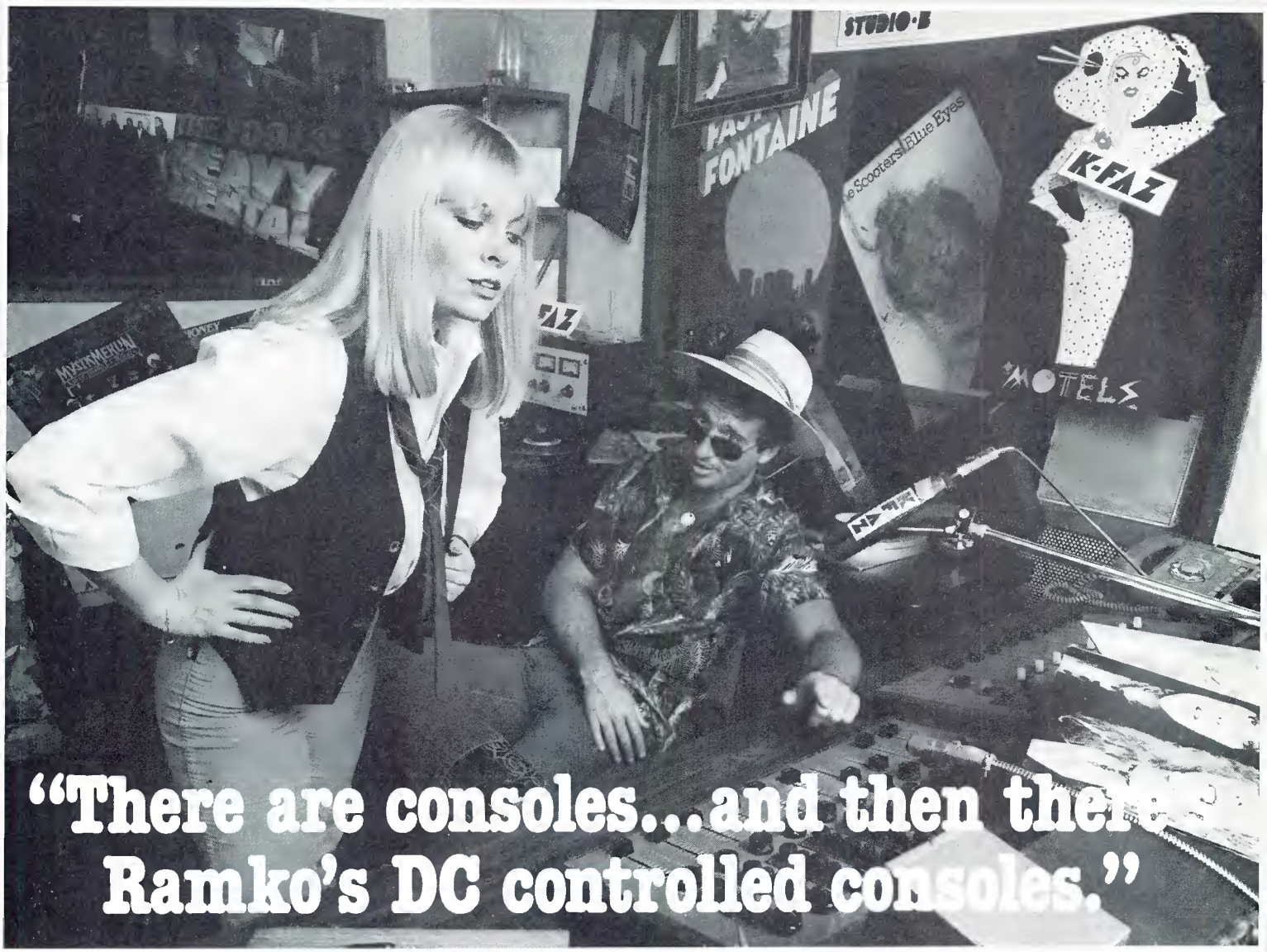
At the time of Ginsburg's arrival, Ampex made professional audiotape recorders for radio broadcasters and recording studios But it didn't take much business acumen in the early '50s to realize that recording pictures on tape with the same ease and versatility with which sound was being done would lead to a large pot of gold at the end of the rainbow.

While the prize was obvious, the path to it was strewn with so many technical roadblocks that only the rich or foolhardy could pursue it. Two affluent organizations—RCA in the United States and the BBC in England—were committing skilled staff and substantial budgets to developing high speed videotape recorders if only to prove that pictures could be put on tape. The machines worked to some degree, but they gobbled up thousands of feet of tape in a few minutes and were commercially impractical.

of the FM system, Shelby Henderson, our model maker, and I were joined by Fred Pfost and in October by Alex Maxey. At the beginning of the new project, we had in our posession a total of six individual heads, four on the old drum and two spares. These heads were the first combination ferrite core and metal tip units made for video recording. They had been constructed a year and a half before and, although crude, they had worked at least well enough not to constitute any real limitation in the system performance during the early efforts.

Accordingly, in the fall of 1954 we were not worried about duplicating the heads, assuming that once again some very simple jigs, some ferrite, metal tips, epoxy and elbow grease composed the full complement of ingredients needed to duplicate them. Maxey was assigned to the task, which proved a severely aging experience for him. The problem was simply this: The new heads would not stay together under the high centrifugal force. The

By March 1955, the Ampex team had corrected many of the playback problems by introducing an FM signal. The comparative improvement in this picture encouraged Ampex to support the video project with time and money commitments.



"There are consoles...and then there's Ramko's DC controlled consoles."

"It's not enough to be morning D.J. at K-FAZ radio. No, sometimes I feel like I'm running the Johnny P. Shift School of Broadcasting.

"First, I have to educate Uncle Bobby, my station manager, about PhaseMaster, the first cart machines to electronically eliminate phase shift, so he'd get me one for Studio A. Now ol' Johnny has to teach our fledgling engineer, Connie, about consoles. Until recently she thought a console was something you lean across in a sports car.

"So I take the Big Con to Studio B and I explain the difference between ordinary consoles (like ours) and Ramko's DC controlled consoles. I got my eye on the DC38.

"I carefully explain that our current consoles get all this hum and RF pickup, but Ramko's "silent series" consoles eliminate audio wiring from the inputs to the various controlling elements—and the result is reduced external interference. I tell her to listen to that sucker hum. Connie wonders if it's humming because it doesn't know the words.

"I tell her all the audio switching and mixing is done through DC control so it's less prone to mechanical malfunctions from scratchy pots or noisy switches. And, it provides more inputs per channel than a mechanically switched type console.

"Also, all the inputs are solid state balanced. No transformers to degrade those sweet sounds I send my fans.

"I go on about how only one pot is needed to control both left and right channel audio simultaneously, eliminating tracking error. And how I can cue by potting down or by simply pushing a button.

"Then I explain how all the function lights make my job easier by telling me how the console is programmed... about the solid-state VU meters that are faster than a mechanical meter so we can keep a tighter, cleaner sound on K-FAZ.

"You know, I really feel like it all sank in. She went to Uncle Bobby and suggested he order a DC38 for me once she figured out what to do with all the switches and dials from our old console."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details of protective support holding the heads in place had been much more secure in the old configuration and we did not now have time to wait for an aging of the green epoxy. We reshaped the original composite heads to be able to use them in the new drum. It was several months before we had the time to go to an improved design.

In December 1954, we made our first picture using the new geometry. The results were gratifying in terms of the improved stability, although it took a great deal of faith and understanding to be optimistic in the face of some gross shortcomings in the reproduced picture. The automatic gain control (AGC) system was not ready for use and it was beginning to be apparent that the problems facing it were extremely difficult.

In late December, Anderson, possibly daunted by AGC troubles, proposed (for the second time, he later said) using a vestigial sideband FM system rather than the old amplitude modulation. Some technical support to his belief that the new method would work was furnished by results the FCC had obtained a few years earlier in conjunction with tests on vestigial sideband FM transmission of television signals. The big questions for us centered on the unusual relations among carrier, deviation and modulating frequencies. Anderson began work on the new system January 2, 1955, and early in February we saw our first FM picture off tape.

Meanwhile, Ray Dolby, who had finished his tour of military service and had returned to Ampex on a part-time basis while continuing a full college program, had started on a simplified FM method. Whereas Anderson had used fairly conventional reactance-tube techniques, heterodyning the sidebands from the 50 megacycle region down to frequencies suitable for reproduction from tape, and subsequently moving the information on playback up to about 50 megacycles for transmission through high frequency IF amplifiers and limiter circuits, Dolby designed and built a multivibrator that could be modulated by applying the composite video signal directly to the control grids.

Because the free-running frequen-

A historical moment. Charles Ginsburg, head of the team that produced the VR-1000 videotape recorder, was on hand in Hollywood in March 1957 to accept Ampex's Emmy Award for the system's development.

For the second year in a row, Scotch® 479 won the award for the best picture of the year in a test of one-inch video tapes.

We scored well in all of the twelve categories tested, but especially well in the categories that commonly represent picture quality: color dropouts, high frequency dropouts, chroma noise, signal-to-noise ratio and stop motion.

These were scientific, quantitative tests, conducted as you would conduct them yourself, with no room for brand bias. The meters didn't play favorites. The standards were the same for every brand tested. And we tested every brand.

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cy of the multivibrator could be set to a value suitable for transmission by heads and tape, circuit complexity and development time were greatly reduced. The pictures obtained with the multivibrator modulator on February 25 were even better than those with the reactance tube system earlier in the month.

On March 2, 1955, we gave a convincing demonstration for the board of directors. The resolution was extremely low because the system was somewhat less than 1½ megacycles wide. The monitor had to be operated with a short time constant in the horizontal AFC because of velocity variations in the head drum, which was at that time belt-driven.

The month that followed was one of careful deliberation on many questions, all of which had to be answered with reasonable accuracy to be able to steer the proper course from promising results to payoff.

It seemed that we had come a long way in a short time using a broadside attack on many of the problems. The approach would certainly have to become more refined before we could be sure of our ground in turning out a commercially acceptable product. Rather than give a full account of what we then knew we didn't know, let alone what we didn't know we didn't know, I will say only that we proceeded under a new engineering project authorization that contained lots of caution but which did have as its objective a system suitable for

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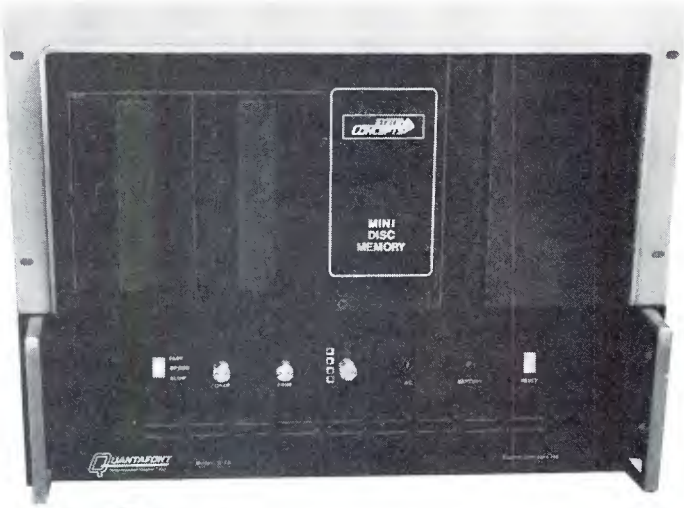

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Philip L. Gundy, then general manager of the Audio Division, of which we were a part, made a major contribution to the program at this time by moving us to isolated quarters with five times as much space as we had before. Now truly behind closed doors, we went to work.

Maxey had done some after-hours experimenting during February 1955 and had discovered some significant phenomena connected with the characteristics of pictures reproduced from tape. He found that we could definitely control the amount of information read out during playback by each of the heads per unit of arc sweep by varying the tape tension in any one of three ways: at the reels, by moving the female guide toward or away from the rotating drum, or by varying the vacuum, which was pulled from the noncontact side of the tape.

Although we were concerned with the extent of the nonlinearities which might be introduced by using the guide position as an information

Industry decision-makers awed: Disbelief, surprise and total acceptance struck the spectators at the Conrad Hilton Hotel as the Ampex record/playback demonstration proved the practicality of videotape recording for television. In the year that followed CBS, NBC and ABC television adopted videotape for use for delayed program broadcast. Today, more than 85% of all sports, news, variety and commercial programming is done on videotape.

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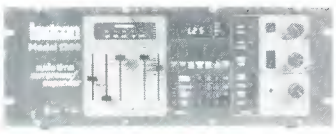

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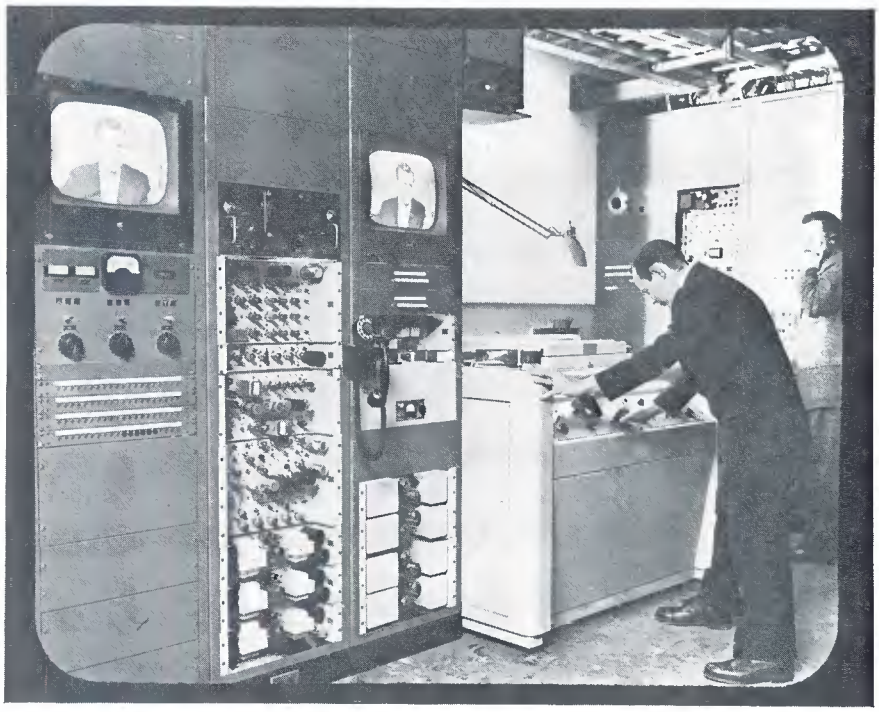
rate control, and did some experimenting with a correction method in which the amount of vacuum was varied, we subsequently discovered that the nonlinearity in the first method was unobjectionable. This technique of varying the tape tension proved to be one of the major breakthroughs in the program. It provided an excellent solution for the problem of information rate changing as the heads wore down to a smaller diameter, and it gave an answer to a great part of the question of ultimate interchangability of recorded tapes from one machine to another.

We made a radical change in the design of the individual magnetic heads, going to a sandwich-type of construction that provided the necessary mechanical support and which was also far more reproducible. A good deal of work was done during this period in a much more quantitative fashion than we ever had time to do before on the magnetic characteristics and performance of the heads.

The entire new head development program was carried by Pfost, who



First-on-air replay: The historic first broadcast via tape was CBS' November 30, 1956, airing of the "Douglas Edwards and the News" program from New York City. CBS Television City in Hollywood replayed the broadcast three hours later on the West Coast and, in the months following, the other networks were to follow CBS' lead.

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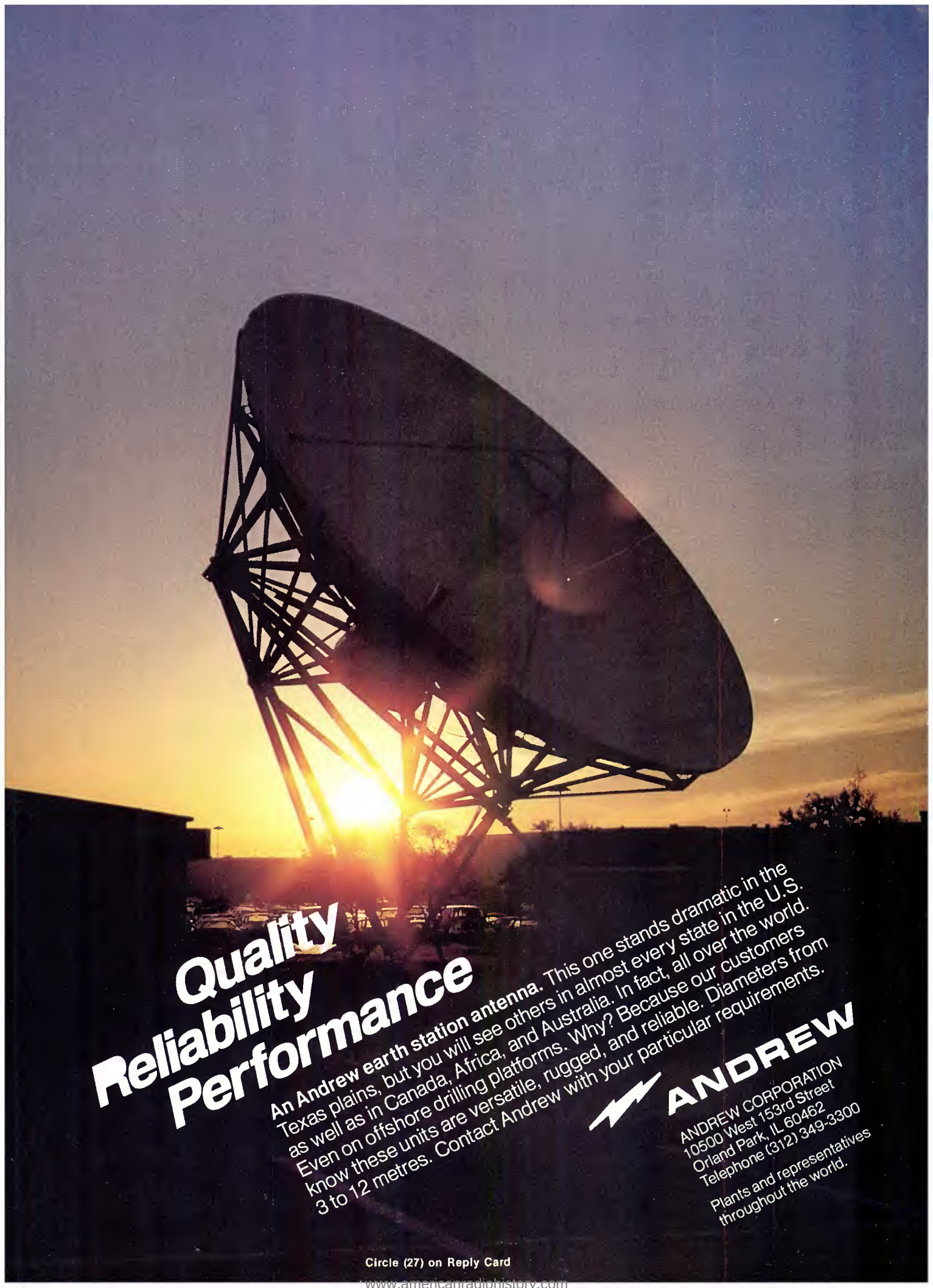
exhibited unbelievable tenacity and patience in coping with the all-important microcosms. Anyone who has attempted to wrest adequate response from magnetic heads at wavelengths below 200 microinches is well aware of the problems that were faced.

The modulation system was extended in bandwidth so that it would be suitable to operate with a carrier frequency of as high as six megacycles if such an operating frequency should subsequently turn out to be usable. The switching unit, which had previously been a two-mode device, was replaced by a four-way switcher that would allow only one channel at a time to conduct.

We made considerably improvements in resolution and in signal-to-noise ratio. We stabilized the drum sufficiently to allow the display of pictures from tape on a standard monitor. We had been making no attempt during this period to design a dressed-up machine and had merely built a crude-looking wooden cabinet containing the top plate and a few electronic units that operated in conjunction with two partially full

Kitchen debate: In July 1959, in Sokoliniki at the First American National Exhibit in Moscow, the famous Nixon/Khrushchev debate took place at an Ampex exhibit booth. An Ampex videotape recording was later to be played before 72 million American home TV viewers. That event was the first to bring prominence to the technology of "live" playback from a strip of magnetic tape.



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racks. At a very small showing that we gave for some officers of the company toward the end of 1955, it was suggested that we should package more attractively what was going to be a very expensive machine. Accordingly, Anderson designed the Mark IV console with its compact rack arrangement. It was also decided at this time that we should start thinking definitely in terms of a surprise demonstration at the National Association of Radio and Television Broadcasters convention in Chicago in April 1956.

In early February 1956, we gave a demonstration for what was originally supposed to be a very small management group but turned out to be one attended by about 30 Ampex people. For all of us on the engineering project, this was the most dramatic demonstration we were to make. The guests arrived, were seated, a few words were spoken to the effect that we would show them what we had produced, and the machine was then put in the playback mode and played back a program we had recorded an hour earlier.

We then announced that we would record a sequence and immediately play it back. We recorded for about two minutes, rewound and stopped the tape, and pushed the playback button. Completely silent up to this point, the entire group rose to its feet and shook the building with hand-clapping and shouting. The two engineers who had done more fighting between themselves than the rest of the engineering crew combined, shook hands and slapped each other on the back with tears streaming down their faces.

We had quite a few visitors during the next couple of weeks, including Bill Lodge of CBS, Frank Marx of ABC and representatives of the CBC and BBC. The visitors were all sworn to absolute secrecy and generally ushered in and out separately so that they would not see each other.

As a result of Lodge's visit, arrangements were made to use a demonstration model, the Mark IV machine, which had not yet been assembled, for a surprise showing to the annual CBS affiliates meeting that was to occur the day before the formal opening of the NARTB convention.

With about six weeks to go before the convention, working hours were extended considerably to complete the construction of the Mark IV unit and at the same time to continue development work so that the picture to be demonstrated in Chicago would be as good as CBS was expecting it to be. The activity became furious. The administrative engineer for the now considerably enlarged group shed his business suit in favor of work shirt and jeans and spent most of his regular time plus nights and weekends modifying mounting brackets for the new Mark IV console, making cable assemblies, and building up re-designed electronic units.

A three-year-old idea of placing the switching transients in the horizontal blanking interval was rushed into hardware form as the blanking switcher and integrated into the basic system as a toggle switch option. An automatic rotary head degaussing system came into being to eliminate the necessity of manually demagnetizing the video heads after a recording operation and before playback.

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Meanwhile, it had been decided that Mark III, the machine used for the previous demonstrations in February, should be used for a press demonstration in Redwood City, CA, on the same day that the NARTB showing was to start. Therefore, while Mark III was being used for development work, barely leading the construction of Mark IV, it also had to be prepared for its press appearance. The true orphan of the project, the audio, which had been sadly neglected up to this point, had to be made at least to approach professional standards.

There were many heroes during this period, but leading them all was Pfost. He experimented with the heads up to the morning before leaving for Chicago. He varied tip structure, core structure, core windings, gap spacing, guide setting, current setting and built new heads continuously. He did an unbelievable amount of work during this period. In the last four weeks preceding the Chicago demonstration, Pfost put in an average of more than 100 hours per week.

At last Mark IV was broken down into many pieces and shipped to Chicago. Three days before the press demonstration, the Redwood City machine was in severe mechanical trouble. Those of us who were headed for Chicago took off, wishing the stay-at-homes good luck and trying not to think about their difficulties.

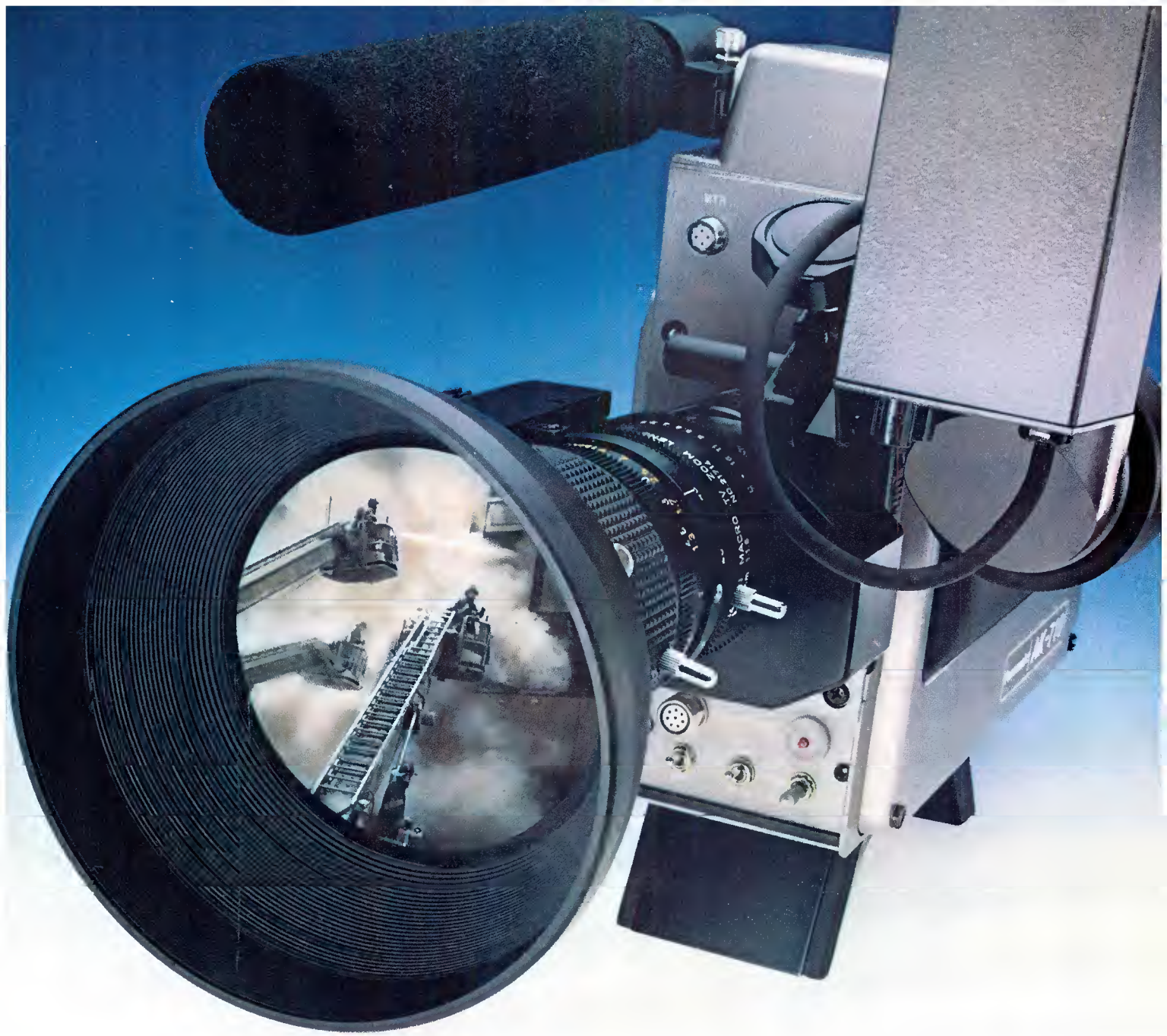
The demonstrations were scheduled for Saturday. By Thursday afternoon, Mark IV was assembled in Chicago and was making the best pictures we had ever seen from tape. A predictable situation then occurred. The CBS engineering staff said the pictures were not good enough. The signal-to-noise ratio was too low and the noise banding was intolerable.

Between Thursday night and Friday night, we made it. Through great cutting, trimming and adjusting, and aided by the last minute delivery of some tape samples that greatly exceeded in performance anything we had seen before, everyone was satisfied. Checking with the crew in Redwood City, we found that they had solved their mechanical problems and were now ready for the demonstration.

The demonstrations were a bomb shell in the industry. In Redwood City the performance was sensational, exciting and satisfying. In Chicago, pandemonium broke loose and Ampex was flooded with orders. From the time of the CBS affiliates meeting on Saturday morning, through the demonstrations extending until the following Thursday afternoon for the convention delegates in general, the machine performed better than we had any right to expect.

The next several months were just hard work. Four months earlier Ampex had expected to deliver five prototype machines beginning in late summer or early fall to customers in government agencies for evaluation, along with a gradual program leading to delivery of machines for TV use starting in 1957. Now we were faced with the pressure of producing 16 hand-built machines, most of them going to broadcasters for immediate on-the-air use, and at the same time we had to gear up for full-scale production of units for which the industry was eager.

In spite of the subjectively good pictures demonstrated in April



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1956, a review of the tasks that had to be covered before releasing the first machine for air use reveals how shaky our ground actually was at the time. Until then, neither manpower nor machine facilities nor technical advances were sufficient to properly evaluate magnetic tape for videotape recording use. And until we could rate the tape manufacturers' samples with comments much more informative than "fair output," "too many dropouts," or "doesn't wear well," there was not too much that could be accomplished toward getting really satisfactory tape.

The tape evaluation program consumed many hundreds of man-hours and was the cause of severe headaches to the tape manufacturers, to us and to our early network customers. With a then-predicted head life of 100 hours, we could not continue to make heads in a tedious one-at-a-time fashion. The many parameters in head construction, several of which had been varied madly in cut-and-try fashion to squeeze out a few precious dBs of signal-to-noise ratio for the April demonstrations, had to be settled on and frozen to establish at least our own standards before the delivery of the first machines.

At the same time, head construction had to evolve to a semi-production process rather than a one-at-a-time handcrafting technique. A processing unit had to be designed and developed that would be capable of providing blanking and sync in the reproduce signal that were sufficiently free of noise to allow the signal to be handled without difficulty by conventional stab amps and clamps anywhere along the line of transmission. The picture reproduced from tape had to be greatly improved over that shown in April with respect to noise, resolution, overshoot and ringing, and horizontal stability. The entire machine and all individual chassis had to be repackaged and tested. The mechanical design details were endless. Our top plate components had to be not only reliable but completely interchangeable. And always, there was the struggle for greater bandwidth and better signal-to-noise ratio.

More accolades in October and November went to John King, Roger Hibbard and Tony Severdia, who several times started a work day at 8 a.m. and finished it 30 hours later. The videotape recorder went on the air for the first time on November 30, 1956, from the CBS Television City in Los Angeles. NBC followed suit at the very beginning of 1957, and ABC started delayed telecasts from tape at the beginning of daylight-saving time in April.

From that beginning, videotape recording grew into a billion dollar industry that touches our lives in some way every day. None of that would have happened without the participation of many others:

- The television broadcast industry, which whole-heartedly accepted the product of our labors;
- Our prototype customers, the networks, which provided technical assistance, patience and tolerance during the trying days of early on-the-air use;
- The magnetic tape manufacturers, who successfully developed a product suitable for television.

And, of course, my colleagues—the wonderful people who lived and breathed videotape recording until it became a reality. □

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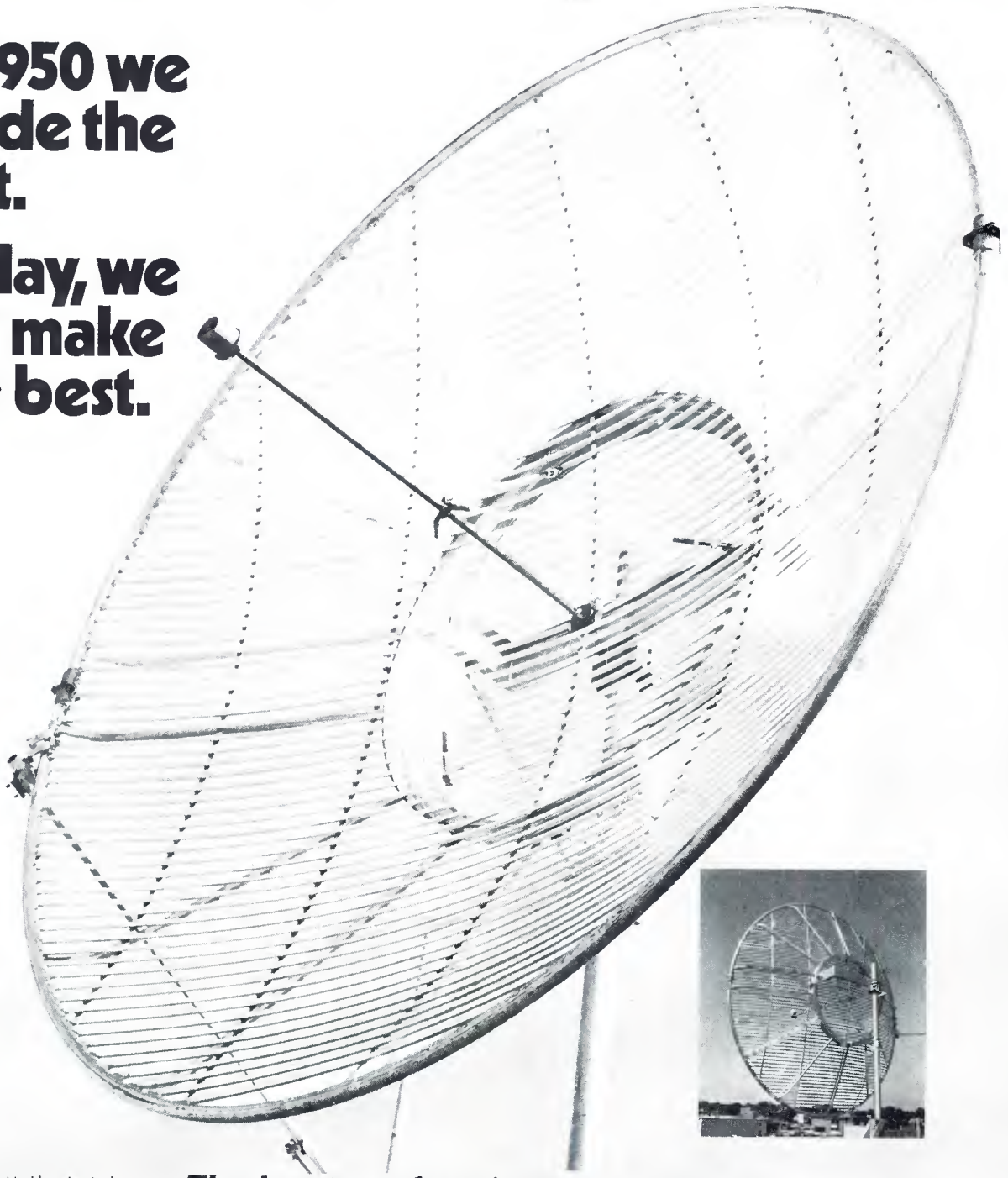

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The basics of studio acoustics

By Robert J. Nissen, vice president of Hubert Wilke Inc., New York

"We lucked out—the acoustics are pretty good."

That comment, by the manager of one of the largest TV studios in the country, reflects the prevailing myth that good studio acoustics are a matter of chance.

Good studio acoustics are the result of good design—not luck. The field of acoustical design is highly advanced and offers many standard answers for standard problems.

However, the field of acoustics is not necessarily concise. In a non-studio environment, such as a concert hall, the acoustical design can be tricky, the results difficult to predict and the final product highly susceptible to subjective opinion. The difficulty with such spaces is that they must be designed to propagate the sounds of unaided voices or musical instruments directly to a live audience.

Studios for television, radio or audio recording, however, do not require unaided sound propagation to an audience. The ultimate acoustic function of a studio is to provide appropriate sound for pickup by microphones, not for direct listening. Although studios have their own exacting acoustic requirements, good results can be achieved by standard acoustical designs. There's no magic to it.

This article reviews basic principles of acoustics and proposes appropriate design criteria for studios. It is not a do-it-yourself guide. There is a great deal of difference between establishing criteria and designing to meet those criteria. The actual design is far better left to those specialists, the acoustic consultants, who must carefully evaluate the multiplicity of possible design approaches and solutions.

Acoustical requirements

Studio acoustics is concerned with only two major elements: noise control and reverberation control (see Figure 1). Noise control considerations include internal and external noises. Considerations of reverberation control include studio shape and surface treatment. The design goal is to reduce the undesired sounds (noise) and make the desired sound in the studio behave as desired.

Noise control

The degree to which noise must be reduced depends on the purpose of the studio. Most radio and audio recording studios cannot tolerate the noise levels that may be acceptable in TV studios. In TV viewing, the presence of the picture element psychologically allows the viewer to accept higher noise levels than are permissible when listening to an audio-only program. This is important to keep in mind when faced with the high cost of reducing noise.

The type of programming is also a factor in establishing the level of noise acceptability. If, for example, the studio will be used for news shows, interviews or corporate training programs in which lavalier or desk mics can be used, a relatively high ambient noise level may be acceptable. Under those conditions, the noise level in the studio will not be reproduced because of the close mic-ing technique. On the other hand, if the programming will be of a dramatic nature in which close mic-ing techniques are inappropriate, the ambient noise level must be low.

Noise sources

The various noises that can exist in a studio have two origins: outside and inside the studio. Those noises from outside the studio ("intrusive noises") can be divided into two categories: those from outside the building, such as noises from vehicular traffic, aircraft, sirens, etc.; and those from inside the building but outside the studio, such as noises from elevators, mechanical rooms, scenery construction shops, water pipes, waste drains, service corridors, rest rooms, screening rooms and other studios.

The noises originating inside the studio are generated primarily by the heating, ventilating and air conditioning system ("HVAC"), but other internal noise generators such as clocks, lighting ballasts, and light batten winches must also be considered.

Studio location

The first step toward noise control is the selection of a suitable location for the studio within the building. Unfortunately, this consideration is often overlooked in the early architectural planning stages. As a result, expensive sound isolation construction may be needed to make the studio usable.

A primary rule in selecting a suitable location is to keep the studio away from the noise makers. An excellent method of enhancing the acoustic isolation of a studio is to surround it with relatively quiet spaces. These peripheral contiguous spaces provide a sound buffer between high-noise areas and the studio. Typical spaces that are relatively quiet include dressing rooms, storage areas, quiet offices, conference rooms and limited-access corridors.

The function of the space directly above the studio must be considered.

Impact noises on the floor above the studio caused by footfalls or rolling carts must not be overlooked. An effective solution to this problem is to carpet the floors.

The function of the space below the studio is not nearly as critical because the floor slab of the space below the studio is removed from the studio.

Noise transmission control

The isolation of noises emanating from outside the studio is known as transmission control. Intrusive noises

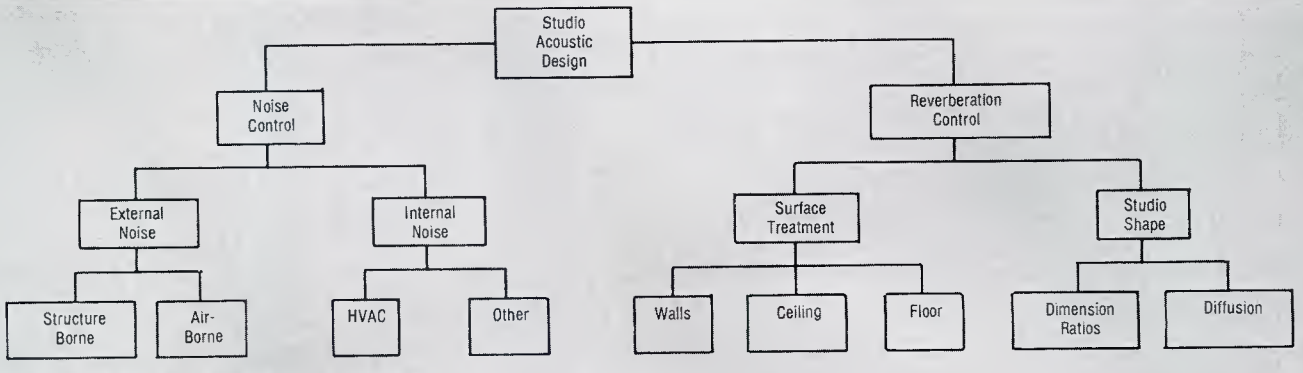

Figure 1. Studio acoustic design elements

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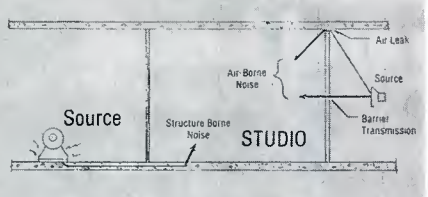

Figure 2. The three paths of intrusive noise

can be transmitted into the studio by three paths (Figure 2). The first is through room barriers (walls, floor and ceiling) forced to vibrate by sounds outside the studio and then re-radiate the sound energy into the studio. The second path is through air leaks such as structural gaps, cracks, door closures and ventilation duct-work. The third noise path is structure-borne and is caused by motors, fans, moving furniture, foot-falls, elevators, etc., which directly vibrate the building structure and, in turn, radiate the sound energy into the studio.

Noise criteria

Before determining the acoustical design of a studio, it is imperative to set standards for the maximum permissible level of ambient noise. Because it is economically impossible to eliminate all noise in a studio, the designer must know what level of noise will be distracting or annoying to a person listening to the final product.

In determining this maximum permissible noise level, it must be taken into account that the human ear is not equally sensitive to sounds at all frequencies. For example, the ear is more sensitive to a sound at a middle frequency than to one with the same intensity at a low frequency. Accordingly, a low frequency noise may be considerably stronger than a high frequency noise before it becomes objectionable.

Because of this characteristic of the ear, various curves have been developed over the years to establish noise limits at different frequencies. The most commonly used rating system consists of a family of curves called noise criterion (NC) curves (Figure 3).

Each noise criterion curve specifies the maximum permissible sound intensity of ambient noise at various frequencies. It is thus possible to specify with the NC number the maximum noise intensity allowed for a group of frequencies. The NC curves are designated by their sound pressure levels in the 1200-2400Hz band.

Typical practice for TV studios requires that any intrusive or HVAC noises do not exceed either the NC-20 or the NC-25 curve. The lower noise NC-20 criterion is used for exacting production and drama studios that require distant-mic-ing techniques. The NC-25 criterion is entirely adequate

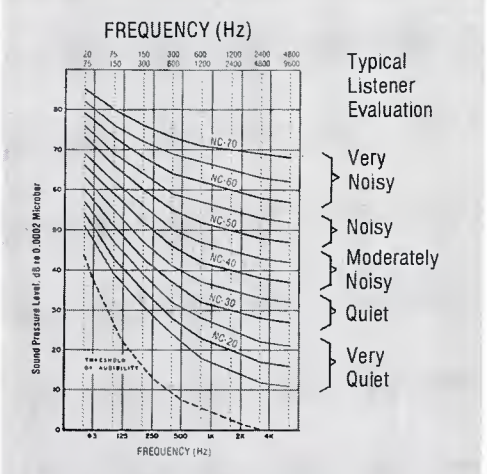

Figure 3. Noise criterion (NC) curves

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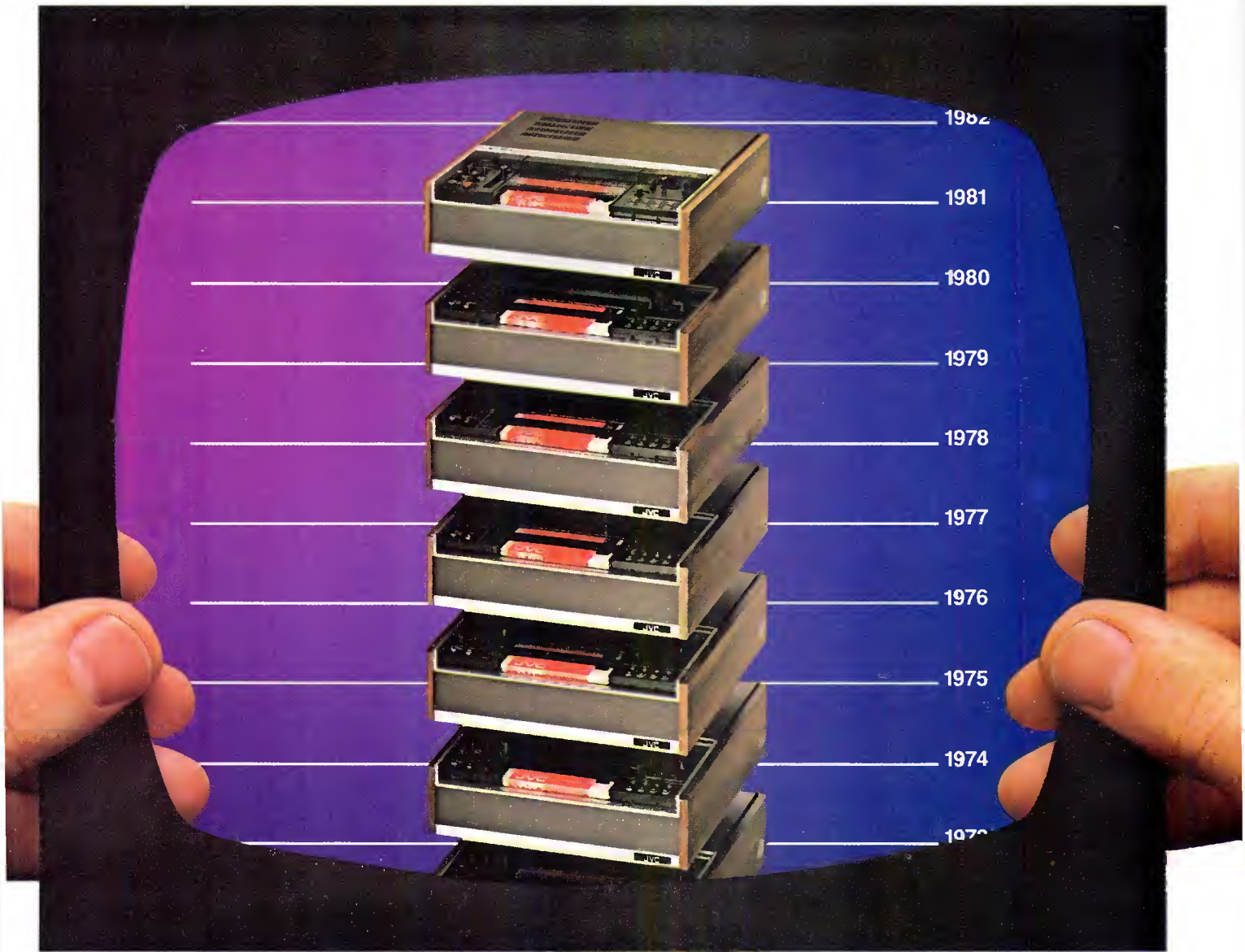

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Acoustics

for typical multi-purpose broadcast TV studios.

Typical practice for radio or audio recording studios often specifies a lower noise level of NC-15 or NC-20. These more stringent criteria are easier to achieve than in comparable TV studios in which HVAC systems are required to remove large amounts of heat generated by TV lighting.

For comparison, Table 1 provides typical recommended noise criteria for various types of rooms.

To determine noise levels in a studio, sound pressure measurements are typically made throughout the production area at 5 feet above the studio floor. While measurements are being taken, the HVAC systems must be operating, but no other noise producing activities are permitted inside the studio.

Airborne noise through sound barriers

Sound barriers in a studio are walls, ceiling, floor, doors and windows. Intrusive noise can be transmitted through these sound barriers by airborne noise which causes the barrier to vibrate and re-radiate the sound into the studio.

The measure of reduction of airborne sound as it passes through a sound barrier is called *Sound Transmission Loss* (STL), and is measured in decibels. STL is, therefore, a measure of the sound insulating efficiency of sound barriers (Figure 4).

Simple, lightweight sound barriers—such as gypsum board mounted on 2x4 studs—can provide good insulation from high frequency sounds.

Table 1. Recommended Noise Criteria for Rooms

Type of Room	NC Number
Radio or recording studio	15 to 20
Television studio	20 to 25
Conference room	25 to 30
Business office	35 to 40
Executive office	25 to 30
Bedroom	25 to 35
Motion picture theater	25 to 30

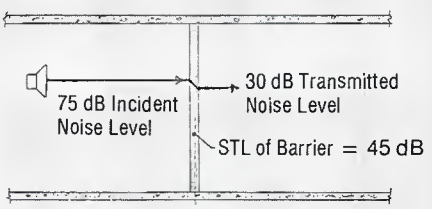

Figure 4. Sound Transmission Loss (STL) is the measure of reduction of airborne sound through a barrier.

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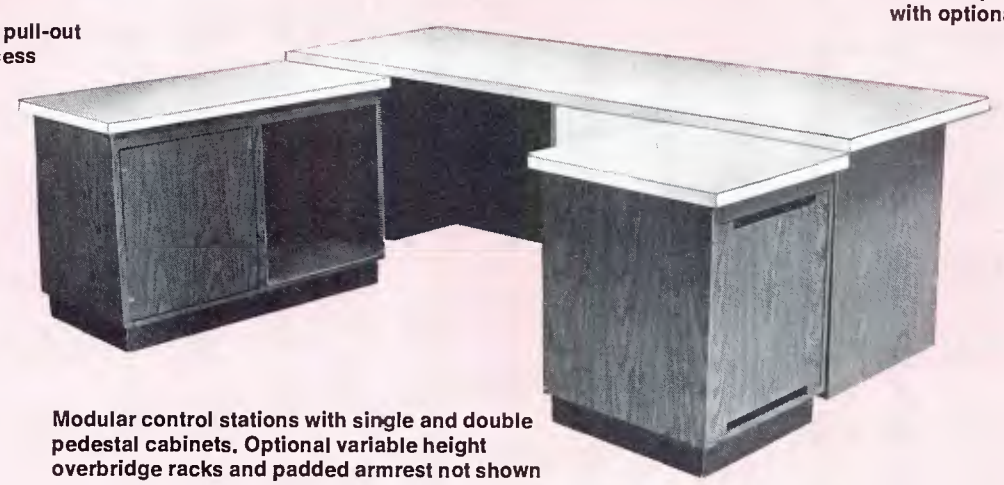

Modular control stations with single and double pedestal cabinets. Optional variable height overbridge racks and padded armrest not shown

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However, such barriers provide poor insulation for low frequency sounds which have a greater ability to vibrate structures.

Because the transmission of an airborne sound through a barrier depends on the capability of the sound to vibrate the barrier, it follows that barriers having more mass vibrate less; the heavier the barrier, the greater the sound transmission loss. Thus, designers use heavy walls, ceilings and floors to isolate the studio from low frequency sounds. *Mass* is the key.

Because sound transmission through a barrier varies with the frequency of the sound, a single STL figure cannot be used to rate a barrier. In 1961, the American Society for Testing Materials (ASTM) devised a "single figure" method of rating the sound transmission of barriers, called Sound Transmission Class (STC). The STC of a barrier is determined by measuring the sound transmission losses at 16 test frequencies and comparing the resulting curve with a standard reference contour (Figure 5). This STC contour attaches different importance (or weightings) to certain frequencies.

The STC method of specifying the STL of a barrier has become commonplace in the architectural field because of its convenience. However, STC ratings should be viewed with some caution because the ASTM standard permits considerable deviation from the reference contour. Therefore, two barriers with quite different frequency characteristics can have the same STC number. This single-figure method is useful in the preliminary design of studio barriers, but it cannot take the place of a careful analysis of the various noise frequencies to be isolated.

Sound barrier construction

There are two basic classes of sound barrier construction: homogeneous, in which the barrier has essentially the same physical properties throughout, and non-homogeneous, in which the barrier consists of two or more elements that are acoustically isolated from each other.

A homogeneous barrier's capability to attenuate sound energy depends primarily on the mass (weight per unit area); see examples in Figure 6.

Homogeneous walls can be entirely adequate for many types of studios if the level of external noise is low or if the studio is protected by adjacent buffer areas. A homogeneous wall can achieve any desired amount of sound

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insulation if it is made heavy enough or thick enough. Generally, mass *law* approximates the comparative amount of sound isolation afforded by sound barriers of the same material but of different weights. This law states that, if the mass is doubled (by doubling the thickness), STL is approximatly doubled (5 to 6 dB).

However, increasing the mass of a wall beyond a certain limit becomes impractical because of cost and building structural support. Under these conditions, nonhomogeneous barrier construction must be used to achieve the desired sound insulation.

Given walls of equal weight, a nonhomogeneous (multi-layer) wall will provide greater sound insulating ability than a homogeneous wall. The three most important factors that determine the sound attenuation of a multi-layer wall are: the mass of the layers, the air separation between the layers and the resiliency of the structural ties between the layers.

The acoustical effectiveness of multi-layer wall construction can be seen in the classical cavity wall in which two layers are physically isolated from each other. The result is essentially a circumvention of the mass law; for example, the sound transmission loss of the double layer wall is considerably higher than the combined mass of the layers would predict. Two 6-inch-thick isolated walls have two or three times the sound insulating ability of a single 12-inch-thick wall of the same total mass.

Hundreds of designs for multi-layer walls have been developed. Some are simple; others are highly complex and complicated to build. One should be wary of the more sophisticated constructions even though they may have

Table 2. Sound absorption coefficients for typical materials.

Materials Frequency	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1. Gypsum board, ½", on 2 x 4 studs	0.29	0.10	0.05	0.04	0.07	0.09
2. Plate glass	0.18	0.06	0.04	0.03	0.02	0.02
3. Carpet, heavy, on concrete	0.02	0.06	0.14	0.37	0.60	0.65
4. Velour drape, medium weight	0.07	0.31	0.49	0.75	0.70	0.60
5. Typical "ceiling" tile, mounted to hard surface	0.10	0.30	0.56	0.70	0.68	0.50
6. Typical "ceiling" tile, hung on suspension system with 16" air space	0.45	0.48	0.65	0.75	0.72	0.55
7. Mineral wood blanket 2" thick, mounted with 1" air space	0.30	0.70	0.85	0.86	0.87	0.87
8. Fiberglass, 4" thick, mounted to hard surface	0.40	0.92	0.98	0.97	0.93	0.88

(Multiply coefficients by 100 to obtain absorption percentage)

theoretically high STCs. The actual sound transmission of such wall designs depends on precise construction methods and workmanship. Seldom does the finished product of such constructions attain the theoretically high STC.

Figure 7 illustrates a number of multi-layer walls with their predicted STC values.

The STC rating is some of the lighter weight multi-layer constructions can frequently be improved by placing sound absorptive material, such as fiberglass blankets, in the cavities between the layers. The improved insulating ability of such barriers is caused by the vibration-damping action of the absorptive material and not by its mass (which is virtually negligible). Care must be exercised when placing absorptive material between wall layers not to permit the material to contact both layers. If this occurs, the absorptive material will itself mechanically couple the two layers and degrade the performance of the barrier.

Windows

Control room windows and observation windows must also be given special attention so that they do not significantly increase intrusive noises. It is usually necessary to use cavity construction for such windows. Two or more panes of glass will afford considerably higher STC values than a single pane of equal mass. The panes are set in a neoprene or felt glazing channel to provide proper air seal and to afford vibration isolation (Figure 8). The panes should be of different thickness to avoid coincident reso-

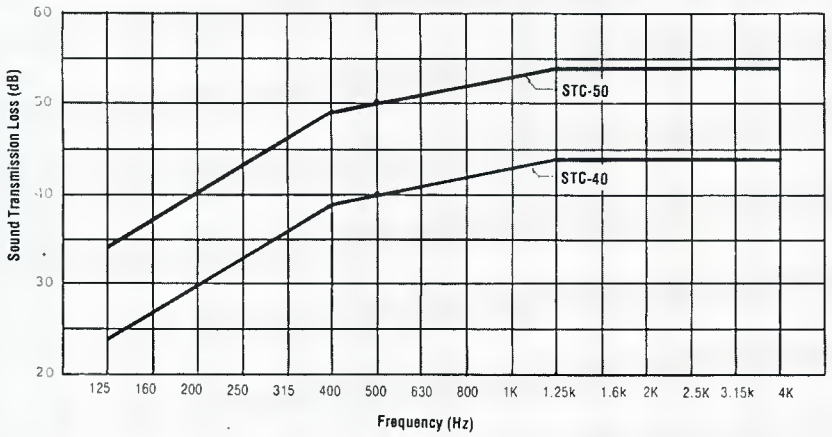

Figure 5. Standard sound transmission class contours for STC-40 and STC-50

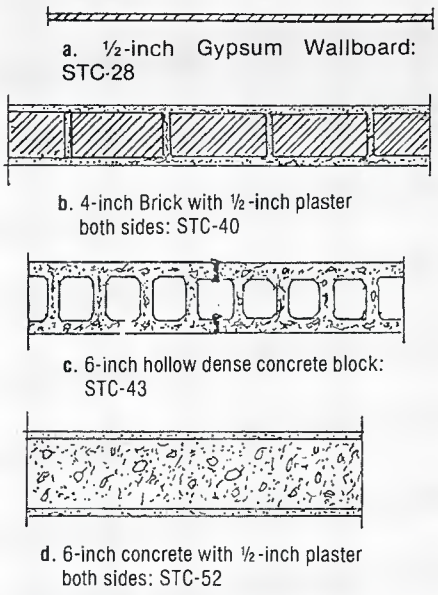

Figure 6. STC ratings of typical homogeneous walls

nant frequencies. The panes should also be tilted in a nonparallel relationship to decrease resonant air coupling and to diminish undesirable sound and light reflections. Because the STC ratings of window constructions are frequently worse than those of the walls, the size of the windows should be restricted to the minimum required by their function.

Sound locks

Sound locks may be viewed as a special case of cavity wall construction in which the air space or cavity between the two walls is sufficiently large to permit the passage of people. The space must be large enough to permit people going through to close the first door before opening the second.

There is considerable disagreement as to the validity of a sound lock. Sound locks are frequently justified on the basis of tradition rather than actual need. Because sound locks cause traffic flow bottlenecks, take up valuable floor space and cost money to construct, they should be used only if required.

Two conditions may require the inclusion of sound locks in radio or TV studios. The first condition exists when people must go in and out of the studio during times of active use. Even this situation may not require a sound lock if the area from which the person is entering the studio is normally quiet.

The second condition may occur when the sound insulation afforded by a single door is insufficient to insulate the studio from high ambient sounds outside the door. Two doors with the sound lock space between provide superior "cavity wall" insulation.

Figure 9 shows how two relatively lightweight doors with a sound lock between can equal the sound insulating ability of an extremely heavy and expensive single door. In the example shown, the single door would need to be five times as heavy as the total weight of the two doors to have equivalent performance.

Even if sound locks are used, doors must be considered one of the weakest links of studio sound insulation. The doors should be of special solid-core acoustical construction, mounted in matching frames with full gaskets and drop-bar seals on the bottom.

Sound absorption vs. sound insulation

Sound transmission through a barrier is primarily related to the mass of

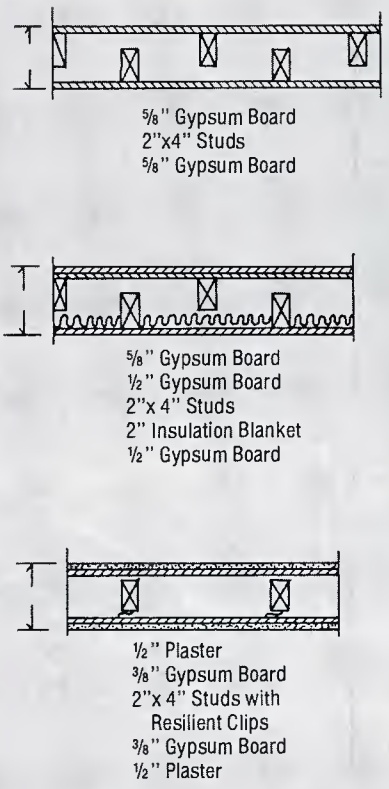

Figure 7. STC ratings of typical non-homogeneous multi-layer walls.

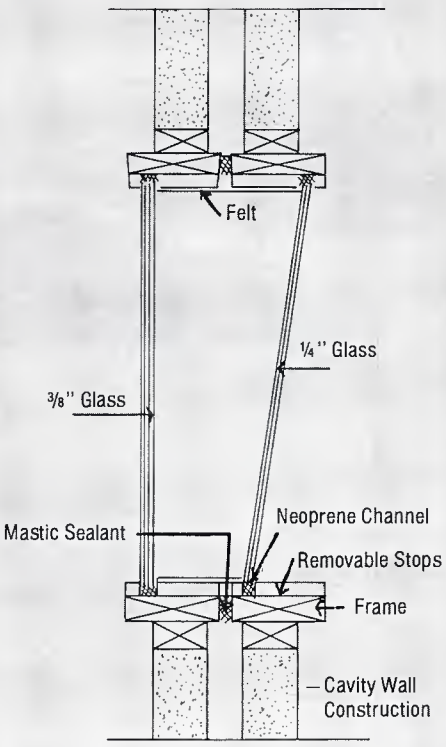

Figure 8. Typical double-glazed control room window

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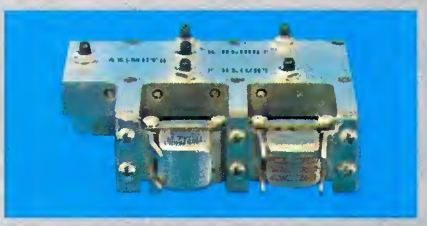
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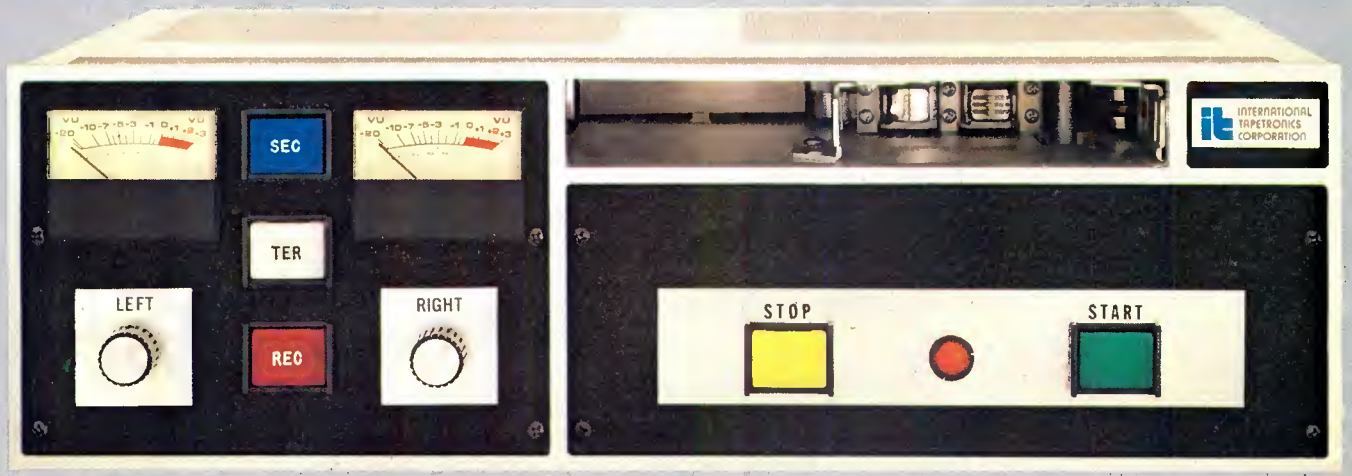

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the barrier. Sound *absorptive* materials seldom have any significant mass and, therefore, have poor sound *insulation* abilities. The property that makes them good sound absorbers—thousands of tiny porous air leaks—make them leak like a sieve in terms of sound insulation. On the other hand, a concrete wall will have poor *absorbing* properties (because most of the sound is reflected) but will have good insulating properties because of its mass.

Air leaks

Of the three paths taken by intrusive noises (barrier transmission, air leaks and structural transmission), air leaks are frequently the most destructive of studio acoustic insulation and are the simplest to avoid. Any open air path into the studio, small as it may be, can frequently degrade the performance of an otherwise excellent barrier by 20 to 30dB.

Typical air leak paths are cracks at partition joints, unsealed openings for pipes and conduits, walls that don't extend slab-to-slab, improper door seals, recessed electrical boxes and light fixtures, cable and wireway openings, etc. All air leaks into the studio must be meticulously sealed to prevent penetration of the studio acoustic envelope.

HVAC ductwork is a special case of an air leak path. Although ductwork must provide an airpath into the studio, it must be acoustically lined on the inside, properly sized and carefully engineered to provide a minimum of sound transmission and at the same time permit proper air flow.

Structural transmission of noise

Structure-borne noise is caused by sound energy that is coupled directly to the building structure in the form of mechanical vibrations or impacts. The studio walls, floor or ceiling then vibrate and radiate the sound into the studio.

These structurally transmitted sounds have their origins in such diverse actions as footfalls, moving furniture, running water in pipes, office machines, carpentry construction, ventilating blowers, motors and other machinery.

Also, vehicular traffic and building construction outside the building can cause structural vibration.

Solving the structural transmission noise problem can be approached three ways.

The first solution, as previously discussed, is to locate the studio at some distance from noisy areas and devices. A vibration imparted to the building structure will become weaker the farther it travels through the structure. This physical separation between the noise sources and the studio must be given attention early in the architectural planning stages.

The second solution is to mechanically isolate the noise sources from the building structure. All devices such as motors, blowers and other machinery near the studio must be isolated by resilient supports such as rubber, cork or springs. The carpeting of the area directly above the studio is a special case of this isolation by resilient support.

The third method of structure noise control is to provide structural discon-

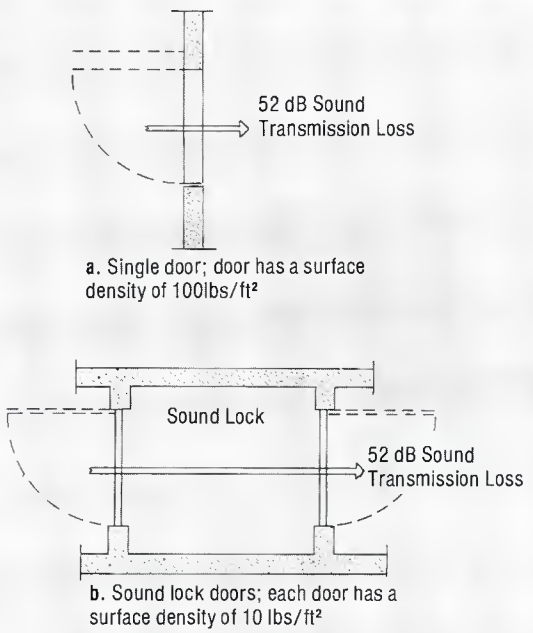

Figure 9. Single-door versus double-doors sound insulation

tinuities in the building itself. One common method is to physically separate the studio floor slab from the building floor slab.

The ultimate in structure noise isolation—and the most expensive method—is the floating room-within-a-room design. In this construction technique, a secondary floor slab is floated on the building slab by means of numerous rubber pads or springs. The internal walls of the studio are then built on this floating slab and are secured to the outer walls only by resilient supports. Finally, the studio ceiling rests on the inner walls and is supported from the slab above by resilient hangers (Figure 10).

The expense of this floating room-within-a-room can be justified only when the type of programming to be produced in the studio requires superlative acoustic isolation or when there is excessive vibration in the building structure. Such a condition might exist if, for example, the studio were to be used for the recording of dramatic productions and a large printing press were close to the studio.

Internal noises

The most serious potential noise problem inside a studio is the heating, ventilating and air conditioning system (HVAC).

Noises produced by HVAC systems originate primarily from air turbulence caused by diffusers and ductwork, blower noises conveyed through the ductwork, and blower and compressor noises transmitted into the studio through sound barriers of the building structure.

The problem of HVAC turbulence noise is more serious in a TV studio than in a radio or audio recording studio. The cause is the large amount of air that must be moved through a studio to remove the heat generated by studio lights. Because fast-moving air tends to generate turbulence noise,

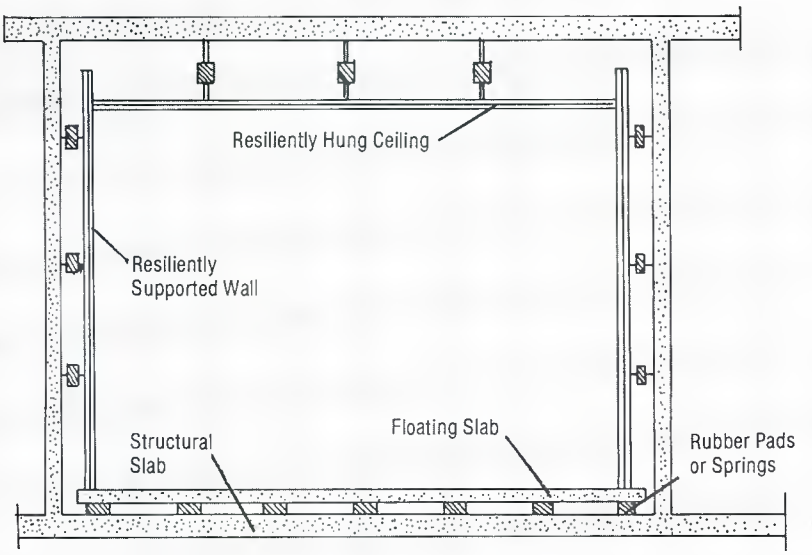

Figure 10. Floating room-within-a-room studio

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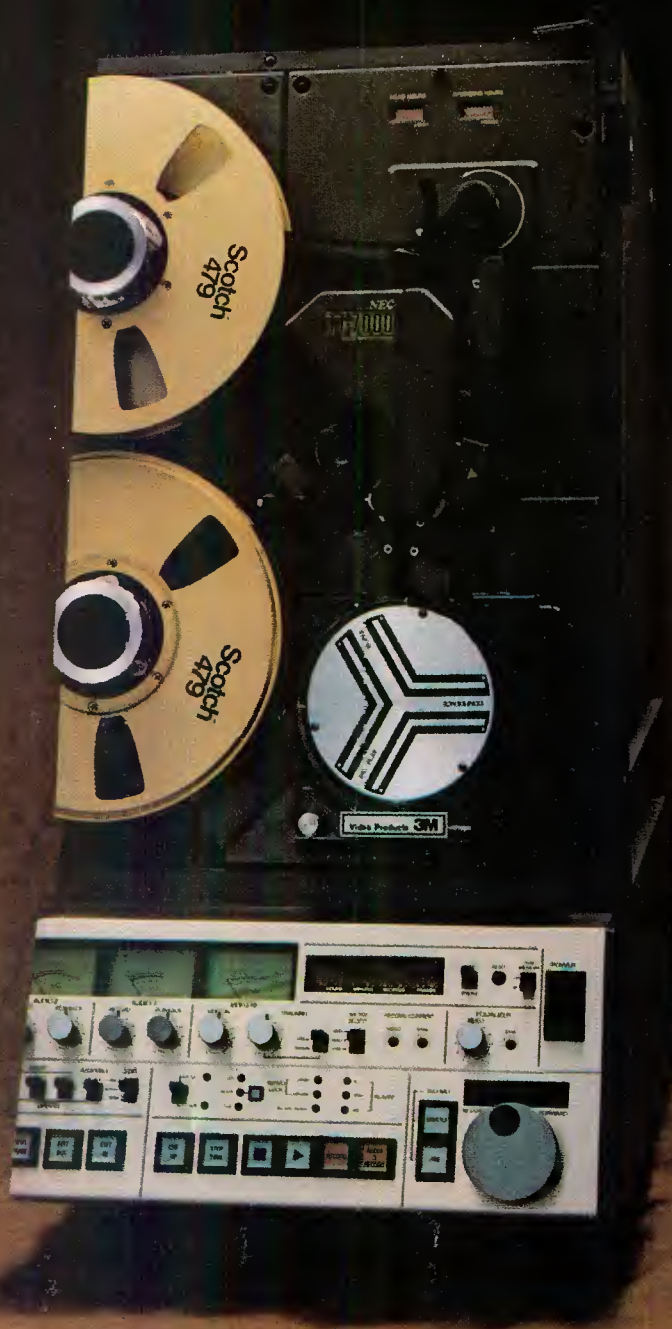

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the HVAC system in a studio must move the air slowly. In other words, the system must use low velocity air movement. However, the system for a TV studio must move a high volume of air to adequately cool the studio. A high volume of air at low velocity requires large ventilating ductwork in a television studio.

The design of the diffusers has a major influence on the amount of noise introduced into the studio. Diffusers are necessary to direct and spread the air into the studio as required and to slow down the rate of the air as it enters the studio. Reduction in velocity is accomplished by making the discharge cross-sectional area of the diffuser larger than the ductwork feeding it. Circular ceiling diffusers or baffling plaques are generally quieter than linear diffusers or rectangular registers and grills.

Maximum air velocities from studio diffusers and grills may be specified from 100 to 400 ft/min. The maximum permissible velocity of the air moving into the studio is determined by the size and function of the studio, the NC criteria and the type and location of the diffusers. HVAC turbulence noise is a function of both the velocity of the air and the physical irregularities in ducts, diffusers and grills.

Airborne noises from the blower conveyed through the ductwork to the studio can be attenuated by three methods. First, the interior surfaces of the duct must be lined with sound absorptive material. Second, the blower should be located far enough from the studio so that the resulting long ductwork will dissipate the blower noise. Third, if long ductwork is not possible, packaged attentuators or duct silencers must be used. These silencers provide zigzag paths that diminish the sound transmission but provide nominal resistance to the airflow.

Blower and compressor noise that is structurally transmitted should be solved at the source by isolating the offending unit. Such units are frequently mounted on a heavy concrete base (inertia block) that is itself isolated from the building structure by resilient mounts.

Airborne noise from blowers and compressors is diminished by locating the units a sufficient distance from the studio or by increasing the transmission loss of the barrier between the mechanical equipment and the studio.

Internal studio acoustics

The internal acoustic conditioning of a radio, audio or TV studio is relatively simple when compared with the acoustical design of live theaters, concert halls or auditoriums. For auditoriums, the acoustical designer must direct major attention to the propagation of sound from a stage area to an audience. The sound must be acoustically "thrust" to the farthest listener, be evenly distributed and have the desired quality. The design of such a room is a demanding task for an acoustician.

Studios, on the other hand, have entirely different functions than rooms designed for an audience. The "listeners" in a studio are microphones. How the microphone "hears" the sound—not how the human ear hears it is of the most importance. Because microphones are normally placed close to the desired sound, many of the critical acoustic requirements for a live theater or music hall are relatively unimportant.

Reverberation control

When a sound occurs in a studio, the microphone hears not only the sound that comes directly from the source but also the sound that it reflected from walls, ceilings, floors and other surfaces. The reflected sound continues to travel inside the room, meeting the various surfaces in

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which it is both reflected and absorbed. This process continues until the sound energy is completely dissipated. If the reflections are strong and the sound dies slowly, the room is described as "live" or "reverberant." If the reflections are weak and the sound dies rapidly, the room is called "dead" or "dry" (Figure 11). Because sound travels at approximately 1100 ft/sec, and because in a highly sound reflective room the sound energy may undergo 100 to 200 reflections, the time required for the sound to die out can exceed several seconds. The result may be loss of speech intelligibility or a "muddying" of the sound caused by syllables and words overlapping.

This loss of articulation is disturbing enough when it is heard directly by a human listener with binaural hearing, but when a monaural microphone replaces human ears as the pickup device, it is far more disturbing. In brief, control of reflections and reverberations is accomplished by absorbing the sound with appropriate surface treatments, diffusing the reflections with multiangled surfaces, and providing the proper room proportions to diminish buildup of room resonances.

Absorption methods

Room reverberation can be controlled by the application of sound absorbent materials to room surfaces. When a sound wave strikes the material, part of the energy is absorbed and part of it is reflected, and the room is made less reverberant.

Studios are frequently designed to have reverberant characteristics similar to rooms designed for live audiences. The reproduced sound from such studios frequently appears to be highly reverberant. Two factors causing this are that mis are monaural devices that increase the apparent reverberation of the room and the reverberation characteristic of the room in which the sound is reproduced (for example, a living room) is added to the studio reverberation.

Assuming that there are no unusual studio requirements, current design practice is to make studios as acoustically "dead" as possible, with the least amount of reverberation. Important advantages accrue from a low reverberant studio design:

- Microphones can be used at a greater distance from the sound source without unnecessary coloration of the sound because lower room reverberation increases the ratio between the direct and reflected sound reaching the microphone.
- A low reverberant studio increases the acoustical separation between microphones. Musical groups are normally recorded using multiple-microphone pickup techniques. In this type of recording, it is imperative to have sufficient isolation between microphones to permit proper mixing.
- A dead acoustical environment aids in the reduction of internally generated noise. This is especially important in a TV studio in which camera movement, HVAC noise and verbal communication by studio personnel contribute to internal noise.
- A highly absorptive studio is less susceptible to the buildup of room resonances than one with more reflective surfaces. This permits studios to be built with parallel walls and what might otherwise be considered undesirable room dimensions.

One of the disadvantages of a highly absorptive studio is that it may sound dead or flat to people in the studio. As a practical matter, in a TV studio this

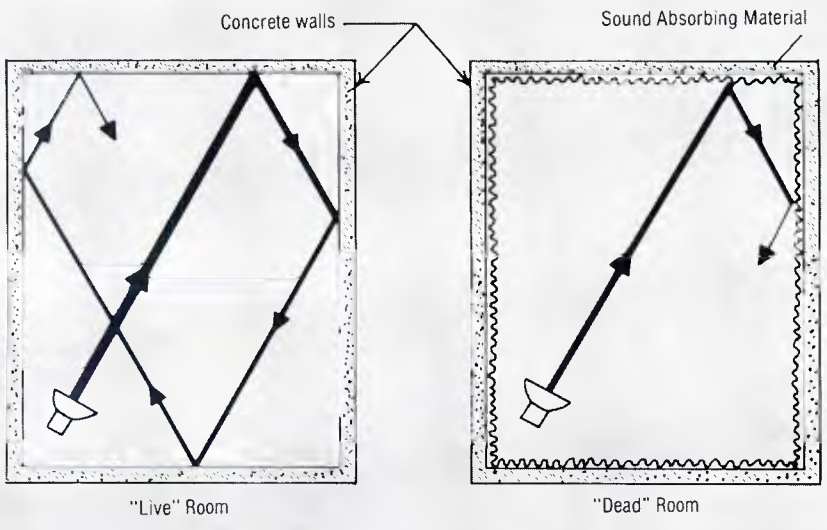

Figure 11. "Live" and "Dead" Rooms

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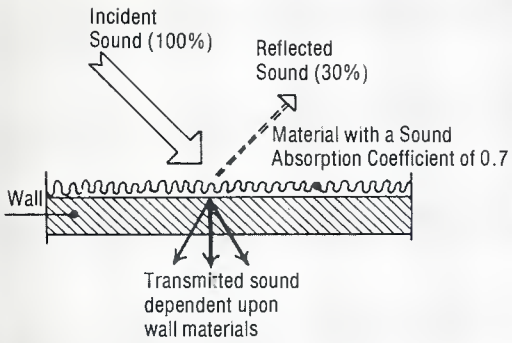

Figure 12. Sound absorption coefficient

is seldom a problem because sets, flats, scenery, windows and other large reflecting surfaces normally provide sufficient reflection to make the sound more naturally reverberant. Because radio and audio studios seldom have all this reflecting paraphernalia, the designer may wish to introduce a small amount of reflecting wall surface to increase reverberance. However, the increased inverberance is primarily for the benefit of the listening audience. State of-the-art electronic reverberation devices are capable of creating a reproduced sound that is virtually indistinguishable from that originating in a more reverberant room. These units can only add reverberation and are best used in a dead studio.

Sound absorption coefficient

The ability of a material to absorb sound is called the sound absorption coefficient. The coefficient can have a value between 0 and 1. When multiplied by 100, the coefficient indicates the percentage of sound absorbed. For example, if a material has a coefficient of 0.7, it absorbs 70% of the sound energy (Figure 12).

Because most materials have different amounts of sound absorption at different frequencies, sound absorption coefficients must be related to particular frequencies. It is standard practice to list the sound absorption coefficient values of a material at six standard frequencies: 125, 250, 500, 1000, 2000 and 4000Hz. Table 2 provides the sound absorption coefficients for several representative materials and methods of mounting.

A frequently used "single-figure" term for rating absorption efficiency is *Noise Reduction Coefficient* (NRC), an average of the sound absorption coefficients for 250, 500, 1000 and 2000Hz. For studio design, NRC is an inadequate indicator because it does not include the low frequency absorption and it also allows for considerable deviation in the sound absorption coefficients of two materials with the same NRC value. NRC can also be a confusing term because "noise reduction" usually refers to the reduction of intrusive noises from outside the studio.

Flat frequency absorption

One of the major problems in designing a highly absorptive studio is to make the absorption treatment equally effective for low frequencies and high frequencies. The nature of typical acoustical materials such as acoustic tile, drapery, carpets and glass fiber blankets, is that they have good absorption at high frequencies but much less absorption at low frequencies. As Table 2 shows, they have "frequency selective" absorption.

If the surface treatment of a studio absorbs high frequencies much better than low frequencies, the studio can have low frequency reverberation and can sound "boomy" or "hollow." Although the high frequencies have been overly absorbed compared with the low frequencies, speech articulation and crispness, which depend on sibilants and high frequency sounds, are diminished.

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A number of methods can be used to increase the low frequency absorption of studio surfaces:

- Provide an air space between the absorptive material and the mounting surface. The larger the air space, the better the absorption at low frequencies. Such an air space is automatically provided by a hung ceiling. Surface absorptive treatment on walls can be "furred out" from the wall to increase low frequency absorption (Figure 13).
- Use special absorptive paneling, such as rigid fiberglass board wrapped with perforated vinyl, which provides relatively flat-frequency absorption.
- Provide panel (or membrane) absorbers on a portion of the studio walls. Panels, such as plywood, when separated from the wall by an air space, will vibrate and absorb low frequency sound. Panels of this type can balance the excessive medium and high frequency absorption of soft porous absorbing materials and contribute to a balanced flat frequency room response.

Reverberation time

To quantify the reverberant characteristics of a room, Professor W. C. Sabine of Harvard University devised the concept of "reverberation time" in 1900. He defined it as the time in which the intensity of sound in a room decays to one-millionth (60 dB) of the original intensity.

If a room is highly sound absorbent, the reverberation time will be short because much of the sound energy impinging on surfaces is absorbed and does not continue on its reflecting course. The sound dies out quickly.

For many years, the acoustic qualities of a room have been judged primarily on the basis of reverberation time. Textbooks and articles on acoustics provide charts to show the "optimum" reverberation time for rooms of different sizes and functions. However, carefully controlled experiments have shown that two rooms with identical reverberation and whether that decay is *balanced* for both high and low frequencies are more important than the *time* taken for a decay of 60dB. Although reverberation time is still an important parameter in acoustical design, it is by no means the main consideration in the design of studios.

In recent years, acoustical designers have used a different method to evaluate the reverberant character of a room. This method measures the ratio of reflected-to-direct sound energy arriving at a microphone (or a listener). The ratio is determined by injecting pulsed sounds into the room and measuring the amplitudes of the direct and the reflected sounds with an oscilloscope on the output of a microphone. This method not only determines the reflected-to-direct ratio but also discloses the diffusive and transient characteristics of the room. It has been demonstrated that

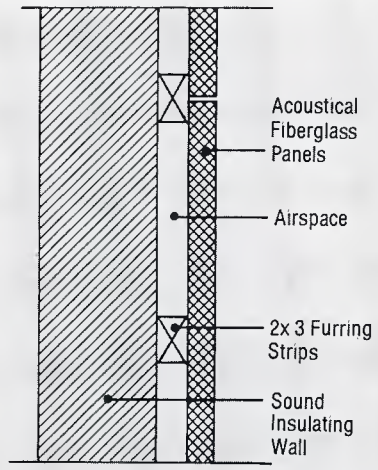


Figure 13. Furred-out surface treatment. The low frequency absorption is proportional to the airspace.

the ratio of reflected-to-direct sound energy provides a greater correlation with the quality of sound in a studio than does reverberation time.

Empirical measurements of this type are seldom required for the design or evaluation of a studio. With few exceptions, studios do not present difficult internal acoustical design problems. A competent acoustical designer can easily deal with the primary design problem of providing adequate absorption with a relatively flat frequency response. The results are highly predictable.

Studio shape and diffusion

Anyone familiar with the acoustic literature will recognize the charts listing the "optimum" length, width and height proportions of a room based on room volume and intended use. There are numerous examples of radio and TV studios that have been designed with slavish adherence to these "optimum" charts, with a result that either compromised the production ability of the studio or made the construction excessively expensive.

The significance of room proportions in studio design is highly overrated. In fact, there are no room proportions that be universally recommended as optimum. On the other hand, there certainly are room proportions for a rectangular studio that should not be used if at all possible. These consist of height-to-width-to-length ratios that are integral multiples of each other. Such proportions will tend to sustain standing wave resonances in the studio.

The worst case, for example, is a studio that has equal height, width and length. Almost as bad, from the standpoint of room resonance, is a studio in which the width is twice the height and the length is twice the width.

As a practical design guide for studios, it is usually necessary only to make certain that the height-to-width-to-length dimensions are not close to being integral multiples of each other. For example, a ratio of 2:3:5 is excellent for a medium-size studio.

It should be understood that these comments, which are intended to diminish the importance of exact "optimum" ratios, are directed specifically to the design of studios. They are not related to rooms designed for other functions in which there may be good reasons to more precisely define the room-proportion ratios.

The principal reason studios are in a special class is that they are acoustically treated to be highly sound absorbent for both low and high frequencies if they are properly designed. They will have little reverberant energy to produce standing waves.

Furthermore, the cubic volume of most TV stations is usually so large that the effects of less-than-ideal dimensions are mitigated.

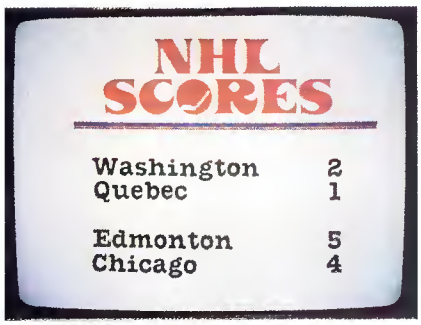
The designer must be aware that for small studios (for example, announce booths) the proportions should closely approximate the theoretical ideal room dimensions. Such low volume rooms tend to sustain room resonances at disturbing frequencies.

Compared with TV studios, room proportions for audio and radio studios deserve more critical examination. This is because audio and radio studios normally do not have the multiplicity of sound diffusing surfaces provided by sets, flats, furniture, lighting instruments, cameras, etc. that are present in a TV studio.

Diffusing surfaces, such as splayed walls and polycylindrical forms, are recommended in critical audio or radio studios when the room proportions begin to approach integral multiple ratios and when the surface treatment is not highly absorptive. In addition to diminishing "hot spots" and resonant conditions in the studio, sound diffusion promotes a uniform rate of decay of room reverberation and produces a clean, pleasing sound. □

Character gene ator roundup

By Bill Rhodes, editorial director, and Carl Bentz, engineer, KCPT, Kansas City, MO



Photos courtesy of 3M

Some typical character generator graphics. From top to bottom: line segment font used for border; special effect using dual channel mix and line segment font; logo compose for special character; and special graphic design for logo compose.

Imagine a televised sports event without players' statistics on the screen; video games without on-screen scoring; arrival and departure times at the airport not displayed on video monitors; no captioning for the hearing impaired. If it involves a video display today, it involves character generators or titlers.

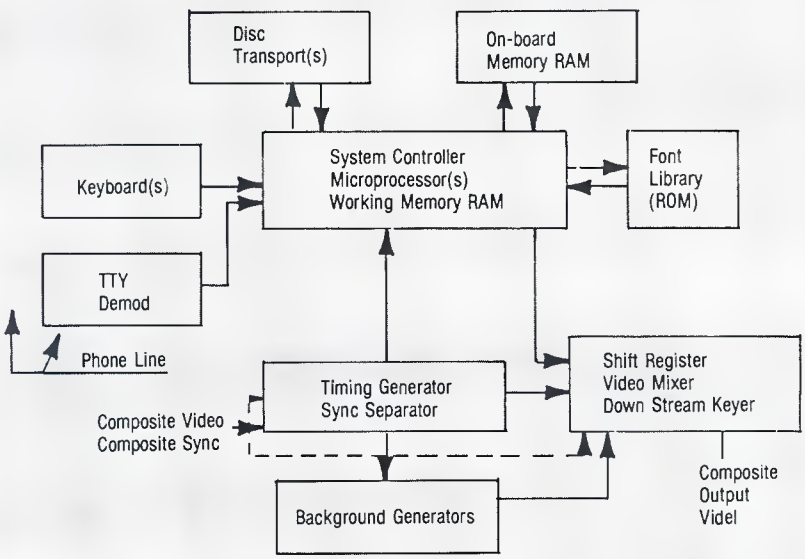
Titling specifically is the use of text material superimposed, keyed or otherwise combined with camera video. Character generators cover the wider range of equipment to place alphanumeric materials on a TV raster.

The character generator marketplace has exploded with models specifically designed for broadcasters and production studios. The range of visual outputs varies from a matte background with all uppercase letters to titles over camera video with lettering in as many as seven of 64 possible colors and with as many as 120 selectable type styles.

Yet each of these character generators has common sections—common in function, though the means of operation will vary. One must look only as far as the microprocessor chip industry to realize the variance that is possible. However, the functions of these systems remain the same—the superimposition of graphic information on video displays.

The basic character generator is a data storage/information retrieval system. An input device allows entry of data to be kept for later use, and a memory holds the information until it is needed. Finally, a display provides the retrieved material in a format understood by the user. Having these three parts, a system controller acts as a card catalog and librarian that locates or stores the materials involved. A timing system makes certain the operation occurs in an orderly fashion, the output being in a suitable format to appear on a TV screen. Finally, a power supply furnishes the necessary voltages to make all the equipment operate.

Character generator inputs can be of several varieties. A keyboard is used to supply information encoded in ASCII characters (American Standard Code for Information Interchange). This 7-bit code enables up to 128 characters or functions. How the ASCII data arrives at the central unit is left to the user. As telephone lines bring one or more inputs to a generator, a special adapter demultiplexing for each portion is needed. The input can be from disc



General block diagram of a practical titler for use in a broadcast situation.

Burt Lippman,
Executive Vice President
The Vidtronics Corporation

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Character generators

memory systems, usually an integral part of the entire character generator system. Newer models include a graphics option, allowing users to create their own type styles or pictures.

The primary consideration for selecting a character generator for use in a studio setting is the amount of memory that will be needed for the productions at hand. Memory is needed for the internal library of character fonts; to store the assorted messages needed during the production; and to provide a constantly refreshed output. In many cases, there are two individual output channels, one of which may be "on air" while the other is involved in composing. The two can be switched immediately in their uses.

A few questions should be considered when looking for an optimum system:

- *How much will the character generator be used?* Will the "on air" portion of the TV station use it as well as the production department? If so, the needs of both must be considered. (Probably a remote keyboard will be needed as well as a local one.)
- *How much font library is needed?* Most moderately priced units hold two, perhaps three fonts. If more are needed, the price will have to include a disc drive to provide the extra library.
- *Will the generator be required to provide for "on-air" and production uses simultaneously?* Two output channels are essential for that situation; one or two disc drives are needed to contain the necessary materials for retrieval.
- *How important is the quality of the character?* Simple systems generally use a ROM chip to produce a 5x7 matrix character. For most broadcast uses, such a low resolution is unusable. The more dots in a matrix, the smoother the final output. Even scriptlike characters are available, as well as cyrillic (Russian) and other non-English alphabets.

Selecting a character generator is more than a matter of matching available features with expressed needs and price with budget. The environment of the application must also be considered. Note that a station/studio environment provides a different set of constraints than a mobile van application in which space is a premium and font selection can be minimal. And, above all, the system selected must be compatible with other equipment in the video chain.

The roundup data that follows should prove helpful in selecting a character generator/titler for most applications. Further details are easily obtained by using the reader service card.

Approximate prices and delivery (ARO) for the equipment listed has been included when provided by manufacturers, but such data vary with backlog. Check with manufacturer for quotation.

Beston Electronics
15315 South 169 Hwy.
Box 106-A
Olathe, KS 66061

Beston CG800

- Character quality: low resolution.
- Roll and crawl.
- Memory options: built-in pages.
- Random page and time display; programmable display sequence.
- Interfaces available to news and weather services.
- Simultaneous page and crawl display.
- Multiple color backgrounds.
- Price: starts at $4000.
- Delivery: 4 weeks.

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Beston Marquee 2000

- Microprocessor and LSI for fewer components.

- All electronics built into the keyboard housing.
- Random display of message pages; page-by-page display time.
- Full editing functions.
- Automatic centering.
- Elastic length crawl line.
- Price: $2650, basic system.
- Delivery: 45 days.

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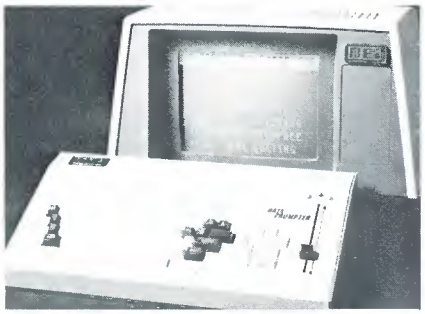
Beston Data-Prompter



- Character generator prompting system.
- Designed for TV news operations, spot announcements or off-camera production.
- Live real-time line 21 closed captioning.
- Editing functions (word processing and story sorting).
- Price and delivery: upon request.

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Chrono-Log
2 West Park Road
Havertown, PA 19083

Chrono-Log 90,000

- Character quality: high resolution, variable size.
- Accepts parallel BCD inputs at TTL levels for up to 16 digits.
- Displays 31 characters on one line, 16 of which can be from external source with the MST fixed in ROM.
- Vertical and horizontal position control.
- Works with digital clock for inserting time into video display.
- Price: Starts at $1000.
- Delivery: 6 weeks.

Circle (178) on Reply Card

Chyron Telesystems
265 Bethpage-Spagnoli Road
Melville, NY 11747

Chyron RGU-1
(Remote Graphic Unit)

- Character quality: high resolution, large alphabet, variable size and font.
- Roll and crawl.
- Floppy disc.
- 27ns character resolution with variable edge selection, four fonts.
- Vertical and horizontal character, including adjacent character tuck.
- Choice of seven colors for characters or background. Background may be colored in eight TV line increments.
- Compact, portable.
- Dual-channel option with full function.

Circle (179) on Reply Card

Chyron IV
- Character quality: high resolution, large alphabet, variable size and font.
- Roll, crawl and animation.
- Memory optional: floppy disc.
- 27ns character resolution with 15 variable edge selections and six fonts.

Character generators

- Vertical and horizontal character manipulation includes character overlap and italicizing.
- Camera compose for custom fonts and graphics.
- Choice of 64 colors for characters and background. Background may be colored in four TV line increments.
- Programmable animation and optional dual channel with full function.

Circle (180) on Reply Card

Computer Video Systems
3678 West 2150 South, Unit 2
Salt Lake City, UT 84120

Compuvid

- High-quality background color and character display, 16 character sizes, eight background colors, nine character enhancements.
- Flash invert, flash, bang, roll, crawl (4 speeds) and page print display modes.
- 16- or 27-page standard memory packages, optional memory expansion.
- Variable page timing and page length; line-by-line or page-by-page control.
- Easy to operate and edit keyboard functions.
- EIA RS-170 sync generator; optional gen-lock sync.
- One chassis/one channel design, each channel stands alone with its own sync generator, character generator circuitry, power supply, microprocessor and memory protection circuitry.
- Price: $4000-$5000.
- Delivery: 90 days.

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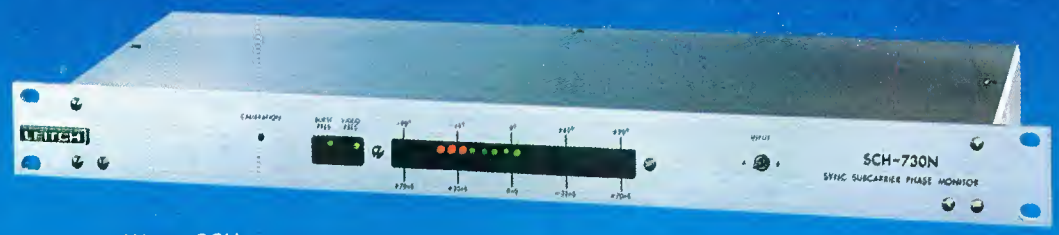
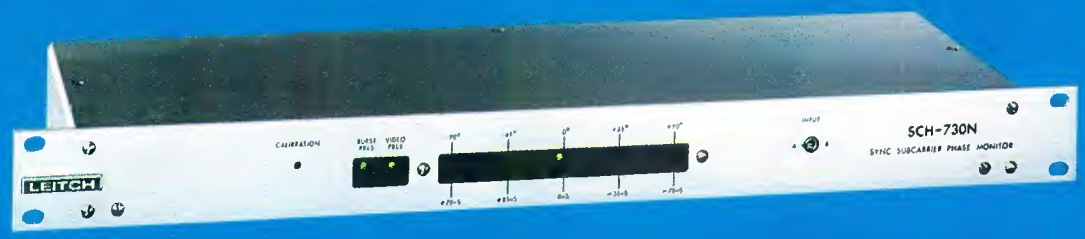


Wrong SCH



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Character generators

- Character quality: high resolution, large alphabet, variable size and font.
- Roll, crawl and animation.
- Memory options: built-in pages, added RAM, high speed rigid disc.
- Optional full second channel can be used independently.
- High speed rigid disc contains six times more messages than floppy discs plus eight fonts, operating programs, 100 animation sequences and 200 election races.
- All digital graphic compose option permits complex animations of logos and characters.
- Reset of font, edge, color and spacing of existing copy without retyping.
- Add-on disc drive permits push-button access to 120 fonts.
- Subtitling option allows composition and insertion of up to 2000 subtitles into time-coded NTSC or PAL videotapes.
- Font editor option provides rapid and efficient means of editing individual characters and full screen graphics.
- Price: $46,000-$82,000.
- Delivery: 30 days.

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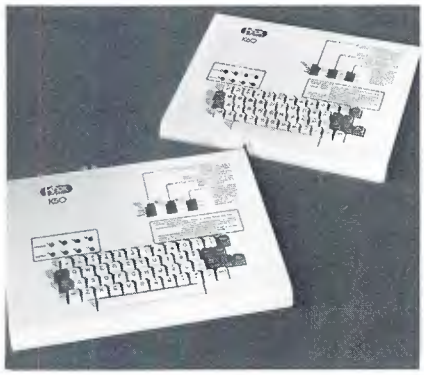
Knox Video Products
5001-J Forbes Blvd.
Lanham, MD 20801

Knox Video K50-60



- Character quality: low resolution.
- Roll, not available.
- Memory: 4 pages built in.
- Character flash.
- Low cost.
- Internal mixing.
- Portable, under 10 lbs.
- High reliability and easy to operate.
- Optional time page sequences to display built-in pages.
- Optional crawl.
- Price: $1100-$2100.
- Delivery: 30-45 days.

Circle (183) on Reply Card

Knox Video K128

- Character quality: high resolution, large alphabet, variable size and font.
- Limited animation with optional floppy disc.
- Memory options: built-in pages.
- Modular concept permits easy upgrading.
- Optional floppy disc programmable to access 400 pages and provide character animation.
- Remote controller available with optional floppy discs.
- True, lowercase letters plus foreign letter and math symbols.
- Expandable 4-page memory, eight lines/page of 24 characters/line.
- Double size characters.
- Internal mixing.
- Price: $3800-$13,800.
- Delivery: 30-45 days.

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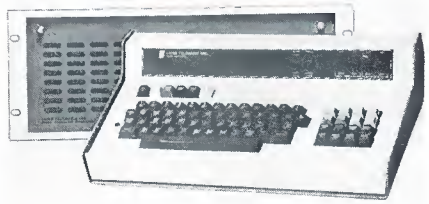
Laird Telemedia
2424 South 2570 West
Salt Lake City, UT 84115

Laird Telemedia 3600A



- Character font: 10-line x 25-character format; 9x14 dot matrix standard; adjustable character size and edging (true horizontal edging).
- Preview and program outputs; keyboard controlled character on/off edging, underline, overline, crawl, roll, box, flash and word length.
- 1k (4-page) memory standard, expandable to 24 pages.
- Keyboard: standard 52-key set for characters, 20-key set for cursor.
- Designed for versatility, expandability and economy; building block concept permits changes and additions in system capability.
- Options include pulse interface, color sync generator, color billboard generator, time generator,

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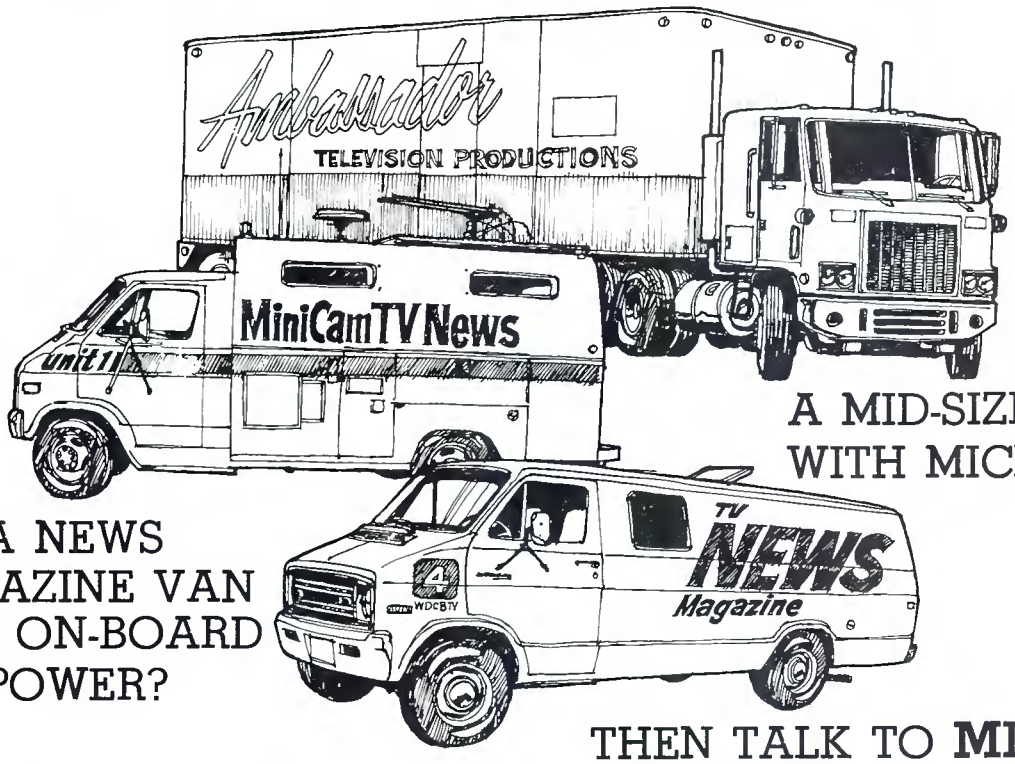

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A NEWS MAGAZINE VAN WITH ON-BOARD POWER?

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Selecting a vendor to supply a $100 thousand or $3 million mobile unit is a great responsibility.

MIDWEST CORPORATION, the nation's largest video sales and service organization, is the best choice for meeting your needs, and here's why:

- We handle major lines of all production equipment, so we don't have to charge for two-stepping.
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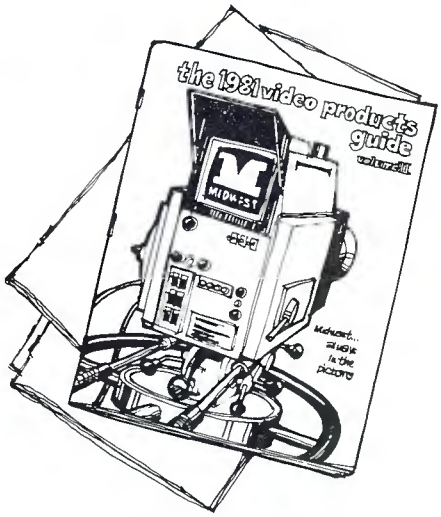

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800-543-1584

(In Ohio 513-651-1904)

Request a copy
- Mobile Unit Information
- 1981 Video Products Guide
- 1981 CATV Products Guide
- Midwest Capabilities Brochure

Circle (64) on Reply Card

Character generators

date generator, up/down counter, temperature and fixed title memory.
- Format window position permits selective assembly of various data sources and keyboard memory.
- Delivery: 3 weeks.

Circle (185) on Reply Card

Laird Telemedia 3201

- TV time/date generator.
- 100-year calendar.
- Black or white characters.
- Large legible font.
- Choice of format.
- Non-add video mix; dual video output.
- Delivery: 3 weeks.

Circle (186) on Reply Card)

Laird Telemedia 1200

- Character font: 9x14 dot matrix uppercase characters; size: 28 TV lines x 9 picture elements standard; enhancement: true horizontal edging.
- 8-page memory standard, with capacity of 2048 characters presented in a standard display of 10 lines of 25 characters each per page; alternative formats: 5 to 20 lines/page, 12 to 40 characters/line.
- Separate keyboard and electronics chassis.
- Automatic or manual sequencing between stored pages.
- Window-position permits selective display of lines through keyboard programmable masking.
- Delivery: 3 weeks.

Circle (187) on Reply Card

MPB Technologies

P.O. Box 160, 21051 North Service
Trans-Canada Highway
Ste-Anne-de-Bellevue, Quebec
H9X 3L5

MPB Vista 80/116

- Character quality: high resolution, large alphabet, variable size and font.
- Roll, crawl and animation.
- Memory options: floppy disc.
- Font extension capability. Modular design permits expandable fonts or channels.
- Fonts and display pages stored on discette by abbreviated assigned titles.
- Easily read index to titles used; automatically prepared and displayed.
- Key stroke sequence programmer stores series of operations, making animation possible plus a display of the sequences.
- Diagnostics: front panel by LEDs or discette-based for detailed diagnosis.
- Price: $1690.
- Delivery: 60 days.

Circle (188) on Reply Card

MPB Vista 80/216

- Character quality: high resolution, large alphabet, variable size and font.
- Roll, crawl and animation.
- Memory options: floppy disc.
- Has all the model 116 features and a second channel with three modes of operations: preview on-air operations; two independent channels; or as a super-channel independently controlling background and foreground.
- Price: $2730.
- Delivery: 60 days.

Circle (189) on Reply Card

System Concepts

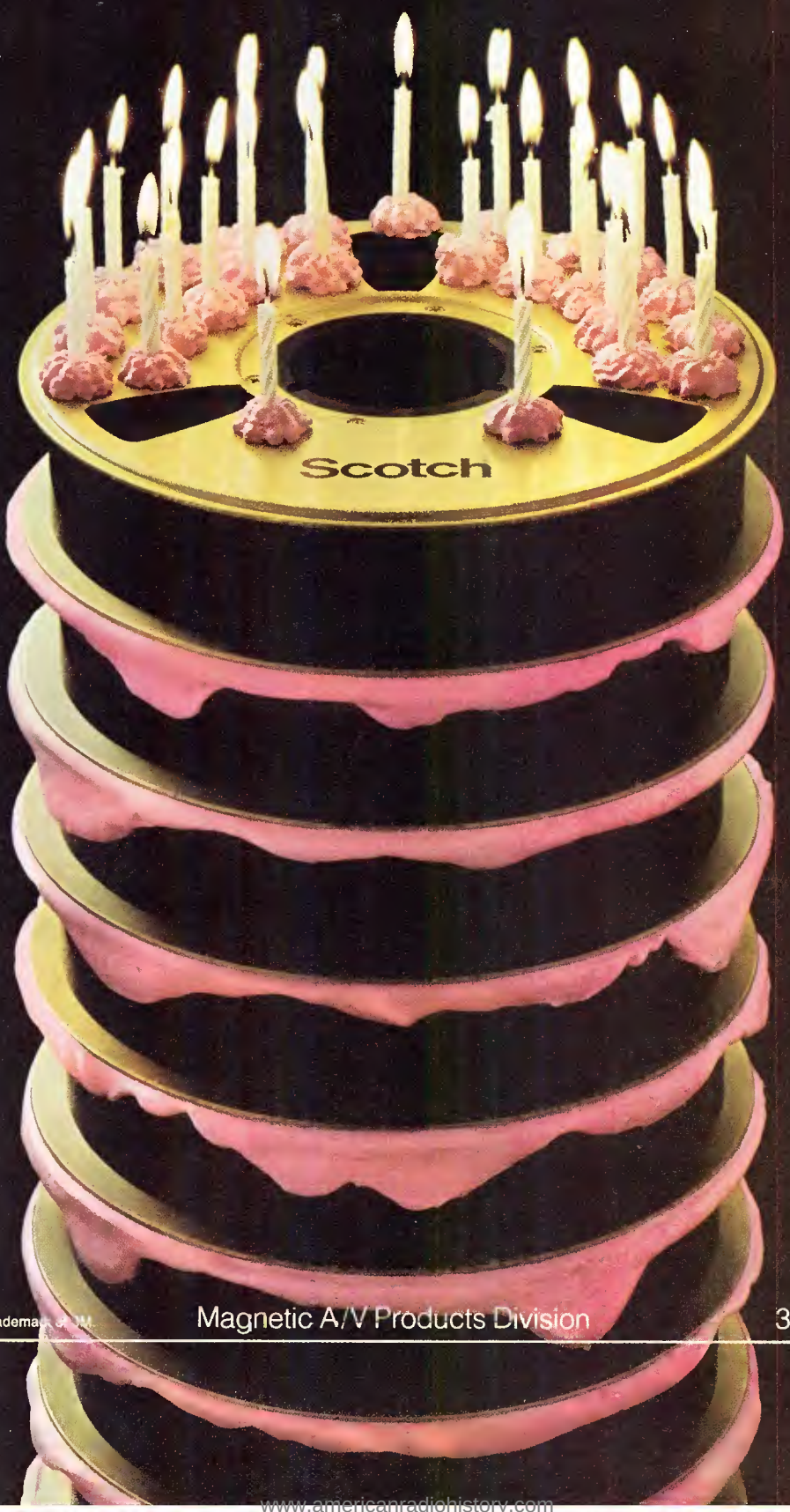
395 Ironwood Drive
Salt Lake City, UT 84115

Features common to all System Concepts character generators:
- Character quality: high resolution, large alphabet, variable size and font.
- Roll and crawl.
- Memory options: floppy disc on VI, VI-A,and VII.

Quantafont Q-V

- Nine-character-size selection of

Happy 25th birthday to video tape from the people who lit the first candle.



"Scotch" is a registered trademark of 3M.

Magnetic A/V Products Division

3M Hears You.

3M

Character generators

both large and small capital letters by row; three heights and three widths.
- Random access to 48, 4-row resident positionable titles of any size character by row.
- Roll, crawl, flash dynamic modes with crawl positionable at any raster location.
- Absolute centering by row and page.

Circle (191) on Reply Card

Quantafont Q-VI

- 24-character-size selection of large and small capital letters by row; six heights and four widths.
- 192-row resident memory can be selectively sized from row/page (192 pages) to 22 rows/page (eight pages).
- Automatic absolute centering by row, page or memory and incremental positioning in ⅛-character increments by row.
- Multiple dynamic functions with two roll modes and crawl modes of any length and number.
- Editing functions: erase to end of row, page or memory plus insert/delete and open/close.

Circle (192) on Reply Card

Quantafont Q-VI/A

- Monochrome version of the Q-VI.

Circle (193) on Reply Card

Quantafont Q-VI/M

- Automatic mass-memory information display system displays more than 3000 rows of information using all display capabilities of Q-VI titler.
- Programmable control of 17 blocks of digitally recorded Q-VI resident memory display.
- Reads, displays, rewinds and repeats an elastic number of blocks automatically for as long as desired.
- Three different access and playback timing modes.

Circle (194) on Reply Card

Quantafont Q-VII

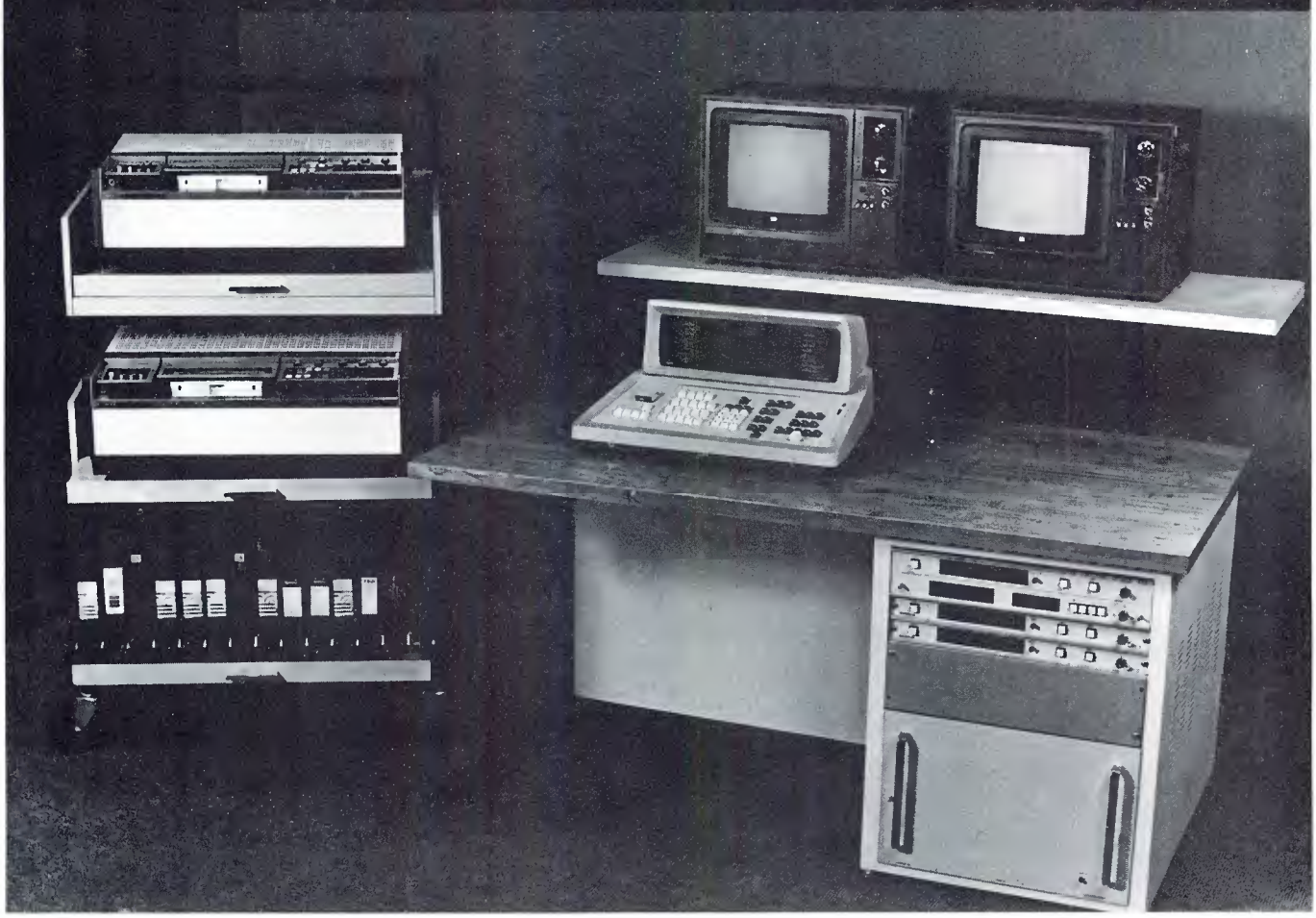
- Multiple resident fonts: serif upper and lowercase, sans serif 2-size caps by row; serif 2-size caps by row.
- 20-character size selection by row of all fonts; four widths and five heights.
- Special character refinement produces effective start point resolution of less than 20ns.
- Color characters and backgrounds by row; seven color selection.
- Borderline or shadow edging; bold or fine border; 4-quadrant shadow.

Circle (195) on Reply Card

3M
3M Center
P.O. Box 33600
St. Paul, MN 55133

Features common to all 3M/Mincom

TEMPO 76
by datatron
2 Machine Videotape Editing System
$32,000 complete



Price includes Tempo 7620 with two time code readers • 50 event memory • auto-assembly • text edit • interfaced to VO2860A and VP2260 player • 2 CVM 1250 monitors • editing, monitor desk and VTR stand
Delivery, set-up and training included.

MANY OPTIONS AVAILABLE

(215) 223-8200
Ask for Ed Zwicker

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ELECTRICAL CORPORATION
COMMUNICATIONS SYSTEMS DIVISION
3125 North Broad Street, Philadelphia, PA 19132

Complete system capabilities

Other Datatron Products TEMPO 76 and VANGUARD for 3 to 5 machines. Systems for use with 3/4", 1" and 2" VTRs.

Circle (70) on Reply Card

Character generators

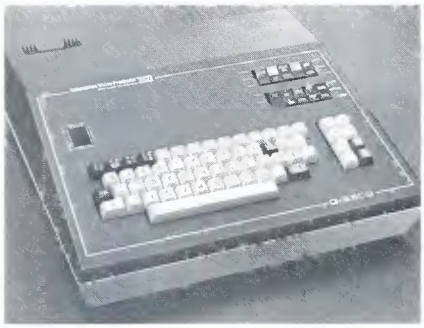
Division character generators include:
- Character quality: high resolution, large alphabet, variable size and font.
- Roll and crawl (on the 2500, 3016 and 8800) plus animation (on the 8800).
- Memory option: built-in pages, added RAM, floppy disc and audio storage (on the 2000).

3M Datavision D-2000

- High resolution graphic arts characters, two sizes, three font sizes.
- Broadcast-quality video mixer; built-in audio interface.
- 10 rows/page, 24 characters/row.
- Serial RS 232 interface option.
- Price: $4000.
- Delivery: 30 days.

Circle (194) on Reply Card

3M Datavision D-2500



- High resolution graphic arts characters; two character sizes, three font sizes.
- Broadcast-quality video mixer.
- Internal 4-page random memory.
- Automatic centering; three vertical roll speeds and three horizontal crawl speeds; three position crawl/title selection.
- Up to 22 characters/row, 20 rows/page.
- Serial RS 232 Interface.
- Price: $6200 (base)
- Delivery: 30 days.

Circle (198) on Reply Card

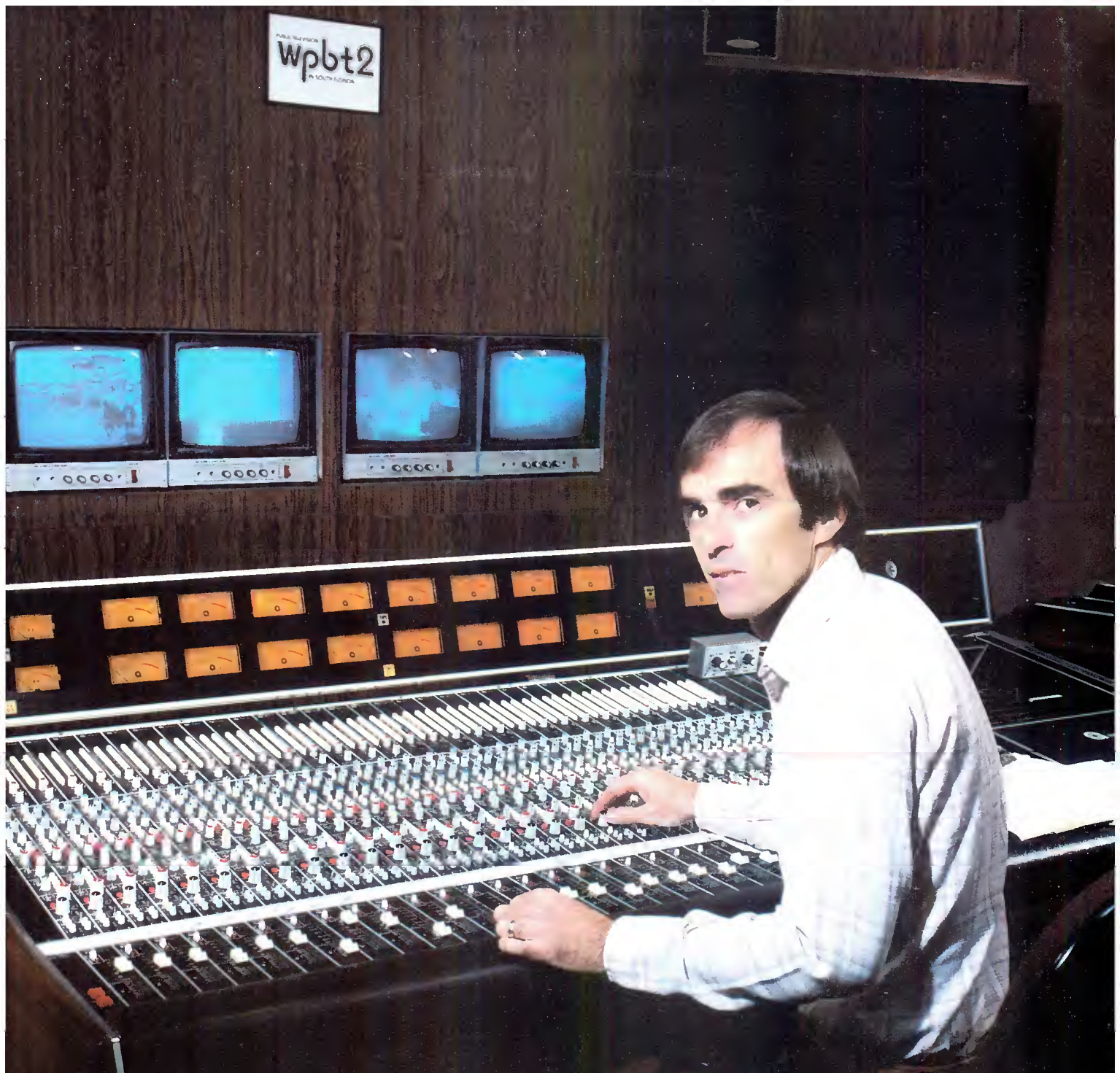
3M Datavision D-3016

- High resolution graphic arts characters; two character sizes, two fonts standard.
- Independent preview and program output channels; internal 16-page random memory.
- Three speed roll and crawl; three position crawl/title selection.
- Word flash, automatic centering.
- Up to 22 characters/page, 10 rows/page.
- Serial RS 232 interface.
- High speed parallel interface.
- Price: $7700 (base).
- Delivery: 30 days.

Circle (199) on Reply Card

3M D-8800 Graphic Generator

- Interactive; microprocessor simplifies and expands creative and system capabilities.
- Standard logo composition feature uses existing hardware (no addi-



"Our Auditronics 720 combines recording studio quality with live broadcast flexibility,"

says Graham Simmons, Chief Engineer at Miami's WPBT — Channel 2. "Auditronics developed this 36 in — 16 out audio mixing console to give us all the EQ, reverb and signal processing we need for studio quality multi-track recording of our productions."

"When you're a national production facility like we are, you've got to have an audio signal path that's strictly state-of-the-art. For example, our Auditronics 720 preamp design is the latest generation and gives us the best signal-to-noise performance available. It allows us to do multiple generation dubbing and mixing without noise build up."

"In addition to its multi-track recording advantages, our 720 has the flexibility to do all the necessary mixing and signal processing in real time for a mono mix for TV, a stereo mix for FM simulcast, including network satelite feeds, as well as a scratch mix on videotape for later synchronization in post-production editing."

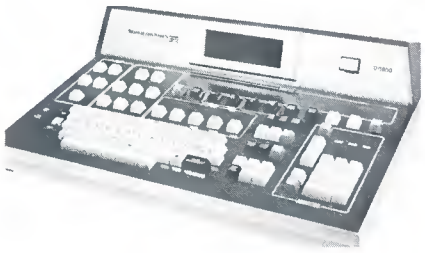
"Whether it's multi-track recording, live broadcast or post-production, our Auditronics 720 does everything we want it to do, and does it very nicely."

If you'd like to know what WPBT-Miami and over 300 other satisfied users know about Auditronics broadcast consoles, circle reader service number or contact:

auditronics, inc.
3750 Old Getwell Road
Memphis, Tennessee 38118
(901) 362-1350

Circle (73) on Reply Card

Character generators



tional purchase necessary); loads from the keyboard; includes italics; reverse or flip, character or logo splitting; character combining; character height reduction; vertical flip.
- Dual microprocessors for two high resolution video channels; outputs can be independently viewed or combined in single channel.
- Animation mode to create unusual and special graphic effects.
- All the expected titler flexibilities and extensive editing controls and computer interface capability.
- Record instruction feature—semi or fully automated to remove burden of operation during time-intensive productions and to help eliminate operator errors; when totally automated, programmable in any mode to select roll, crawl and loading-in the correct fonts.
- Price: $30,000 (base).
- Delivery: 30 days.

Circle (200) on Reply Card

Texscan/MSI Corporation
Suite S
3855 South 500 West
Salt Lake City, UT 84115

Texscan FMC-81

- Characters: eight selectable sizes on a line or page basis (4 heights and 2 widths).
- Six display modes (roll, crawl, splash, bang, static and page print).
- Basic system provides 58 pages of solid-state RAM memory and is expandable to 812 pages. With disc system interface, memory is expandable to 4000 pages.
- Eight selectable color backgrounds.
- Selectable page time (1-99s), selectable page sizes (1-21 lines); three display speeds.
- Variable titles programmable from the keyboard—any channel, any region.
- Titling over radar scan and advertising displays.
- The Flexicaster Memory Controller system (FMC-81) is a sophisticated microprocessor-based automated information system used in single and multichannel applications in the CATV industry—as well as in newspapers and other industries New 1981 generation includes character edging, upper and lowercase characters, graphics and custom logo capability, gen-lock sync built-in.
- Price: $13,000.
- Delivery: 60 days.

Circle (201) on Reply Card

Thomson-CSF Broadcast
37 Brownhouse Road
Stanford, CT 06902

Vidafont Mark IVA

- Character quality: high resolution, large alphabet, variable size and font.
- Roll, crawl and animation.
- Memory options: built-in pages, added RAM, floppy disc.
- Microprocessor-controlled font generation; 45ns resolution.
- Extensive library of custom fonts and special logos; large multiple-font memories; independent font change.
- Automatic character overlap with manual override; features 132 combinations; true proportionally structured and spaced characters.
- Background color on full row, partial row, or page basis; color edit output combines program, character video and background colors with composing indicators.
- Eight roll and crawl speeds and pause and resume; simultaneous static display and crawl message; programmable crawl position.
- Price: $26,500.
- Delivery: 30 days.

Circle (202) on Reply Card

Video Data Systems
5630 Waterbury Way Plaza
Suite B-102
Salt Lake City, UT 84121

T-1000A

- Versatile TV studio titler with a wide variety of operating modes and types of characters.
- 16-page memory, crawl line, variable length page roll, and one- or two-line title window.
- 12 character variations with special font and edge enhancements and two character heights.
- True off-line editing while another page of text is displayed.
- Available in PAL version.
- Price: $4000.
- Delivery: 30-60 days.

Circle (203) on Reply Card

TM-1024S

- Low-cost microprocessor-based character display can be operated either in a titler mode or as a character generator with internal sync.
- Can display single pages and titles, or automatically sequence eight or 10 pages of stored text.

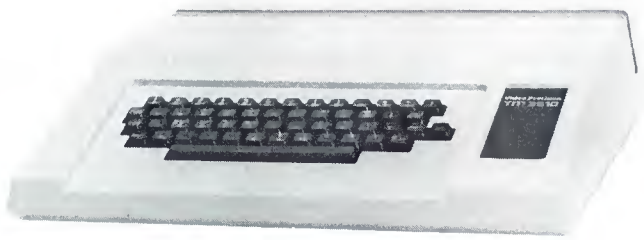
Kelcee **COMMUNICATIONS INC.**

proudly presents . . .

...Video Precision

CHARACTER GENERATORS AND PRODUCTION TITLERS

CG-3000 SERIES:
(self-contained)



CG-3000 SERIES

CG-3000 CHARACTER GENERATOR
CG-3030 PRODUCTION TITLER
CG-3050 CHARACTER GENERATOR/TITLER

FEATURES:

* 8-Lines of 28 ULTRA-CLEAR Characters
* Character Generators have Seven Color Page-by-Page Background Selection
* 8 or 16 Page Memory
* Character Flash
* 2-Speed Bottom Line Crawl
* Titlers have Vari-Speed Credit Roll
* Audio Cassette Off-Line Memory Interface
* Optional RS-232 Interface for Computer driven applications

CG-3500 SERIES, SEPARATE KEYBOARD AND ELECTRONICS:

CG-3510 CHARACTER GENERATOR with TIME and TEMPERATURE DISPLAY.
16,32,96 or 160 Page Memory.

CG-3520 DUAL CHANNEL CHARACTER GENERATOR.
8,16,32 or 64 Page Memory per Channel.

CG-3530 CHARACTER GENERATOR, as CG-3510, but with Electronics Interface for Heathkit Weather Package

CG-3500 SERIES KEYBOARD AND ELECTRONICS UNIT

FEATURES:

* 10-Lines of 32 ULTRA-CLEAR Characters.
* Two-speed, elastic length, Crawl Line.
* Keyboard Programmable Fixed Title Line.
* Line-by-Line and Page-by-Page Eight Color. Background Selection.
* Word or Phrase Accentuation by Complementary Color Background Selection or Flash.
* Power Protection via External 12V DC Source.
* Remote Programming via TELCO Line.
* Audio Cassette Off-Line Memory interface (Optional on CG-3520).
* Optional GENLOCK.

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3445—12th Street N.E., Calgary, Alberta, T2E 6S6 (403) 230-2118 (TWX) 610 821-6400

Circle (74) on Reply Card

Character generators

- Special keyboard functions for efficient editing, including character insertion and deletion, row centering, character flash and full cursor control.
- Options include choice of eight background colors in character generator mode, power failure protection and a PAL version.
- Price: $2500.
- Delivery: 30-60 days.

Circle (204) on Reply Card

T-1024S

- Low-cost microprocessor-based titler for displaying single pages or automatically sequencing eight or 16 pages of stored text.
- Special keyboard functions for efficient editing include character insertion and deletion, row centering, character flash and full cursor control.
- Options include power failure protection and a PAL version.
- Price: $1700.
- Delivery: 30-60 days.

Circle (205) on Reply Card

KCS-400

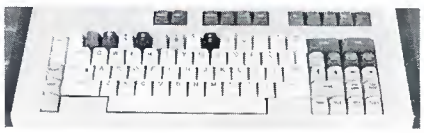
- Low-cost keyboard crawl operates

as a downstream keyer.

- 256, 512 or 1024 character repeating crawl loop with two crawl speeds.
- Options include power failure protection and PAL version.
- Price: $1500.
- Delivery 30-60 days.

Circle (206) on Reply Card

TPT-2500



- Microprocessor-based TV production titler with variety of capabilities.
- 32 pages of stored text with automatic page sequencing in any arbitrary order with one or two positionable crawl lines of variable length.
- Many types of characters can be created by different combinations of character height and width, character edging and white or black color.
- Advanced keyboard functions for efficient editing include line centering, page reformatting to restore word integrity, tab, character insertion deletion and character flash.
- Upper and lowercase characters and graphic symbols.
- Optional digital cassette memory.
- Price: $5000.
- Delivery: 30-60 days.

Circle (207) on Reply Card

MCG-2500

- Microprocessor-based message character generator with a variety of capabilities.
- Formatting, editing and character selection features are similar to those of the TPT-2500.

Circle (208) on Reply Card.

FMD-100

- Character generator provides a fixed message display with four lines of 32 characters on a monochrome background.
- Optional loop-through titler mode.
- Other options include color background and expansion to eight lines.
- Price: $595.
- Delivery: 30-60 days.

Circle (209) on Reply Card □

TV test equipment from the inventors of the Plumbicon® tube.

At long last a new, reliable source of TV test equipment. One that offers fast, predictable delivery. One with a name all the world trusts—Philips. Four quick examples:

PM5565 Waveform Monitor

Enjoy the luxury of examining one line and one field at a time. On top of this, there's a convenient front probe input so you can use the monitor as a troubleshooting oscilloscope.

PM5567 Vectorscope

If you want more accurate decoding and the ability to have an external reference from composite video signals, choose our vectorscope.

Both waveform monitor and vectorscope mount side by side, fit all existing hardware and use less power than the competition.

PM5539 Color Analyzer

Take it on a quick trip through your studio or control room and adjust all monitors to the same color temperature in a matter of minutes.

With four different memories, there's no problem in quickly calibrating four different phosphors.

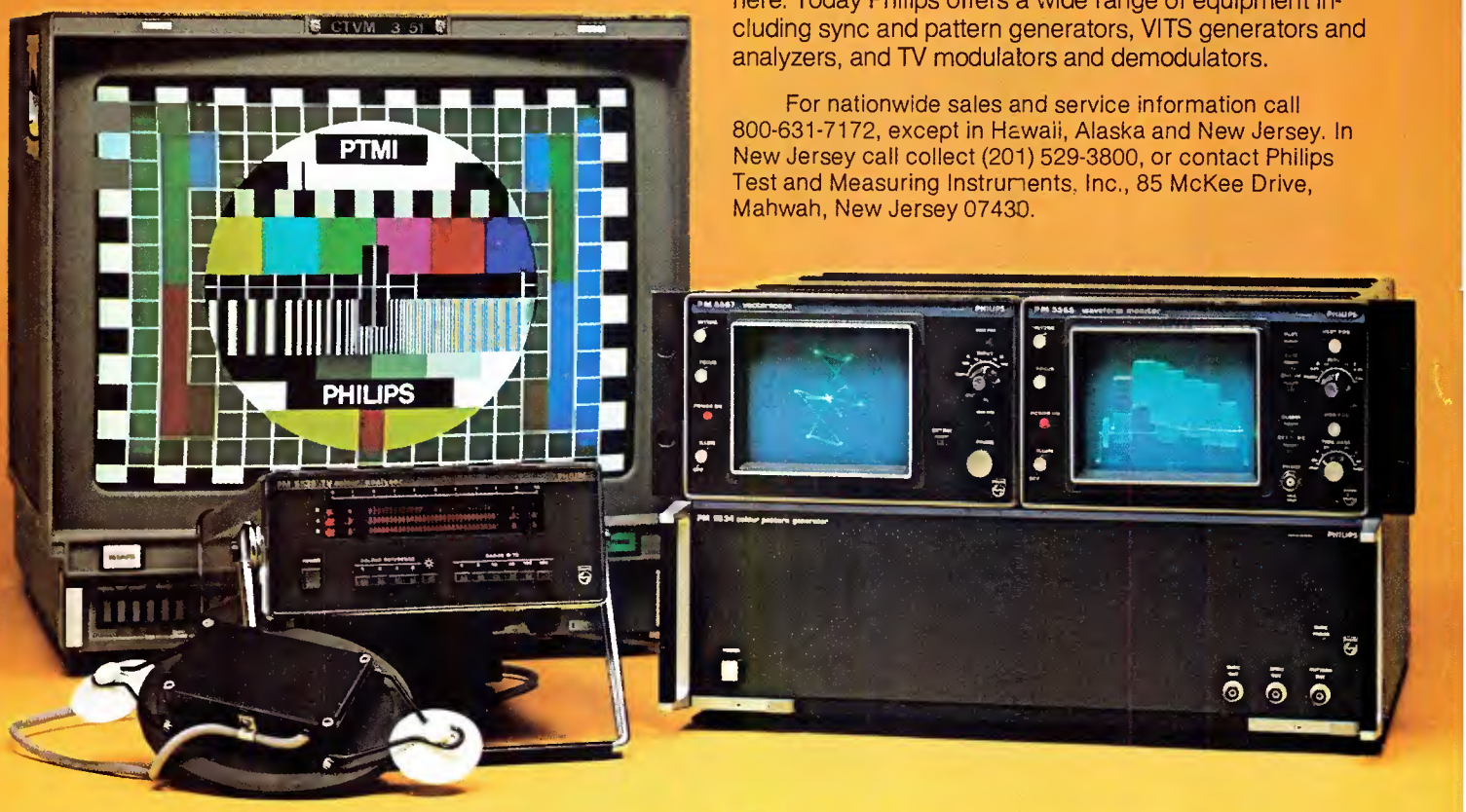
Variable full-scale, from less than set up to more than reference white, allows measurement of color tracking as a function of APL.

PM5534 Color Pattern Generator

Our universal pattern contains all the signals needed to verify overall system operation—directly from the picture. No wonder virtually every set manufacturer uses our pattern for their TV set alignment.

Of course our TV test equipment line doesn't end here. Today Philips offers a wide range of equipment including sync and pattern generators, VITS generators and analyzers, and TV modulators and demodulators.

For nationwide sales and service information call 800-631-7172, except in Hawaii, Alaska and New Jersey. In New Jersey call collect (201) 529-3800, or contact Philips Test and Measuring Instruments, Inc., 85 McKee Drive, Mahwah, New Jersey 07430.



Philips, of course.

PHILIPS Test & Measuring Instruments

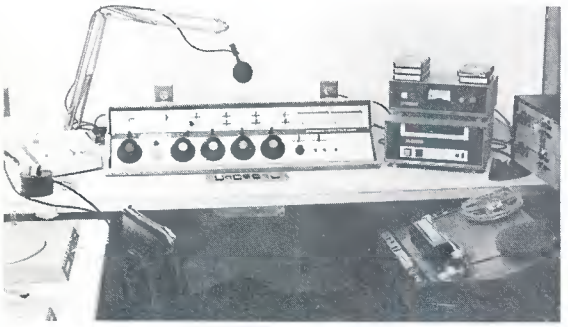
PHILIPS

Circle (77) on Reply Card

Technology enhances AM-FM operations at WLAP

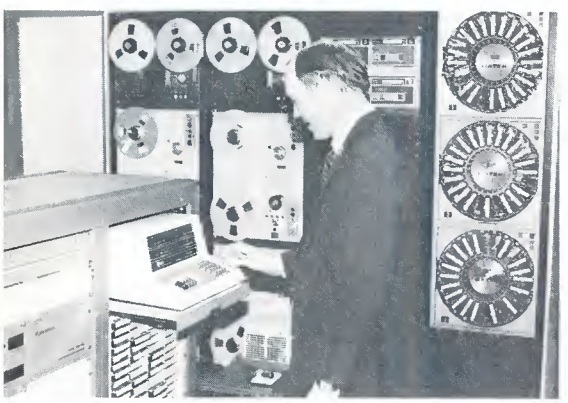
By Lewis M. Owens, technical director, WLAP, Lexington, KY

WLAP and WLAP-FM studio, office and transmitter building.



WLAP-FM control room.

WLAP-AM control room with Jack Pattie, program director, at console viewing through window, Phil Miller, news director, during local newscast. Extended modulation meters and alarm panel in upper right. Lower left is remote control panel for equipment in other departments for use as needed.



Dan Dorsett, operations manager, at WLAP-FM program automation system console.

Technological advances in broadcast equipment can be beneficial to a station's operation and can be integrated into an existing facility in a partial or complete rebuild. To eliminate operational problems, WLAP verified that by following a detailed plan, by completing each phase before beginning another, a convenient operation during construction can result.

The purchase of WLAP and WLAP-FM in 1968 by Illinois Broadcasting Company was made with plans of a significant rebuilding effort in the immediate future. The studios and offices were in a building modified for use in downtown Lexington, KY. The transmitter plant was seven miles away on a 70-acre tract to accommodate the AM's 4-tower parallelogram directional array. The installation completed 20 years earlier was obviously well-engineered for optimum dependability, but was in need of considerable attention.

The rebuilding project required maintenance attention to the existing operations and a new building, because management wanted an "all-under-one-roof" operation. The project's magnitude required thorough planning to reach the desired objectives and still maintain the operation of both stations.

The first serious efforts began in early 1971 with a regular preventive maintenance program on all equipment to improve reliability and consistent on-air sound. Repair began on the 4300 feet of 1⅝-inch rigid AM transmission line, installed above ground. The transmitter was replaced in July 1971 with a Gates BC-5H, improving the AM's dependability and minimizing engineering time on transmitter maintenance. At that time, plans were being made to relocate the studio and office complex to the transmitter site. At its completion, it was desired to complete upgrading of the FM facility.

Architectural and acoustical design was done by Donald B. Shelton Architects, Lexington, KY.

All RF improvement designs were by Ralph J. Bitzer, Consulting Radio Engineer, St. Louis, MO, and on-site engineering was handled by the WLAP and WLAP-FM technical staff.

FM Antenna optimization was by the antenna manufacturer Electronics Research Inc., Newburgh, IN, from actual measurements on their Test Range.

The existing transmitter building was constructed in the late 1940s of concrete blocks with reinforced walls, roof supports, floors and roof, and was deemed satisfactory for continued use. Its distance from the highway allowed the front addition of a studio-office building. Architects designed the building for appearance, incorporating desired features for comfortable operation of both AM and FM facilities with expansion capability for the future.

The selected design was a 3350-square-foot brick-veneered building with concrete floor, built-up roof; the building is attached to the front of the existing 1200-square-foot transmitter building. Departmental responsibilities were placed by area in the new addition and dual hallways were added to provide efficient internal traffic flow. Internal office walls are of drywall construction. Studio and control room walls and ceilings are dual stud drywall construction separated by insulation. Suspended ceilings are used in the office part of the building. Studio and control room windows are ¾-inch thick made of three ¼-inch plate glass sheets and their doors are 2-inch metal soundproof units.

Internal window placement allows control room personnel to comfortably see live participants in other areas, and when they have operator duties, they can view the transmitters and FM automation system with ease in the adjacent room.

The air-conditioning and heating system selected was an electric unit supplying a constant temperature from the roof-installed main unit, and with individual room thermostat-controlled duct-heaters, allowing individual comfort and conservation of energy during non-office hours.

The building's open attic area was used as the return air plenum; individual room returns were designed for minimum sound transfer, which has proved satisfactory. Telephone and electric service was installed underground. The electric service was changed from Delta to Wye feed for a balanced load to the utility service. A paralleled electric entrance was installed to furnish the new section without disturbing the existing building's operation, which is ac generator-supported.

A 30-inch thermostat-controlled exhaust fan is located at ceiling height to

The end of the endless loop

Eumig's new FL-1000 makes cassettes the broadcast medium.

The Eumig FL-1000, an extraordinary new cassette tape deck, has started a revolution in the world of broadcasting. We believe—and radio engineers agree—that it will soon make the cassette the standard tape format in the broadcast industry.

The FL-1000 is the world's first computer-interfaceable cassette recorder. Up to sixteen FL-1000 decks can be controlled by any 8-bit computer. Some of the decks can be used for commercials; others for news and weather; still others for music and station ID's. And the location of *every* item on *every* cassette can be stored at the beginning of each tape and then in the computer, so *any* sequence can then be played back—automatically, with no human intervention, all day and all night long.

Watching a bank of FL-1000's working together is an awesome experience. One deck is rewinding while another is playing, and still another is moving in fast-forward to locate the next selection. Meanwhile, other decks are copying from a network feed and recording an air check.

The technology of the FL-1000 is so advanced that half a dozen units can do the work of more than 100 individual cartridge players—plus several reel-to-reel recorders. And they do it better, at far less cost, with sound quality comparable to that of the finest open-reel equipment. And the Eumig FL-1000's have none of the mechanical problems that plague endless-loop broadcast cartridges.

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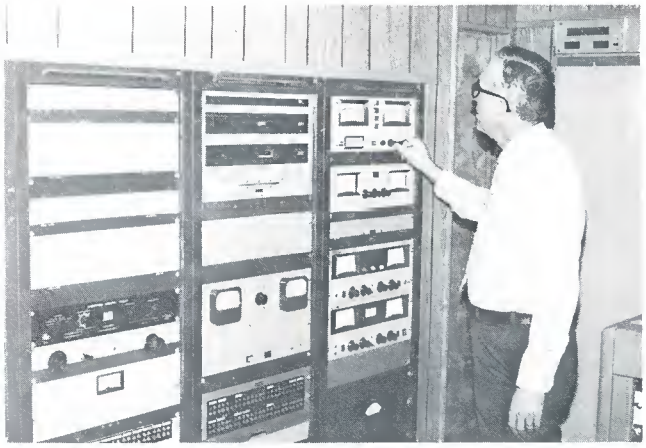
Eumig (USA) Inc., Lake Success Business Park, 225 Community Drive, Great Neck, New York 11020, (516) 466-6533

Jackie Shurr, traffic manager, at terminal of WLAP's business computer.



Lew Owens, technical director, observing antenna monitor at transmitter room area racks containing audio distribution, audio processing and RF monitors.

WLAP

remove the heat from the transmitters, which is replaced with natural air through a louvered, filtered intake. The fan will replace the air in the area every 30 seconds, resulting in the area's temperature never exceeding the outside temperature during summer weather.

The new section's design included a regulated voltage feed to a separate breaker-distribution panel for all control room equipment (also ac generator-supported), wiring trenches and conduit integrated with the existing building, and an office monitor system allowing the selection from a constant level of AM, FM, network or auxiliary feed from the production room. A master clock system was installed that has since been modified to accept corrections from a crystal-controlled clock-unit.

Before the move into the new facility, the technical staff installed new control room cabinetry, AM control room equipment except cartridge playback units, FM control room equipment with stereo capability, the office monitoring system, new studio and control room monitor speakers, front door visitor notification and intercom system, organized the engineering office and shop area, and

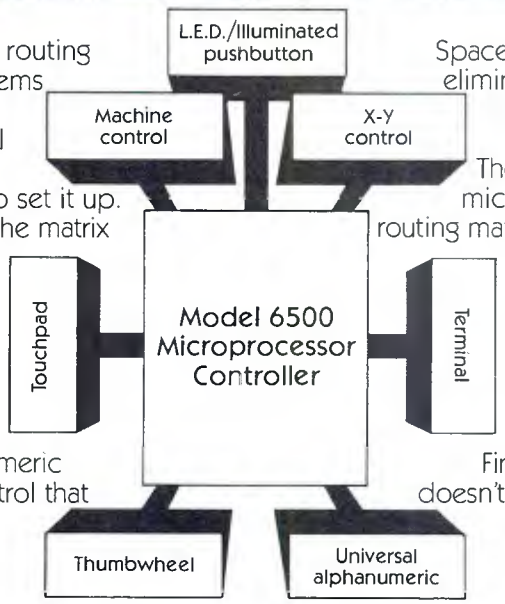
ON THE OTHER HAND, OUR ROUTING SWITCHERS HANDLE GROWTH VERY NICELY.

With a microprocessor-based 3M routing switcher, you can eliminate the problems of hard wiring once and for all. And specify just about any type of control you want.

It all depends on how you'd like to set it up. Our design engineers can then tailor the matrix for you. From your smallest requirement on up to any desired size. And they'll help you select the control that's best suited to your needs, too.

The choice is yours. Touchpad, thumbwheel, illuminated or L.E.D. pushbutton, machine, X-Y, or alphanumeric universal control. Even a terminal control that allows you "supervisory" control throughout the system, or computer control through our RS-232 port.

What's more, 3M routing switchers are easily expandable. Start with a matrix that matches your present requirements. Then as your studio grows, your routing switcher does, too. With the simple addition of extra frames and switch cards.



Space-guzzling, multi-conductor cables are eliminated. And so are unnecessary output panels. Because with our system, outputs can be reallocated as required.

The heart of the system, the Model 6500 microprocessor, as well as controlling the routing matrix, can be integrated with a machine control system to offer absolute production control of film chains, VTR's and other production machines.

Or it can be used as a stand-alone machine control system which offers the same coaxial wiring and expandability of the routing switcher panel.

Finally, a routing switcher whose growth doesn't depend on the size of your building.

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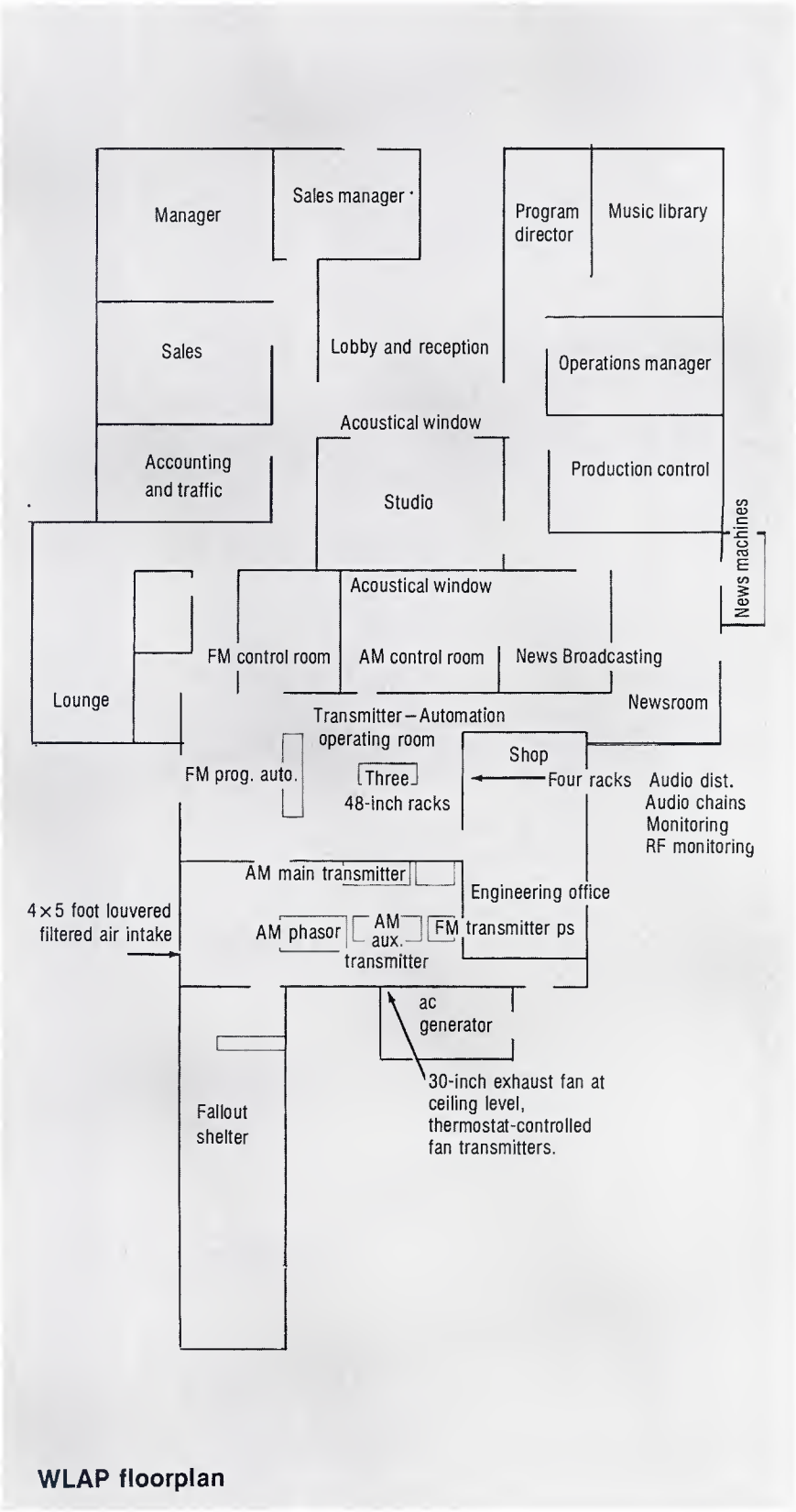
constructed solid-state distribution amplifiers and other audio-assist equipment.

Considerable detail planning had been completed in an effort to prevent RF problems from the 5kW-AM and planned 20kW-FM transmitters, which were to be in the same building and only a few feet from the audio installations. All trench and conduit joints were spot brazed and then connected to the station main ground



WLAP floorplan

with a 2-inch copper strap. Audio wiring shields were planned to eliminate ground loops but retain effective shielding.

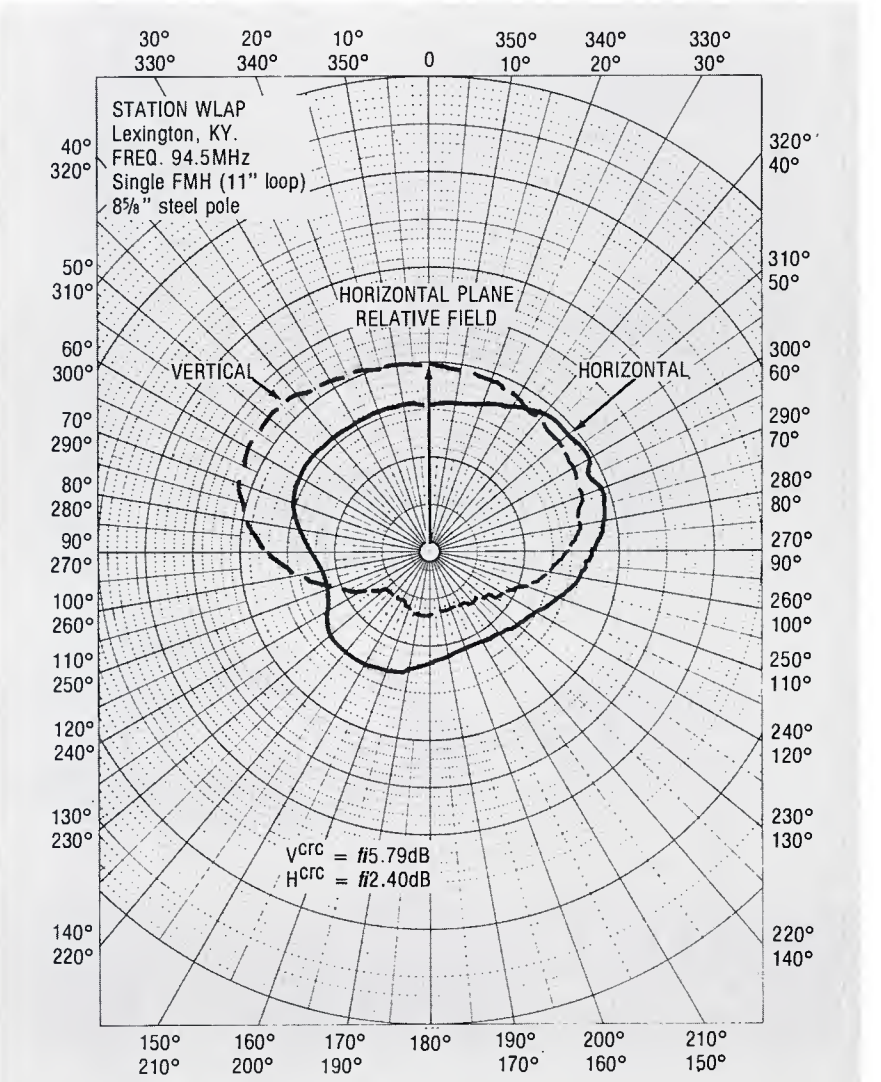
The files contain records on every audio circuit and their shield connections. Modifications or additions are not started until they are reviewed, and then the new circuit is planned and completed. These procedures are believed to be the reason for only a couple of RF problems, the ease in resolving them and system noise levels better than -55dB on AM and -60dB on FM.

Equipment locations were planned for personnel comfort as well as maintenance access. Even though most all audio equipment controls are within arms' reach, all equipment in each control room is remote controlled from a panel installed at the operator's position in front of each console.

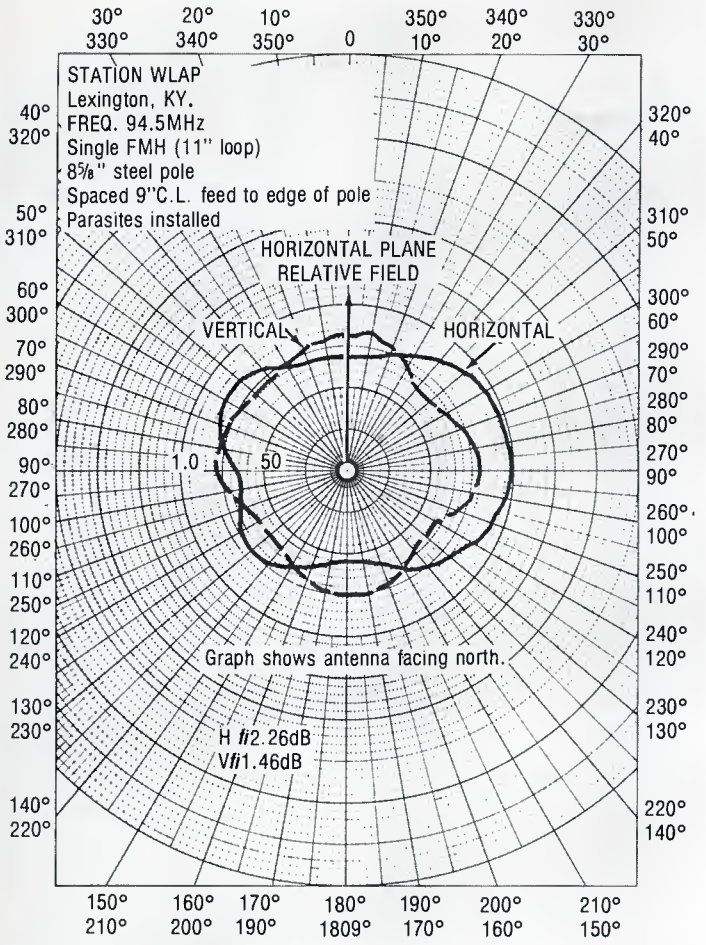
Audio chain equipment, distribution systems, network and remote line terminal units and RF monitoring equipment is installed in the transmitter-FM automation system room area. Its immediate access for technical personnel without working in on-air areas enhances the overall operation, in addition to allowing immediate evaluations without disturbing on-air personnel.

The new facility was completed in late 1973 and the move was made in January 1974. Cartridge units and news teletype machines were relocated after sign-off at midnight on a Sunday and operation began from the new facility at sign-on on Monday morning. The production room and newsroom equipment was moved to the new facility later during daytime hours.

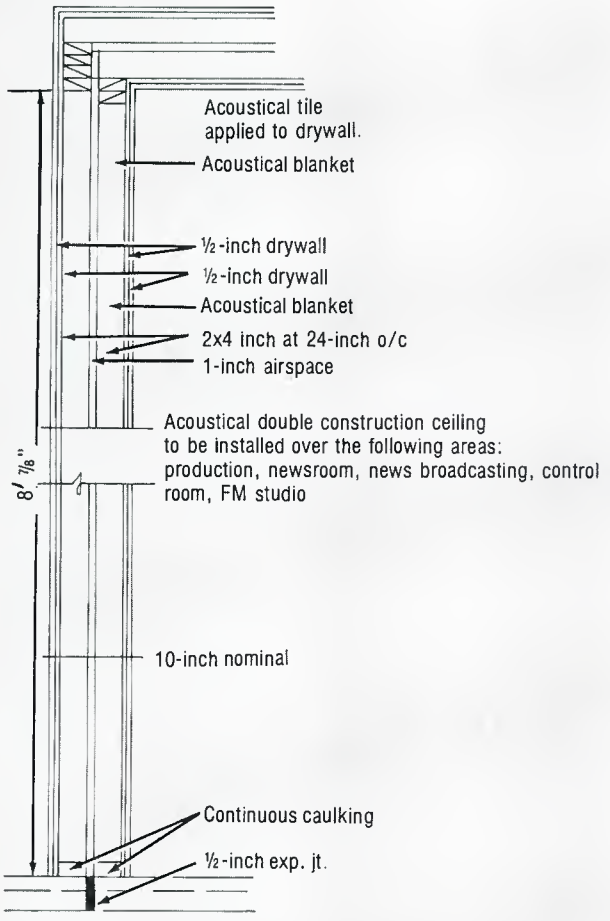
The FM operation was on a Class C Channel with 3540 watts ERP. Programming consisted of simulcasting the AM programming and live record shows until May 1972 when a small automation system was installed at the transmitter location, allowing separate programming and with stereo capability for the future. This system would be expanded to satisfy programming requirements in August 1974 when the installation of a Harris FM20H3 transmitter and 6-day antenna was completed, improving the effective radiated power to 50kW. In



Antenna pattern without optimization



Optimized antenna radiation pattern



WLAP/WLAP-FM Broadcasting area
wall-ceiling detail

Room-in-room construction
for soundproofing

WLAP

September 1974, full stereo programming began. The listening public's approval was immediate as the ratings position improved from 11th in the market in 1974 to fourth in 1975. The automation system was further improved in January 1978 with a Harris SC-90 programmer, increasing the program sources to six tape decks, four single-play cartridge units, four multiple-cartridge units, and using the FM control room as a live source as needed for one-time inserts, news, bulletins, weather announcements or other live programming as desired.

At that time, plans were being finalized for further improving the RF part of the FM facility, which had holes in the local area coverage from the side-mounted antenna on one of the AM towers at 280-feet HAAT. The selected alternative was an increase in antenna height at the same location to fill in coverage holes without the increase in energy cost of additional operation power and the inconveniences and costs of a separate installation.

In June 1980, one of the 300-foot AM towers was removed and a World Tower 600-foot tower was installed with World Tower's 60-foot pole on its top, on which was installed a Harris FMH-6 FM antenna. The effects of the mounting structure on an FM antenna's radiation circularity are known, and it is known the pole-type installation minimizes this effect. However, the antenna manufacturer checked the antenna's pattern to optimize its vertical pattern for the pole installation. The antenna test range results indicated the non-circularity was more than anticipated, and optimizing the vertical pattern corrected this to a satisfactory level; improvement was realized in the horizontal pattern also. The 660-foot structure was chosen because it was needed to realize the desired signal improvement without affecting the AM directional array to a point of no return, was close to the maximum height that would receive air clearance and because it was the maximum guying space would allow.

In July 1980, the operation was changed to the new antenna installation and the results have proved the approach was correct; WLAP-FM now leads the market in listeners 12 years of age and older. However, the transmission line, isocoupler (for crossing the AM tower's base insulator) and antenna will accept an increase in transmitter power output should management make this decision in the future, and was realized at a small additional cost at the time of installation.

The AM facility was a 5kW-day, 1kW-night DA-1 operation and its improvements were merged within the overall plan.

With the view toward using less than First Class Licensed operators, the sampling system was upgraded in 1973 with a type-approved antenna monitor, current transformers for base sampling the 69° towers in 1974, and, with the existing solid-shielded heliax sampling lines all equal length, resulted in an approved sampling system in 1976.

The increase in one of the arrays towers in 1980 to accommodate the new FM antenna resulted in a DA-2 operation, necessitating the installation of control circuitry to each tower for pattern change. With this necessary change, and looking toward AM stereo, the decision was made to retire the 30-year-old phasing system, except transmission lines, in preference to a system that emphasized broadbanding. Frame-constructed tower-base buildings were replaced with masonry buildings which were designed to be "dust and bug proof." Array tuneup and completion of the project was realized in November 1980.

Complex equipment installations must be flexible for the non-technical personnel, and its operation comfortable. This was given consideration in all areas, with dividing networks allowing audio feeds to be realized at various recorders with minimum use of patch panels. Patch panels were installed in all areas for even more flexibility and maintenance ease. Further flexibility is possible because of remote control panels in all audio areas, which allows other departments' equipment to be used comfortably as the need arises.

The significant key to minimizing operational panic situations is reliable equipment operation that can be accomplished only through proper installations and preventative maintenance procedures. Each unit receives preventive maintenance at 90-day intervals on a scheduled basis. Each item is cleaned and must meet the manufacturer's original specifications before its PM is completed. Not only is the equipment's appearance retained and reliable performance realized, but many years additional dependable life is added to it.

With the listening public's confidence from operation during periods of multiple county-area electric blackouts, severe weather conditions, in addition to the one million calls annually to the recorded weather forecast facility, and as WLAP and WLAP-FM are the EBS Primary CPCS's for the Lexington Operational Area, a modern efficient facility using the latest in technology is a necessity to maintain this service to the listening public. □

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Photo courtesy of NASA

Mini Pod mounted on the cargo frame of a helicopter. Here there is no vulnerability to the type of damage that may be encountered with a more exposed antenna mounted on the landing gear.

Network views new airborne ENG/EJ system

Blair Benson, engineering consultant, Norwalk, CT

A new directional microwave system, designed specifically for helicopter use, has significantly extended the range and transmission reliability of airborne relays used in ENG/EJ operations. In the Copter Pod and Mini Pod systems, developed by Nurad Corporation, four circularly polarized Clavin cavity transmit antennas, instead of a single broadbeam omnidirectional antenna, provide selectable forward, aft, left and right directional coverage.

System demonstration

Recently, in a demonstration for one of the network flagship stations in New York, top-quality TV signals were received continuously via a ground receiving station 10 miles west of New York from a Bell Jet Ranger as it flew a route from over Philadelphia at an altitude of 4000 feet to New York, and then on to Westchester and Stamford in the nearby Long Island Sound area. Particularly impressive was the lack of any multipath reflections or fading during flights over the tall buildings in Manhattan.

In the Mini Pod version demonstrated, the four transmit antennas and a circularly polarized Clavin cavity receive antenna for ground-to-air-to-ground relay operations are mounted in a 3-foot-long aerodynamically streamlined housing mounted under the helicopter. Unlike most other ENG/EJ systems, no special mounting brackets need be attached to the helicopter for installation. Instead, the pod is clamped onto the standard cargo frame, which is designed to carry externally mounted loads. Here it is not necessary to lower the antennas for operation or to retract them for landing, as is the case for some omnidirectional systems.

The Mini Pod housing contains the four transmit antennas, the single receive antenna and the transmit antenna selector switch. The remote control panel for the antenna selector, the transmitter with its power amplifier and the receiver are packaged for mounting within the helicopter cabin.

The larger 4-foot-long Copter Pod housing contains all of the components, except the control panel. An additional control panel, available on both designs, permits the operator to select any one of the nine transmit/receive combinations possible. For example, the operator can transmit the camera, receiver or VTR output, or transmit and record the

camera or receiver output, or simultaneously transmit and record independently the camera and receiver outputs.

Ground station antenna system

Operating in the 2000 MHz bands with a transmitter power of 15 watts, the directional antennas provide a gain of 8dB over a similarly polarized ideal isotrope. The effectiveness of this directional feature was proved by the noise-free pictures received from the Philadelphia and Baltimore area during the demonstration.

At the receiving location in Verona, NJ, a Superquad directional antenna equipped with a pair of sequentially lobing antennas was used to manually track the Bell helicopter. The two auxiliary Supertrack antennas provide the receiving station operator a simple left-right signal-strength indication, showing which direction to pan the main antenna for maximum signal strength from the moving helicopter.

Another antenna with a broad-beam directional characteristic is available in the same assembly for close-in transmissions where panning for tracking purposes would have to be too rapid to be manually practical. For such situations, the operator merely switches central receive antenna to the broadbeam antenna. Both antennas can be quad-polarized; that is, the optimum received signal can be chosen among the four modes of operation—CW, CCW, horizontal and vertical—by means of a four-position switch. Thus, multi-path degradations can be minimized.

System operation

Operation of the system is straightforward and relatively easy. In the helicopter, the operator merely selects the antenna directed toward the receiving point. Switching among antennas is accomplished without any interruption or breakup apparent in the received signal.

At the receiving point, the antenna is panned manually in accordance with the left-right field strength indicators to remain on target. Switching to the broadbeam antenna for close-in transmissions, as in the case of switching among transmit antennas, is done without interruption of the received signal.

The Copter/Mini Pod helicopter transmission system and Super Track/Super Quad ground receiving station developed by NURAD promises to add a new dimension to ENG/EJ broadcasting operations by the increase in range, and a significant improvement in picture quality and transmission stability under extreme conditions or multi-path transmission. □

British Embassy holds videotext press meeting

By Dr. Charles Jackson*, Shooshan & Jackson Inc., Washington, DC

- British Embassy
- February 19, 1981
- 150 attendees

It was, as one observer put it, a demonstration of just what $27 million of Canadian money could buy. On February 19, the British Embassy held a standing-room-only presentation and demonstration of the videotext services and products available from the United Kingdom.

The session began with a short speech by the British Ambassador to a crowded room of about 150 people. Present were representatives of the trade press, the federal government, the electronics industry, trade unions and trade associations. Three major announcements were made at this session:

- Logica Inc. had entered into a joint venture with British Telecom, the British telephone company, and the firm which conducted the original development of Prestel. This joint venture, to be known as BVT (British Videotext and Teletext), will sell both teletext hardware and turnkey systems.
- The joint venture had made a major sale in the United States. The identity of the customer, however, was withheld.
- BVT and others interested in the development of teletext and videotext services would submit a standards proposal to the FCC for standards for broadcast videotext services.

At press time, it was not clear what the formal British position was with regard to the adoption of a teletext standard. Although it appears that the British proponents might be content to see the FCC adopt a "marketplace" solution to the issue, it also was evident that they were not going to press for a decision that would make their standards the only that could be used. Rather, they appeared to prefer that the FCC adopt a standard that allowed broadcasters to choose among any of several standards for over-the-air videotext—as long a that list included the British standard.

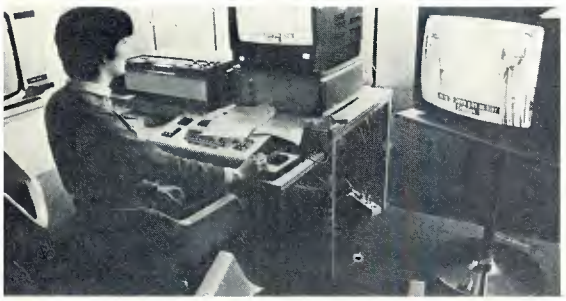
These announcements were followed by demonstrations of both Context (an advanced version of the older CeeFax over-the-air videotext system) and Prestel.

*Jackson attended this event for **BE** and filed this report. The accompanying stories are from press releases distributed at the meeting.

The burgeoning US videographics market is about to be aggressively pursued by the latest British technology.

Mindful of the inroads scored by both French and Canadian governments following Britain's pioneering of videotext systems in the 1970s (the French with ANTIOPE and the Canadians with TELIDON) the British have snapped back by announcing a major joint venture that will market videographic systems in the United States that already have a large installed base in Europe.

In the home, Prestel acts as an information provider on leisure activities, consumer prices and education.



Teletext is being promoted in Austria by Osterreichischer Rundfunk (ORF), the Austrian TV authority in Vienna. Following a 12-month trial, some 15,000 receivers are already in use. Also, ORF has recently taken delivery of a CONTEXT system, developed by Logica and the BBC.

The joint venture will unite British Telecom, the telecommunications arm of The British Post Office, with Logica Inc., the New York-based US subsidiary of Logica Holdings Ltd., London. British Telecom operates Great Britain's telephone systems, while Logica Holdings Ltd, a $50 million multinational computing and communications company, is best known as the overseas manager of the PRESTEL INTERNATIONAL videotext system.

At a press luncheon in Washington, DC, the British Embassy formally announced the new joint venture, which will be known as BVT or British Videotex and Teletext. M. C. (Dill) Faulkes, Logica president, said his company would be openly going after the US print and broadcast media as prime prospects. BVT will also contact telephone companies and other information providers in all 50 states. "I should like to make it clear that unlike our Canadian and French competitors, we are not talking about trial installations or experimental runs, nor are we dealing in futures. At this moment, the very services BVT will be marketing here are hitting some 250,000 modified TV sets in seven countries—and generating substantial revenues."

Faulkes indicated that the joint venture's first US sale had been made but that the announcement would be forth coming with the client making that announcement.

He also said that at the outset the joint venture would focus on three principal activities:

1. Marketing of PRESTEL as a turnkey system to telephone, cable and broadcasting companies, as well as industrial and commercial companies planning to operate their own videotext systems.
2. Marketing of a range of TV-related technical systems that have been developed by Logica and the British Broadcasting Company (BBC).
3. Promotion of relevant technology and standards, backed by the British Department of Industry, that are compatible with the present BVT systems.

Among the systems that will be extensively promoted are:

- CONTEXT teletext systems, which allow broadcasters to send "pages" of news, features and advertising to US viewers (CONTEXT is the advanced version of the BBC-TV's CEEFAX system).
- FLAIR, an "electronic paintbrush" tool for TV graphics designers, which enables them to create artwork directly on the TV screen during broadcast.
- ICON, an intelligent, interactive (2-way) graphics system for "on-air" creation of high-resolution text and diagrams.

In many respects, Faulkes indicated the United States is lagging behind other countries.

"There are at least 16 nations that are now operating or installing videotext systems," he said. Of these, seven of them use PRESTEL hardware and software, while five others are using terminal standards applicable to PRESTEL. The seven using PRESTEL hardware and software are the United Kingdom, West Germany, Switzerland, Austria, Holland, Italy and the Crown Colony of Hong Kong.

Seven countries have run or are now running market trials of the PRESTEL INTERNATIONAL (business information) service before full commercial service starting later this year.

"It is clear that of the three competing videotext systems," said Faulkes, "ours has established a substantial lead in worldwide sales. We are now ready to take on the American market."

Joining Faulkes was Richard Hooper, director of PRESTEL, who said, "The BVT venture represents a meeting point of two separate lines of TV and computing technology, both invented and pioneered by British engineers. They transform the TV set into a display terminal with a new role to play in the home and in the office. Teletext allows the viewer to use his television as a newspaper, a shopping guide or an educational tool. Videotext turns the set into an interactive business terminal, and a cost-effective electronic publishing facility. Private, customized versions may be used by business organizations as a flexible filing system."

PRESTEL, British Telecom's public videotext system, links TV sets to computers by telephone lines so that information, stored and updated centrally on computers, can be brought simply and cheaply directly into offices and homes.

Access to the computer is through an ordinary telephone line linked to a specially adapted TV set. Information is selected by using a small push-button keypad linked to the TV set. The selected information, free of editorial control and provided by many of the country's major information sources, is displayed as a "page" on the TV screen using a combination of words, figures and simple diagrams in up to seven colors.

STATISTICAL INFORMATION
12 February 1981

Number of registrations	Business	7044
	Residential	1038
	Total	**8082**
Number of sets attached to PRESTEL		8970
Main market sectors		Travel, investment, commercial property, agriculture, construction, hotels, lawyers, closed user groups and affluent residential
Number of Information Providers		473

Experimental teletext transmissions began in Britain in the early 1970s. The system specifications developed by the British Broadcasting Corporation (BBC), Independent Broadcasting Authority (IBA) and the British Radio Equipment Manufacturers' Association (BREMA) defined the standard for the public service that began in 1975. This permits transmission of pages with 24 rows of 40 characters, upper and lower case, normal and double height, in color.

Two sets of mosaic characters also permit pictorial information to be displayed. The basic display format of the system has also been adopted by British Telecom's Prestel and other videotext services. Features such as row-adaptive working (to increase transmission efficiency), and a wide range of display attributes are incorporated. Newsflash and captioning (subtitles) for the deaf are also included.

The enhanced system, now fully specified, includes multilingual character sets, additional high-definition graphics and a wide range of colors and pictorial facilities. The equivalent 525-line standard for North America has been defined. A comprehensive document defining standards for 525- and 625-line transmissions was drawn up and submitted to the international standardization and regulation bodies.

These standards define multiple implementation levels with compatibility features covering developments in teletext for the foreseeable future. Dynamically redefinable character sets (DRCS) are included. Alphageometric transmission, to carry the Canadian Telidon-type system, is defined. Transmission of still pictures in addition to text is also included. On the basis of these proposed standards, the FCC will shortly be petitioned and it is hoped that this will prove positive and constructive in helping to resolve regulatory and standards issues in the United States. □

Conversion to standard radiation patterns for AM stations

By Thomas Schattenfield, Arent, Fox, Kintner, Plotkin & Kahn, Washington, DC

The commission has recently issued a "Report and Order (Docket #21473 FCC 81-45) in which it adopted the proposal to convert the daytime and night-time contours of all directional AM stations from individually designed to "standard radiation patterns." (In rare cases, nondirectional stations will also have to use standard patterns. Such cases arise where measurement data indicate that the station is, in fact, directional because nearby structures or ground conditions make the signal stronger in some directions than others. This occurrence is not common.) This conversion will be handled by a commission-paid, independent contractor and will be accomplished on a frequency-by-frequency basis. The "Report and Order" became effective March 17, 1981 and the conversion is scheduled to be completed by the end of May 1981.

The conversion will supposedly not require changes in the operation of existing stations, but will increase the level of protection some stations receive. Nevertheless, an understanding of the mechanics of the conversion process is essential for licensees who wish to comment on the patterns developed for their stations by the contractor.

Discussion

Standard patterns have been required for new stations and major changes in existing stations since 1971. However, stations licensed before 1971 have measured patterns that describe the station's actual operating patterns, and theoretical patterns which describe how the station would operate under ideal circumstances. Because circumstances are never ideal, the theoretical patterns include Maximum Expected Operating Values (MEOV) which are estimates of the maximum expected deviations from the ideal.

The measured/theoretical pattern approach created two problems. First, because there is no easy way to define either measured patterns or MEOV with a formula, the advantages of computerized allocation studies could not be fully exploited. Second, the notification format of the International Frequency Registration Board (IFRB) uses only theoretical patterns without MEOV. In order to retain the radiation rights US stations presently have under existing sub-regional agreements, the commission must notify standard patterns to IFRB in time for the Second Session of the Region 2 MF Broadcasting Conference which is to be held in November and December 1981. The "Report and Order" is intended to help solve both these problems.

One potential difficulty in converting to standard patterns is the creation of apparent interference to other stations when a standard pattern exceeds currently licensed values. For those cases in which the standard pattern radiation exceeds the MEOV and the measured radiation in the direction of a Class I station, the commission decided to require the "interfering" Class I or Class II station to use a different standard pattern that will not increase the radiation beyond that now authorized. This will be done through use of a lower Q, or by negative augmentation, or both. On the other hand, a reduced Q and/or negative augmentation will not be used where the standard pattern produces theoretical interference to Class II or Class III stations, unless required by international considerations. This difference in treatment is due to the fact that the change in a Class I station's service area is greater than the change in the service area of a Class II or Class III station produced by the same increase in radiation. This is because Class I stations have skywave service areas protected on a single signal basis while Class II and Class III stations have groundwave service areas protected on an RSS basis.

Another potential difficulty involves Class III-A stations that now have an RSS of no more than 2.5 mV/m. Conversion to a standard pattern could result in such stations having an RSS greater than 2.5 mV/m, thereby making them subject to a greater RSS limit and more potential interference. To resolve this problem, the commission has simply redefined Class III-A stations with respect to their night-time power instead of their RSS; all Class III stations with night-time power of 1kW will become Class III-A stations. As the commission pointed out, this change will not affect existing operations except to afford some Class III-B stations greater protection than they now enjoy. On the other hand, such increased protection may limit the ability of other stations to modify their present operations.

The conversion will use authorized theoretical RMS to determine the size of the pattern. Where authorized measured patterns and/or MEOVs exceed the standard pattern, a formula will be used to develop an "augmented" standard pattern. The commission originally proposed to reduce excessively high RMS values before making that calculation; however, such reductions have been postponed, and will be addressed in a separate proceeding.

At the same time the conversion to standard patterns is made, the commission will convert to the metric system. Accordingly, radiation will be expressed in mV/m at 1km rather than one mile.

Because of the short time limits imposed by the need to prepare for the Region 2 MF Broadcasting Conference, the commission concluded than the use of a contractor was the only feasible way to carry out the conversion. For the same reason, the commission decided that conversion by frequency was preferable to conversion over the renewal cycle. The contractor will prepare a public notice setting forth new parameters, and those notices will be distributed by the commission. Any party may then submit proposed modifications within 30 days after commission publication. The contractor will either accept the modification or refer the matter to the commission for decision. It is important to emphasize that the pattern developed by the contractor will become final, and will constitute a legal modification of a station's license, unless a modification request is submitted within the 30-day notice period. Furthermore, it will not be sufficient merely to state that the contractor's parameters are unsatisfactory. In order to receive consideration, a party must specify an alternative pattern.

The precise effect of conversion on a given station's pattern will vary depending on the parameters developed by the contractor. Because of the short time that will be allowed for modification requests, it is important that interested parties be prepared to act quickly. Therefore, if conversion will affect a station's pattern, it is advised this matter be discussed with the engineering staff or consulting engineer. □

This artical appeared as Engineering Resource #28 for the members of the National Radio Broadcasters Association. It is printed here with NRBA permission. The author serves as general counsel for the NRBA.

business

ACTVA asks FCC to change 'low-power' reference

The American Community TV Association (ACTVA) has asked the FCC to change the name of its proposed new low-power TV service.

ACTVA, an association representing low-power TV stations, charged that the use of the term "low-power" suggested an inferior type of TV service, which could adversely affect the success of the stations.

ACTVA's attorney, M. Scott Johnson, said in his comments to the FCC that the title of the TV service should convey a positive image in keeping with the purpose of the service, suggesting that the stations be referred to as community TV stations rather than low-power TV stations.

Last year ACTVA changed its name from The Low-Power Television Association to The American Community TV Association in anticipation of the commission's concurring with its reasoning.

Ampex delivers 3000th VPR-2 to McDonnell Douglas

Ampex Corporation has announced the delivery of the 3000th VPR-2 series helical scan VTR to McDonnell Douglas Corporation for flight simulator development of a reconnaissance version of the F-18 Hornet fighter plane.

McDonnell Douglas, St. Louis, MO, will use the Ampex VPR-2B in its laboratory to emulate operation of the aircraft onboard systems for recording video infrared and high resolution radar signals.

The Ampex VPR-2B is an advanced version of the VPR-2 which offers a reverse slow motion capability together with other new features and improvements.

The newest option for the VPR-2B allows true-frame playback in stop motion. The true-frame option essentially doubles the vertical resolution in stop motion and offers picture improvements in some instances.

C-COR announces expansion

James R. Palmer, president, C-COR Electronics Inc., has announced another expansion phase with the groundbreaking for a new facility. The new building, directly behind the present manufacturing facility at 60 Decibel Road, will house manufacturing operations and the Systems Design Department which currently leases space in downtown State College.

The addition of this 14,400-square-foot building, to be completed in early fall of 1981, will bring the State College facility to a total of 38,000 feet. Also, C-COR leases a 20,000-square-foot manufacturing facility in Altoona, PA.

New computer software approach announced by Midstate Computing

The development of a new computer software approach to broadcast business management has been announced by J. Douglass Berry, president, Midstate Computing Services, Inc., Harrisburg, PA.

Features exclusive to the Ultacom broadcast business management system include an innovative co-op

coding and billing system, an order/entry form that eliminates the need for a separately prepared computer entry form, and a daily log that provides all information necessary for compliance with FCC regulations. Available as either a purchased system, or by lease, the turnkey Ultacom broadcast business management system has been in development for more than a year.

The Ultacom system has been planned around the use of Data General equipment, and features an on-line diagnostic capability. A unique voice/data communications link between the Ultacom user and a support center, the on-line diagnostic capability can remotely guide new operators, assist in providing program additions, coordinate system start-up and diagnose hardware/software problems.

Acrodyne moves

Acrodyne Industries has moved to new facilities. They can be contacted at: 516 Township Line Road, Blue Bell, PA 19422; (215) 542-7000.

WOLE-TV in Puerto Rico increases coverage

WOLE-TV in Aquadilla, Puerto Rico, owned by the Western Broadcast Corporation of Puerto Rico, will increase its coverage area through the installation of an RCA transmitter, antenna and related equipment valued at approximately $1 million.

The equipment, manufactured by RCA Broadcast Systems, includes an RCA TTG-30H, 30kW transmitter and an RCA TW-12A12 traveling wave antenna.

Bonneville Productions wins 'The Inventors Award'

Bonneville Productions Recording-Duplication Department has won "The Inventors Award," an annual presentation from BASF Systems for outstanding contributions to state-of-the-art tape duplication.

Bonneville Productions, a division of Bonneville International Corporation, Salt Lake City, has a full-service capability for creative and technical production of films, recordings, and radio and TV programming.

San Joaquin Communications purchases KMJ-TV, Fresno, CA

San Joaquin Communications has purchased KMJ-TV, Fresno, CA, and has changed the station's call letters to KSEE effective March 2, 1981.

An NBC affiliate, KSEE (KMJ-TV), was formerly owned by McClatchy Broadcasting. Jim Thompson, who was president and general manager of KMJ, has been named president and general manager of KSEE.

KSEE, Channel 24, is represented by Katz Television Continental.

CBS TV contracts for Neve audio consoles

The CBS TV Network, a division of CBS Inc., has selected Rupert Neve Inc. of Bethel, CT, as its primary supplier of sophisticated TV sound production consoles for its New York City broadcast center. An initial quantity of three consoles has already been ordered, and CBS holds options to purchase another five during 1981 and 1982. These consoles are of the new standard Neve design to specification 7056 incorporating microprocessor control of input to output routing and the ability to store in internal solid-state memories central routing assignments. The console has 36 inputs, eight submasters and 16 masters.

WUFT awarded production grant

A grant of $18,830 has been awarded to WUFT-TV by the Southern Educational Communications Association (SECA). The money will be used to help fund the production of a documentary about the industrial applications of America's space program, titled "Space: The Next Industrial Revolution."

Two Valtec executives form fiberoptic systems company

Richard A. Cerny and Tadeusz Witkowicz, two former key executives of Valtec (A Philips—M/A-Com Venture) have formed their own fiberoptic communication systems manufacturing company. The new company, Artel Communications Corporation, will soon begin production of high performance video and related fiberoptic transmission systems.

Video Voyager delivered to TCS Productions

Video Voyager I, a mobile studio, which will be used to originate more than 120 live, regional sports events for "Action TV" and TCS Sports, was delivered to TCS Productions, according to Tom Huet, vice president of production and engineering.

The multi-million dollar "studio on wheels," as described by its manufacturer, A.F. Associates of Northvale, NJ, was also previewed to commercial network production executives. Immediately after review by CBS, NBC and ABC, VVI undertook a heavy schedule of assignments for early spring.

Public TV station honored

WUFT-TV, the public TV station in Gainesville, FL, is the recipient of three Florida Advertising Federation "Addy Awards." The awards recognize three advertising and promotional campaigns coordinated by the station during 1980: two in support of membership/fund-raising drives and one in support of an evening of "Monty Python's Flying Circus" programs.

Calvert to distribute Frezzolini Electronics

Calvert Electronics has announced that it is now distributing a new product aimed at increasing its services to TV and broadcast stations. Effective immediately, all battery packs and chargers made by Frezzolini Electronics Inc. will be available from stock at factory pricing. For more information, contact: Broadcast Dept., Toll Free (800) 526-6362; Calvert Electronics Inc., One Branca Road, East Rutherford, NJ 07073; (201) 460-8800.

Greater Star Link, Videostar and Videonet produce teleconference

More than 17,000 Ford dealership personnel meeting in 38 cities throughout the United States participated in the largest teleconference ever held. The occasion was Ford Motor Companies' Winter Sales Meeting. Addressing the meeting live-via-satellite from Detroit, Ford senior executives unveiled the new, 2-seat EXP Sport Coupe and communicated the latest corporate information to dealers, salesmen and district managers.

VideoNet Inc. of Woodland Hills, CA, produced and coordinated the Ford event which was uplinked by Greater Starlink's Detroit common carrier earth station facilities to the Weststar III satellite and the Tele-Meeting Network of VideoStar Connections Inc. was used to distribute the program to premium hotels around the country.

The meeting originated at the studios of WTVS-TV and was transmitted to Greater Star Link facilities via local telco circuits. Dennis R. Ciapura, Greater Star Link general manager of telecommunications, described the event as an excellent example of splendid cooperation between several companies to make a very large scale teleconference possible. □

people

Doug McDonell, formerly of the Robert A. Jones Consulting Engineers firm, has established his own firm to provide engineering consulting service to radio broadcasters. He can be reached at 4 Deercrest Lane, Indian Head Park, IL 66525.

Microdyne Corporation has announced the promotions of **George A. Bell** to vice-president of marketing, Satellite Television Products, **Richard B. Elsea** to vice-president of marketing, Telemetry Products, and **William E. Droullard** to vice-president of antennas for communications.

William E. Gibson has been promoted to vice president-general manager of Harris Corporation's Transmission Systems Division, San Carlos, CA. Gibson will be responsible for Farinon Electric and Farinon Video, both of San Carlos, and Farinon Canada Ltd., Quebec.

Keith Larson has joined Standard Communications Corp. as vice president—special products. Larson will be responsible for all sales and marketing of the earth terminal product line (TRVO) and future special products.

Lawrence G. See has been appointed product manager of the Broadcast Division of Sony Video Products Company. His new responsibilities include the marketing and development of Sony Broadcast cameras and monitors, as well as developing market plans.

Robert J. Garbutt has been promoted to general manager of the Professional Products Department of Sharp Electronics Corporation. Garbutt, assistant general manager for five years, continues to have active responsibility for Sharp's professional products department, which markets and sells audio-visual equipment and professional broadcast and non-broadcast video products.

Shure Brothers Inc., Evanston, IL, has announced the promotion of **Tom Tichy** to department manager, electroacoustical development, with responsibilities for all loudspeaker component and system research and development activities.

Lynn M. Kurth has been named chief engineer for KGW-TV, Channel 8 in Portland, OR. Kurth joined the King Broadcasting Company in April of 1973 as a maintenance engineer in the Northwest Mobile Television division. He was promoted to technical director in October, 1973, and became maintenance supervisor in August 1975. Kurth was named operations manager for Northwest Mobile Television in May 1977, a position that he held until the present.

Gail Clason has been named plant manager of Ampex Corporation's Colorado Springs facility. In his new position, Clason will be responsible for AVSD manufacturing in the main Colorado Springs plant, as well as in other facilities in Cupertino, CA; Juarez, Mexico; and Taiwan.

California Microwave Inc. has announced the appointment of new regional sales managers in three of its telecommunications division sales offices. **Walter L. Hammill** was appointed Midwestern regional sales manager, based in St. Louis, MO. Hammill comes to California Microwave from Lear Siegler Corp., where he was the area sales manager for the Midwest. **David M. Hammond** was named Southeastern regional sales manager, based in North Andover, MA. Hammond comes to California Microwave from Tau-Tron, where he was regional sales manager. **James A. Lang** is California Microwave's new Western regional sales manager, located in Sunnyvale, CA. Lang comes to California Microwave from Wescom Inc., where he was a marketing specialist.

Stewart Greenberg has been elected vice president of marketing and sales at James B. Lansing Sound Inc. Greenberg will direct domestic and international sales and marketing efforts for JBL's high fidelity and professional product lines.

The Board of Directors of Fernseh Inc., the video corporation of Bell & Howell and Robert Bosch, has announced the appointment of **Dietmar Zieger** as senior vice president-marketing and product management. Zieger will be responsible for all activities related to the commercial marketing group.

Appointment of **Oded Ben-Dov** as unit manager and technical director, antenna engineering, for RCA Broadcast Systems was announced. Dr. Ben-Dov is responsible for the technical development of circularly polarized and other VHF antennas, UHF antennas and special multiple antenna installations.

Audiotronics Corporation, North Hollywood, CA, has announced the appointment of **George H. Wagner** as director of marketing, video display division. Wagner is responsible for the division's total marketing effort, sales programs and supervision of the district sales managers and internal marketing personnel.

McMartin Industries Inc., of Omaha, NE, has established a regional liaison office in London, England. **Norman A. Broad** has been named regional sales manager for Europe, Africa, and the Middle East, and will coordinate all aspects of sales, service, and project management in the region.

Datatron Inc. has announced the appointment of **Frank B. Logan** as marketing manager of the Video Systems Division. Logan will be responsible for sales and marketing efforts for Datatron's Vanguard and Tempo computerized videotape editing systems and SMPTE time code equipment.

Dr. Martha J. B. Thomas has been appointed manager of technical services at GTE Lighting Products. Since joining the group in 1945, Dr. Thomas has held both engineering and engineering management positions. In 1970, she was named manager for phosphor pilot development and was promoted to engineering manager for technical assistance in 1972. In her new position, she replaces **Dr. John Eby** who was recently named manager-microprocessor development.

3M Video Products has added **James N. Mazzoni** and **William W. Weston** to its marketing and sales teams. Mazzoni is market development manager for TV display systems, with emphasis on 3M's line of graphics generator systems. His additional responsibilities include marketing communications and international marketing liaisons for the entire video line. Weston is senior account representative for all video product sales in the mid-Atlantic states region.

Barry Enders has been appointed Northeast sales manager, Vital Industries, 338 E. Lake Rd., Williamson, NY 14589; (315) 589-9289. □

May 20-22, 1981

Experts from 10 countries will speak at VIDEOTEX'81, North America's first major international videotex conference and exhibition, being held in Toronto.

VIDEOTEX'81 will feature speakers from Britain, France, Germany, the Netherlands, Finland, Switzerland, Japan, Venezuela, Canada and the United States. Also featured will be live demonstrations of the world's leading videotext systems, including Prestel from Britain, Teletel from France, Knight-Ridder/AT&T Systems from the United States and Telidon from Canada.

One of the conference's three session streams will be an "International Review" examining the state of the art. Globally, more than 1000 organizations are active in videotext and important developments in the technology are happening almost every week.

VIDEOTEX'81 will also offer a general and business interest stream which will include sessions on videotext in business, the electronic newspaper, the social impact of videotext retailing, direct marketing and teleshipping, videotext and cable TV, home information systems and videotext in the service of society.

The industry stream will offer sessions on regulatory and legal aspects, videotext standards, videotext and the database business, the economic realities of videotext and the videotext marketplace.

For further details, contact: Rossanne Lee, VIDEOTEX'81, Infomart, 122 St. Patrick St., Toronto, Ontario M5T 2X8; (416) 598-1981.

Broadcast courses sponsored by Bradley University and BE

June 1-5, 1981. A short course on microcomputer and broadcast automation and broadcast antennas will be sponsored by the Department of Electrical Engineering and Electrical Engineering Technology, Bradley University and **Broadcast Engineering** magazine.

These courses provide a comprehensive introduction to two important topics of interest to technical personnel and managers in the broadcast industry. The first course treats the subject of digital technology and microprocessors, including applications to broadcast automation. The second covers broadcast antenna theory, design and performance.

Attendees should have a technical background, but fundamental concepts will be covered and extensive experience in the areas is not required.

The Microcomputers and Broadcast Automation course will be held June 1-3, 1981, and the Broadcast Antennas course will be held June 3-5, 1981.

Microcomputers and Broadcast Automation

Course description: The initial portion of the course will be devoted to microprocessor fundamentals. These sessions will enable participants to understand microcomputer concepts common to a variety of equipment and instrumentation in the broadcast field. Additionally, the rapid and continuing developments in integrated circuit technology will make such topics increasingly important in the coming decade. The second part of the course will feature technical staff from the broadcast industry who will cover current practice and future trends in broadcast automation and computer applicants.

Microprocessor fundamentals will be presented by Dr. D. R. Schertz, professor of Electrical Engineering and Electrical Engineering Technology, Bradley University, and Dr. T. L. Stewart, chairman of the Department of Electrical Engineering and Electrical Engineering Technology, Bradley University. Industry applications will be presented by technical staff from Broadcast Electronics and Harris Corporation, Quincy, IL.

Course Outline

Monday, June 1

Morning session
1. Microcomputer components
2. Microcomputer architecture
3. Data and instructions
4. Input/output

Afternoon session
1. Addressing
2. A typical instruction set
3. Introduction to programming

Tuesday, June 2

Morning session
1. Programming example
2. Troubleshooting instrumentation
3. Demonstration

Afternoon session
1. Technology applications
   Broadcast Automation
   By Broadcast Electronics

Wednesday, June 3

Morning session
1. Technology Applications
   By Harris Corporation.

Broadcast Antennas

Course description: Topics in the design, construction, analysis and proof of performance of broadcast antennas will be treated. Included will be coverage of basic antenna and transmission line theory. The speakers are from a number of consulting companies with extensive experience in antenna system design and maintenance.

Wednesday, June 3

Afternoon
1. Basic antenna theory
2. Transmission lines for radio antenna systems
   Don L. Markley and G. A. Breed,
   Markley and Associates, Peoria, IL.

Thursday, June 4

Morning
1. Directional antenna design
2. Antenna system construction, proof of performance and analysis
   D. L. Markley

Afternoon
1. Phasors and RF networks
   Robert E. Ritch,
   Moffet, Ritch, & Larson, P.C.

Friday, June 5

Morning
1. Sectionalized towers and detuning tall structures
   Ogden Prestholdt,
   A. D. Ring & Associates

Afternoon

1. FM antenna system design and maintenance
   Thomas B. Silliman,
   Silliman and Silliman

For more information, contact: College of Continuing Education, Bradley University, Peoria, IL 61625.

Housing in campus dormitories can be provided at a rate of $13 per night.

All sessions will be held in the College of Engineering, Jobst Hall, Bradley University, Peoria, IL.

June 28-30, 1981

A second workshop on "How to Video-Teleconference Successfully" has been scheduled in Denver, CO, sponsored by the Public Service Satellite Consortium.

The first workshop, conducted at the end of March, was oversubscribed a month before it was held. Plans are being made for a third workshop on Long Island, NY, October 4-7.

The Denver workshop will open with a reception and registration on Sunday, June 28. The program will include a session on teleconference options defining various kinds of teleconferences that are available; and a panel on elements of teleconferencing that will include program development, promotion and audience preparation, pre-production, network coordination, production, evaluation, post-production and receive site organization.

Elements of teleconference production will be covered in a 90-minute closed-circuit telecast from PSSC's teleconference studio to the meeting room where workshop participants are gathered. Equipment, techniques and teleconference "dos-and-dont'ts" will be described.

Audio bridging technologies, the facilities of the Rocky Mountain Broadcast Center and other aspects of "private television" will be discussed in a special session featuring guest speakers.

"Putting It All Together" will cover budgeting, assessing needs, applications and other final-touch aspects of video-teleconferencing. Workshop participants will be invited at the workshop to submit an outline of the teleconference they would like to do, and PSSC experts will select two or more to discuss in the workshop.

For more information, contact PSSC Headquarters, (202) 331-1154. □

new products

Master control monitors

BARCO is introducing the HQCM 3 series high quality color monitor for technical and aesthetic picture evaluation. The monitors will be shown for the first time at the 12th International Television Symposium, May 30-June 4 in Montreux, Switzerland. These monitors are available with slot mask in-line or delta gun shadow mask picture tube in 37 or 51 cm version. Also new is the CTVM 3/66, a 66 cm (26") high resolution delta gun master control color monitor completing the range of 37 cm (14") and 51 cm (20") CTVMs for applications in which high technical performances are required. In addition, CD 3 chroma decoders are now available for any color system: PAL B, PAL M, PAL N, NTSC 3.58, NTSC 4.43 and SECAM.

Circle (220) on Reply Card.

Quartzline lamp

A new 425W, 120V Quartzline tungsten-halogen lamp has been introduced by the General Electric Company. It is designed to reduce energy costs 15% while producing 81% as much light as a standard 500W T3 tungsten-halogen lamp. Average rated lamp life is 2000 hours for both lamp wattages.

The new 425-watt lamp can be retrofitted in all existing fixtures using standard Q500T3/CL lamps. Each lamp can save about $7.50 in energy costs over its 2000-hour life, at 5¢/KWH, when used in place of the standard 500W tungsten-halogen lamp. Applications include building and security floodlighting, architectural "wall wash" lighting, stage and studio cyclorama lights, and illuminating parking lots, tennis courts and other small recreation areas.

Circle (221) on Reply Card

Recorder/reproducers

TEAC's Production Products Group has introduced two new recorder/reproducers in the Tascam Creative Series.

The 22-4 is a compact 4-track 15 ips multichannel recorder with sync. The 22-2 is a compact 15 ips ½-track recorder. The 22-4 features function and output select, headphone monitor select, pitch control, optional dbx interface and optional remote pause controls (RP-22, FP-70).

The 22-2 features expanded scale VU meters, independent monitor and record ready controls, detachable head housing and optional remote pause control (RP-22). Both units are 3-motor, 3-head transports with precision moulded reel tables and spring-loaded reel holders.

Circle (222) on Reply Card

Beta format videocassette

Maxell's Professional/Industrial Products Group has announced the addition of the L-750 videocassette. The L-750, which provides up to 4.5 hours of play per tape, incorporates all the features of Maxell's other Beta videocassettes, including their high-precision cassette shell mechanism and exclusive Epitaxial oxide formulation.

Circle (223) on Reply Card

Noise reduction modules

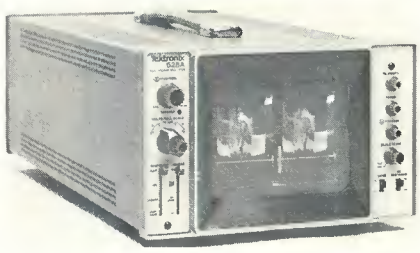
Two Type II Noise Reduction modules, one module for encoding and one for decoding, are being added to dbx's 900 series signal processing system. The new modules will provide up to 16 channels of Type II noise reduction for broadcast applications in a rack-mount unit measuring just 5¼ inches high.

The dbx 941 2-channel encode module and dbx 942 2-channel decode module feature active balanced inputs and +24 dBm output drive capability. Also, the 942 provides switch selectable dbx disc decoding.

Circle (224) on Reply Card

Waveform monitors

A new solid-state video waveform monitor, the 528A, has been announced by Tektronix Inc. The unit is designed for displaying and monitoring waveforms from camera outputs, video system output lines and video input lines using 525-line systems. Users can obtain flexibility because the instrument has an option for 625-line systems.



The compact 528A Waveform Monitor is only 5.25 inches high and one-half a rack space wide, resulting in vacant space usable for mounting the 528A alongside another 528A, or a companion TV monitoring device.

The unit has been designed to meet the needs of TV facilities, production studios, broadcast TV stations and video service facilities.

Circle (225) on Reply Card

Spare parts kit

The Professional Products Department of Sharp Electronics Corporation has introduced a new complete spare parts kit designed to enable immediate on-the-spot servicing of the company's XC-700 ENG/EFP camera.

The kit, designated Model XC-700KIT-0001, includes all printed circuit boards, the power modules as complete assemblies and the motor board.

Circle (226) on Reply Card

Low noise FET amplifier

A new 4.2 GHz 78K low noise FET amplifier is being marketed by Mitsubishi Electronics America, (MELA), Compton, CA.

The unit—the model 4078—is state-of-the-art hardware and can be used in various communications satellite equipment including regional satellites and repeater stations.

Circle (228) on Reply Card

Stereo amplifier

Conex Electro Systems has announced the Conex PA-30 stereo amplifier. The PA-30 is a 30W per channel stereo amplifier designed for studio monitoring and general purpose applications. The PA-30 is manufactured with quality components and straight-forward assemblies in order to perform dependably in the field for extended periods without failure.

Circle (229) on Reply Card

Portable color camera

The new S-100U portable color camera from US JVC Corporation features single 1-inch Saticon tube construction, combining light weight with a quality picture.

With lens, electronic viewfinder, hand grip and shoulder mount, the S-100U weighs less than 10 pounds. The 1-inch Saticon tube and color stripe filter provide 280 lines of resolution and a video signal-to-noise ratio of more than 45 dB.

Major features of the camera include a unique "zoom" microphone coupled with the standard 10:1 servo zoom lens with "macro focusing." There is also a 1.5-inch black-and-white electronic view finder with exposure, VTR start/stop, low battery, auto white balance, and standby modes indicated. The S-100U also has +6 and +12 dB gain boost switches for low light shooting.

Circle (231) on Reply Card □

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GLITCH AWARD! Give this humorous, framable award to fellow video workers for errors, production goofs, missed shots, etc. $2.95 + 1.00 handling. Also, funny Color Camera Registration Charts. Specify: FUZZY or CURVED lines. $2.00 + 1.00 handling. Send check to: AaRLO Enterprises, 109 Minna St., Suite 254, San Francisco, CA 94105. 3-81-4t

SMALL STATION EQUIPMENT. 2 studio cameras with spare. Switcher, sync generator and DA's. 2 High band quads. All $25,000. Call (812) 852-4036. 5-81-2t

FOR SALE. USED TV EQUIPMENT—1 Convergence ECS-10 Edit System; 1 CVS-520 Time Base Corrector; 1 Tektronix 650 Color Monitor; 1 Barco Color TV Receiver/Monitor; 2 Sony VO-2860 Cassette Machines; 2 Ampex Mark XV VTR Heads, Unused; 3 Ampex Mark XV VTR Heads, Used; 3 Varotal 16:1 Lens for PC-70;1 Ampex HS-100/HS-200; 25 Videotec Mon/Rec KV 1923; 1 Utah Scientific 10x10 A/V Routing Switcher. For information on additional equipment and complete listing contact: Dallas Clark or Douglas Weiss, TPC Communications, Inc., Production Plaza, Sewickley, PA 15143, (412) 771-4700. 5-81-1t

EQUIPMENT FOR SALE (CONT.)

DATAVISION MODEL D-1032 Video Titler. As new cond. Best offer. Millstein, 2151 E. 38 St., Bklyn, N.Y. 11234, (212) 338-4286. 5-81-1t

FOR SALE: 500 watt AM broadcast transmitter. ITA Model 500A. Operating condition unknown. Inquiries to: W. H. Stock, UW-Superior, Superior, WI 54880, (715) 392-8101, ext. 269. Sealed bids should be addressed to: Mary Denny, UW-Superior, Superior, WI 54880, with "Transmitter Bid" clearly marked on envelope. 5-81-1t

MOSELEY LPE-10 High-band exciter with stereo SCA Generators, $1195.00. KZUM Engineering, 1038 S. 23rd, Lincoln, Nebraska 68510, (402) 474-5086. 5-81-1t

RCA TS-51 Studio switcher. Completely operating. For information call collect: M. D. Smith, 212/539-1783. 4-81-2t

FOR LEASE

COMPLETE AIR PAC SYSTEM: 2 Hitachi SK 90's, Ross Switcher, RTS, Sony BVH 500, Full Monitoring, All Accessories. Lease to Own. O.W.C. Call (213) 541-9488. 5-81-6t

HELP WANTED

TECHNICIANS WANTED for maintenance and operation of major television facility. Formal training in electronics and First Phone. Previous experience desirable. No phone calls please. Send resume and salary requirements to: JACK VERNER, 1050 TECHWOOD DRIVE, ATLANTA, GEORGIA 30318. 4-81-2t

CHIEF ENGINEER: Automation, FM, AM with DA, must be a worker and know FCC rules with 1st Class. Believe in maintenance. Call Manager, 813-639-1188. Equal Opportunity Employer. 4-81-3t

LIGHTING EQUIPMENT SALES: Bardwell & McAlister needs sales engineers, sales reps., dealers, and agents for full line of TV and motion picture lighting and grip equipments. Many U.S. Territories and overseas open. Please write to Arthur Florman, President, Bardwell & McAlister, 7051 Santa Monica Blvd., Hollywood, California 90038. 5-81-3t

FILM TRANSFER OPERATOR: Applicant must possess a solid background in commercial and feature film transfer work. Contact: Lori Weiss, CFA Video, Los Angeles, California 90028. 5-81-2t

NATIONWIDE COMMUNICATIONS INC. is looking for a Chief Engineer for 50kw quality stereo in Cleveland, OH. FM broadcast experience a must. Enthusiasm, an ability to relate to people, a desire to be part of a winning team. First class license required. Apply in confidence by resume including salary history with a brief cover letter: David Gerard, General Manager, WKSW Radio, One Playhouse Square, Cleveland, OH 44115. M/F EEO. 5-81-1t

CHIEF ENGINEER: Las Vegas CBS affiliate, KLAS-TV, is searching for a Chief Engineer with 10 to 15 years 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. Since we maintain our own 350 mile network microwave system, your background should include some familiarity with Lenkurt, Microwave Associates, or Farinon Microwave. Salary DOE. Submit resume, salary history and requirements and references to Linda Imboden, KLAS-TV, P.O. Box 15047, Las Vegas, NV 89114. Equal Opportunity Employer/MF. 5-81-1t

SYSTEMS DESIGN ENGINEER – Major video systems co. seeks qualified person to perform physical and electrical design of sophisticated, closed circuit and broadcast type television systems. Will develop system concept, design and manage projects in progress and perform testing and training on completed projects. Requires minimum 5 years direct experience and ability to handle total project management responsibilities. Send resume including salary history to: Barbara Fritz, Personnel Manager, PEIRCE-PHELPS, INC., 2000 North 59th St., Phila., PA 19131. Equal Opportunity Employer M/F. 5-81-1t

HELP WANTED (CONT.)

TELEVISION MAINTENANCE ENGINEER: Seeking self-starter and independent worker with minimum of two years broadcast maintenance experience to include familiarity with RCA video tape equipment, cameras, digital logic; salary DOE; submit resume and salary requirements to Linda Imboden, KLAS-TV, P.O. Box 15047, Las Vegas, NV 89114. Equal Opportunity Employer/MF. 5-81-1t

CHIEF ENGINEER for top ranked UHF independent in central California. Experienced in administration, maintenance and some design background. A.S. degree in electrical engineering and a minimum of five years experience as chief or assistant. Submit resume, references and salary history to: Dept. 539, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. An EOE/M-F Employer. 5-81-2t

HELP WANTED (CONT.)

POST PRODUCTION MAINTENANCE ENGINEER: Must have – at least 7 to 10 years on the job experience; completed at least 3 years experience with CMX 50/300/340 systems; working experience with one inch C & B equipment plus AVR 3's; experience in design and installation of post production and dubbing facilities. Send to Dept. 538, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 5-81-1t

TV MAINTENANCE ENGINEER (subject to budget approval). 3 years in maintenance of portable color camera, BVU ¾" cassette recorders, TV receivers, studio & remote equipment required. Associate degree or equal. FCC license and digital background preferred. Salary commensurate with experience to $20,500. EXCELLENT FRINGE BENEFITS including 21 days earned vacation. EOE-AA. Write by May 22, 1981 to Ed Wright, Learning Resources, State College, Oswego, New York 13126. 5-81-1t

HELP WANTED (CONT.)

AUDIO ENGINEERS: Radio network is looking for experienced audio engineers. First phone preferred. Heavy tape editing, remotes, board work. Good benefits package. Also maintenance positions open, first required; digital circuitry. RF, troubleshooting. Send resume to P.O. Box 796, Avon, CT 06001. 5-81-1t

CHIEF BROADCAST ENGINEER: KWMU-FM 100,000 watt NPR station in St. Louis active in local production needs top-notch Chief Engineer. High school graduate or equivalent, 1st Class FCC radio-telephone operators license, 3 to 4 years experience in transmitter and studio maintenance. Good salary and fringes. Application deadline: May 11, 1981. Send resumes to: Personnel Department, University of Missouri-St. Louis, 8001 Natural Bridge Road, St. Louis, Missouri 63121. EQUAL OPPORTUNITY EMPLOYER. 5-81-1t

TELEVISION MAINTENANCE ENGINEERS: First-Class FCC License. Strong Background in all phases of TV maintenance required. Famous year around Colorado recreational area. Contact A. L. Ladage, DOE, XYZ Television, Inc., P.O. Box 789, Grand Junction, CO 81502. 303/242-5000. 5-81-4t

REMOTE VEHICLE SUPERVISOR experienced in remote operations to oversee construction in 43 ft. state-of-the-art vehicle and take charge of same upon completion. Heavy field experience, ability to maintain and control operations of vehicle and certain public contact required. Ability to meet uncompromising technical standards under difficult conditions. Salary commensurate. Position available immediately. CONTACT: Director of Finance, WYES-TV, Box 24026, New Orleans, LA 70184. WYES-TV IS AN EQUAL OPPORTUNITY EMPLOYER. 5-81-3t

SENIOR PROJECT ENGINEER—NEW PRODUCTS

One of the largest and fastest growing manufacturers of communications systems and components seeks a Senior Project Engineer for its new Advanced Development Group. Specific responsibilities will include the hands-on development of satellite systems products, scrambling, decoding and encoding devices for use in direct-to-home services. A BSEE is required with experience in radio frequency engineering and some familiarity with digital is preferred. Ideal background includes knowledge of test equipment for development and refinement of receiving equipment. Attractive East Coast location. Please send resume with salary history to: Dept. 540, Broadcast Engineering, P.O. Box 12901, Overland Park, Kansas 66212.

CHIEF ENGINEER: We are looking for a certain person who would like to work in immaculate surroundings as Chief Engineer for a long established 5 million watt plant. Must be thoroughly experienced with UHF Klystron transmitter and be able to maintain VTR's and other Control Room equipment. Good pay and fringe benefits in Central California. E.O.E. Telephone (213) 527-3060. 5-81-2t

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PHONE/RESUME - Alan Kornish (717)287-9635

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106 new bridge center, kingston, pa. 18704

HELP WANTED (CONT.)

RADIO—HELP WANTED: TECHNICAL. Chief for Chicago area FM/AM. Requires 1st phone, strong background in studio and transmitter maintenance. Digital knowledge needed. Experience in radio a must. Should be self-starter, able to work without direct supervision. Contact James Maddox, General Manager, WBMX, 312-626-1030 or 408 South Oak Park Avenue, Oak Park, Illinois 60302. 4-81-3t

IMMEDIATE OPENINGS—VIDEO/MAINTENANCE ENGINEERS. Southwest television sports production company seeking Video/Maintenance Engineers for remote unit with Ampex 1" Tape, Phillips cameras, and Grass Valley Switching. Contact: Russ A. Abernathy, MCI Productions, #10 Greenway Plaza, Houston, Texas 77046, 713-627-9270. 4-81-2t

DIRECTOR OF ENGINEERING

A Corporate Staff position is available with a group Broadcaster having six TV and five Radio stations. Knowledge of technical equipment, industry trends, capital budget Expenditures required. Send resume and salary history to Broadcast Engineering Magazine, Dept. 536, P.O. Box 12901, Overland Park, KS 66212.

HELP WANTED (CONT.)

Field Service Engineers

The Grass Valley Group, Inc. a leading manufacturer of television broadcast equipment, is looking for people who want challenging professional positions PLUS the added attraction of working in a small town nestled in the Sierra foothills.

These challenging positions combine chances for U.S. travel plus marketing and engineering career opportunities. Individuals with experience designing and/or maintaining television broadcast systems are required to provide after-sales support for our wide variety of complex systems.

Interested and qualified candidates are invited to send a resume in confidence to Sylvia Smith, The Grass Valley Group, Inc, P.O. Box 1114 Grass Valley, CA 95945. An Equal Opportunity Employer M/F/H.

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For immediate consideration, call collect, or send a letter or resume to: John Thayer, **(609) 778-0770, RCA Service Company, 102 Gaither Drive, Mt. Laurel, NJ 08054.** An Equal Opportunity Employer.

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VIDEO TAPE DUPLICATING ENGINEER: Minimum one year experience, operation maintenance in quad video, type C-1 inch, and U-Matic recording. Must have at least technical shcool BG. Resumes to Personnel Director Broadcasting WSM, P.O. Box 100, Nashville, Tennessee 37202. An Equal Opportunity Employer. 5-81-1t

HELP WANTED/TELEVISION MAINTENANCE TECHNICIAN: Performs maintenance on all monochrome and color television equipment. Responsibility includes a multi camera color production studio with related equipment, several black and white portable cameras with ½" recorders, and an extensive system of ¾" video cassette players and monitors. Is generally responsible for technical operations and maintenance of all college instructional television equipment on and off campus. Competitive salary and excellent benefits. Send resume and cover letter to: Personnel Services, College of DuPage, 22nd and Lambert Road, Glen Ellyn, IL 60137. Equal Opportunity Employer. 5-81-1t

MAINTENANCE ENGINEER: Immediate opening for qualified person with background in ¾" video-cassette recorders and 3-tube color television cameras. Requires experience with UHF transmitter, video switchers, character generation and strong analytical-diagnostic abilities. FCC First Class License required. Contact Norm Wright, WRAU-TV, 500 N. Stewart St., Creve Coeur, Ill. 61611, 309-698-1919, EOE. 5-81-1t

TV ENGINEER—Independent Houston UHF station has an opening for a full time licensed Maintenance Engineer. Duties include technical maintenance and alignment of all studio equipment. Other duties as required. Send resume and salary requirements to KRIV-TV, 3935 Westheimer, Houston, Texas 77027. We are an equal opportunity employer. 4-81-2t

MAINTENANCE ENGINEER. First; audio and RF troubleshooting experience. Well equipped facility, good benefits. Send resume to: Randle Sather, KTNT/KNBQ, Box 5200, Tacoma, WA 98405. 5-81-1t

HELP WANTED (CONT.)

TELEVISION HELP WANTED—TECHNICAL: $40,000 + FIRST YEAR GUARANTEED. Our company has grown so quickly in the past 5 years, we are in desperate need of a very special person who knows broadcast equipment intimately and has aggressive sales ability. We are diversifying into other areas and need someone to take over the equipment sales division. Responsibilities include sales of new and used broadcast equipment and further development of equipment sales division as business demands. We are a first rate company and believe in paying top dollar for the right person. Call Bill Kitchen, Quality Media Corp., (800) 241-7878. 9-80-TFN

ENGINEERS, TV Systems Engineers, Electronic Technicians, Technical Supervisors, Maintenance. Immediate openings. Experienced. Full time. Full benefits, plus Pension. Excellent salary plus commissions. Send resume to Technical Operations, Inc., P.O. Box 840, New Hyde Park, N.Y. 11040, or call Personnel Mgr. (516) 352-2238. 9-80-tfn

WE'RE IN THE MARKET for a qualified maintenance engineer with aspirations to become assistant chief. Needs background in studio and transmitter. Offering good salary and benefits package and the Monterey Peninsula to live. Send resume to Ken Warren, Chief Engineer, KMST-TV, 46 Garden Court, P.O. Box 1938, Monterey, California 39340. A Retlaw Broadcasting station. EOE. 3-81-4t

POSITION WANTED

TECHNICIAN. One-man studio operation. 4 years experience maintenance, troubleshooting, manager, producer/director. Dedicated. 26, married. Kevin Lynch, 28 Frederick Street, Belleville, NJ 07109, (201) 751-5729. 5-81-1t

WANTED

ALL COLOR TV CAMERAS WANTED. Also interested in post production equipment as well as portable VTR's. Frank Didik, Box 133, Rego Park, N.Y. 11374, (212) 843-6839. 5-81-1t

WE HAVE CONSTANT NEEDS for camera tubes, transmitting tubes, lamps, cameras, monitors, klystrons, other broadcast items. Will reply immed. with cash price offers. Reply & state condition to: S & M Associates, 105 Cedar Ave., Hewlett Bay Park, NY 11557, Tel.P (516) 599-6434. 5-81-1t

WANTED; Pre-1928 radio equipment and tubes. August J. Link, Surcom Associates, 305 Wisconsin Ave., Oceanside, CA 92054, (714) 722-6162. 3-76-tf

HIGHEST PRICES PAID for 112 Phase Monitors and for clean, 12 year old or less, 1 KW and 10 KW AM Transmitters. All duty and transportation paid. Surplus Equipment Sales, 2 Thorncliffe Park Dr., Unit 28, Toronto, Ontario, Canada. M4H 1H2, 416-421-5631. 2-79-tfn

INSTANT CASH FOR TV EQUIPMENT: Urgently need transmitters, antennas, towers, cameras, vtrs, color studio equipment. Call toll free 800-241-7878. Bill Kitchen, Quality Media Corporation (in Georgia call 404-324-1271). 6-79-tfn

WANTED: Radio Transcriptions 16" E.T.'s, any Eddy Arnold, or other Country 15" or 12" Transcriptions. Will consider others. Interested in Radio Station Libraries to purchase, all speeds of records. Boyd Robeson, 2425 W. Maple, Wichita, Kansas 67213, (316) 942-3673, 722-7765 Eve. 9-80-tfn

ANTIQUE MICROPHONES, ETC.—Interested in purchasing old microphones and early radio and T.V. equipment suitable for museums. Please supply description and price. Dept. 532, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 4-81-2t

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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
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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
10	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
11	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
12	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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- Decoders: with an optional set of decoder printed circuit boards plugged in, the CTVM 3 accepts composite NTSC; PAL or SECAM signals (Comb-filter or aperture correction optional on NTSC version).
- Mechanical construction: conversion from cabinet to rack, VTR bridge, in-wall or ceiling mounting is easily accomplished without dismantling the monitor through the optional special mounting kit.

TVM 3 monochrome monitors.
The BARCO professional monochrome monitors are measuring instruments for use in broadcasting, industrial and educational applications where quality and reliability are most required.
Facilities to be essential including colour subcarrier filter, pulse cross, size switch, remote control, internal/-external sync. offer broadcast-oriented operating features and controls.

As regards to the CRT a choice is offered between WA (6500°K illuminant D) and W (9.300°K) phosphors. Screen size and mechanical construction can be chosen as with the colour monitors.

ROHDE & SCHWARZ SALES CO. (U.S.A.) INC.

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Phone: (201) 575-0750
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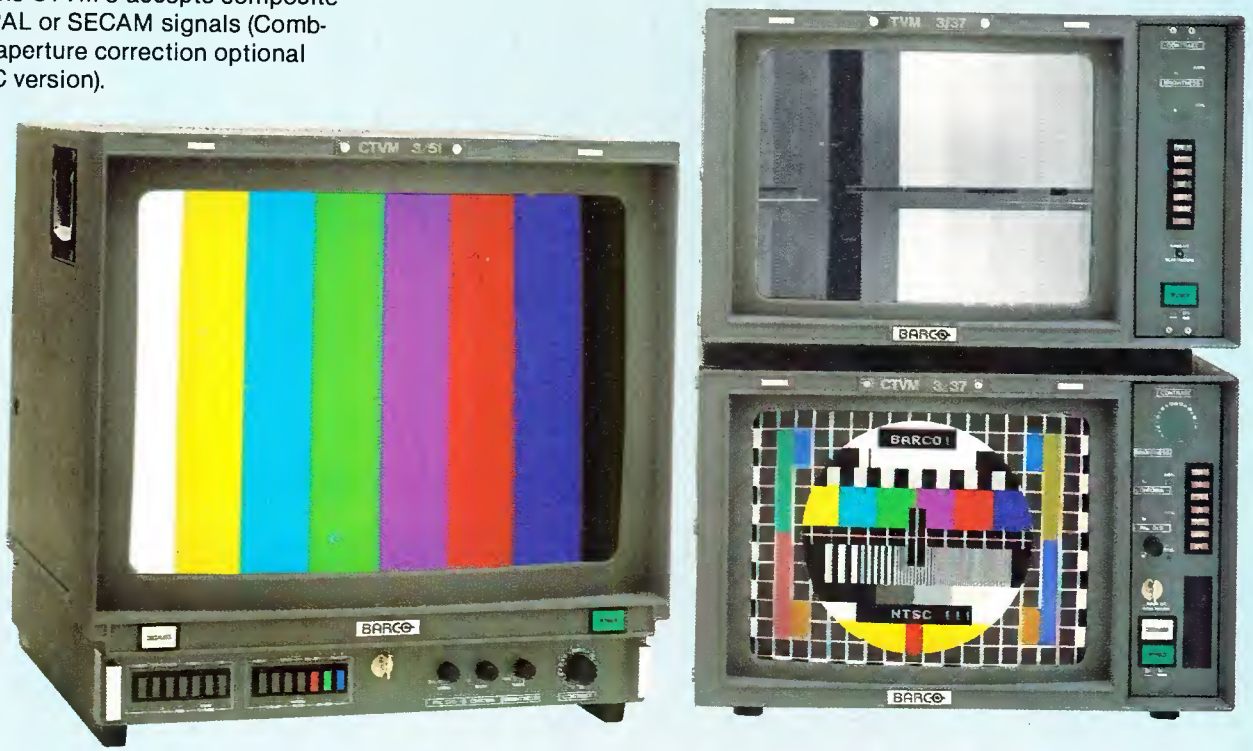
Sole representative for Barco Professional Video Systems Dep. in the United States.



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